

MADHYA PRADESH SCIENCE, TECHNOLOGY & INNOVATION POLICY 2022 (MP STIP - 2022)



Madhya Pradesh State Policy and Planning Commission

1. Introduction

Science, Technology and Innovation ('STI') have become inevitable and essential parts of our everyday life. 'Science' and 'technology' is ever-evolving, dynamic and the answer to several socio-economic issues, while 'innovation' is the key driver of science and technology. STI policy needs to consider locally-defined societal challenges, as well as adapt to the specific nature of the innovation systems in place. The state's economic growth depends on the capacity to educate, innovate, and build. Building innovation capabilities enables state to become Atmanirbhar by building their own development pathways, responding to economic, environmental and social aspects of sustainable development.

For a state like Madhya Pradesh ('MP'), sustainable economic development is possible only through the adoption of scientific principles with the implementation of innovative technologies. STI is not merely limited to education and R&D but has a vast domain of applications in nearly every field of society. Madhya Pradesh is a state which leads in front of agriculture, its natural resources and tribal population that inherits traditional knowledge, so this policy aims to focus on the key sectors like Agriculture, Natural resource management, Tribal development, Traditional Knowledge System which requires Science, Technology and Innovation intervention to turn these sectors into assets.

In present scenario, despite of demographic and geographic hurdles, Madhya Pradesh is striving hard to emerge as a frontier state in Science, Technology and innovation. Madhya Pradesh stands at 13th rank out of 17 major states, as per India Innovation Index 2020 with a score of 20.82 against the country's average of 25.35 (considering the category of Major states). There is a huge scope of improvement, and hence attention is required to various parameters like Human capital, Innovation, Investment, Knowledge workers, Performance, Knowledge output and Knowledge diffusion. Although State overperforms in provision of Safety and Legal environment and Ease of doing business but there is a dire need of State specific STI ecosystem that addresses the local needs and challenges of society.

In Madhya Pradesh, as per the statistics available, a marginal rise is seen in number of researchers and PG students is observed over a period of last 5 years. Foreseeing the opportunity in the field of Information Technology sector, GoMP has made necessary amendments in its IT, ITeS and ESDM Investment Promotion Policy and Scheme, in 2019.

To create and manage spatial data infrastructure in an effective manner, the State has Madhya Pradesh State Spatial Data Policy, 2014 in place. In similar way, to facilitate the availability and access to data and information in both human-readable and machine-readable forms through an electronic network, Madhya Pradesh Data Sharing and Accessibility Policy, 2012 is there in amendments. In financial year 2021-22, as per the budget received by the Department of Science and Technology, an amount of 213.1 crores was allocated to MPSEDC, which is about 89% of the total budget of the department and an amount of 27.33 crores was allocated to MPCST by the department. This is about 11% of the total budget of the department. The maximum budget of the Department of Science and Technology has been allocated to MPSEDC, which is minimum as compared to budget allocation received by Science and Technology departments of Chhattisgarh, Gujarat, Uttar Pradesh and Kerala. There are various ICT initiatives taken by the state like Sarthak Portal, MP Covid-19 portal, Jeevan Shakti Yojana Portal, DigiLEP, Land administration using Blockchain technology etc.¹ Alongside, Madhya Pradesh also have shown a marginal increase in filed patent applications over a period of 5 years from 112(in 2012-13) to 191(in 2017-18).²

In December 2020, the Ministry of Science and Technology, Government of India ('GOI') published the Science, Technology, Innovation Policy 2020 draft ('STIP 2020 draft'). On the basis of STIP 2020 draft, Government of Madhya Pradesh ('Govt. of MP') has been tasked with tailoring a STI policy, hereinafter referred to as, Madhya Pradesh Science Technology and Innovation Policy 2022 ('MP-STIP'). In addition to taking targeted steps towards building an STI ecosystem and pursuing certain focused sectors, MP-STIP shall strive to incorporate features such as implementation and monitoring strategy as well as a periodic review.

1.1 Vision

This policy aims to develop a Science, Technology, and Innovation (STI) ecosystem in Madhya Pradesh that will ameliorate the scenario of technological self-reliance i.e. Aatmanirbhar Madhya Pradesh which in turn will drive economic growth of the state via global excellence and local relevance. It focuses on sustainable growth and socio- economic improvement through science and technology & innovation interventions.

¹ Source: Madhya Pradesh Sushasan Development Report, AIGGPA.

² Source: Research & Development Statistics 2019-20, DST, GoI.

1.2 Objectives

1. To elevate Madhya Pradesh as a frontier state in the field of Science, Technology and Innovation and place the State among top 5 scorer in India Innovation Index.
2. Generation of employment opportunities will be doubled through Science, Technology & Innovation intervention in various sectors by public/private partnerships.
3. Promotion of interdisciplinary scientific research & innovation in every department and hence the expenditure on R&D will be escalated to at least 1% of the allocated budget.
4. Creating awareness among STI stakeholders on the latest technologies, R&D areas, collaborations, facilities, and knowledge sharing.
5. Identifying the priority areas (Healthcare, Agriculture, Tribal development, Natural Resource Management, Skill development & Employment generation and Energy, Environment & Climate change) where STI interventions can help society to achieve greater economic growth and better quality of life.
6. To eradicate all forms of inequalities and discrimination based up on caste, gender, religion, disability, geography or language in STI participation, promotion and retention.
7. In line with NEP 2020, fostering research culture in higher education institutions and forging forward connections to transform academic research into products and solutions along with demand-driven research and development.
8. Developing scientific and technological capacity to provide highly skilled human resource for increased productivity in the economy.
9. Fostering national and international linkages for enhanced technology transfer to facilitate the acquisition, adaptation and utilization of frontier technology.
10. To promote the sustainable development of natural resources by adopting the Traditional Knowledge System (TKS), with emphasis on 'vocal for local'.

2. Thematic Areas

2.1 System Interconnectedness- Education, R&D and Industry

Academia and industry cannot work in a sustainable manner without Research and Development. While academia produces new knowledge, firms find ways to commercialize it. Academia has the potential to generate high-quality scientific research that can be adopted commercially as well as train individuals that can, in turn, generate applied research and work with the industry to commercialize it. Therefore, it is essential due policy support is provided to ensure that key infrastructure is provided to academia and industry along with strong incentivization mechanism.

2.1.1 Strategies

- Science and Technology in Hindi in various stages of education will be promoted to tap a vast pool of talent of Madhya Pradesh.
- STI units in universities, public and private enterprises will be established to conduct research/innovation activities.
- Synergy of different stakeholders (academic/research institutes, Private investor/ industries, Research scholars, Government departments, NGOs, and CSOs etc.) to build a strong STI ecosystem is needed, for which a common platform is required which can place all stake holders at a single platform. As per directives of NEP 2020, there will be a formation of a state level institutional mechanism like National Research Foundation (NRF) to fill in the gaps through digital media (website, portals) or physical media (newsletters, conferences, conclaves) etc.
- Establishment of basic science laboratories/tinkering labs in primary Schools will be done to inculcate the innovative and scientific temper to generate and transform ideas among students in early education. Alongside, existing laboratory facilities available in secondary and higher secondary schools must be strengthen and upgraded to keep up with latest advancements.
- Career funding schemes will be launched for early and mid-career researchers/individuals in partnership with universities and colleges which offers young scientists the opportunity to pursue research and development.

- Research-based innovation will be facilitated through funding projects at the interface between research and science-based innovation as expounded in Project BRIDGE.³ The scheme should not only assist such innovators by funding also assist through entire innovation growth cycle from idea conceptualization to technology commercialization and reach to market will be facilitated through online platforms.
- Scheme that aims to bring back outstanding Indian research scientists and professionals from abroad to take up leadership posts in various autonomous institutions and publicly funded research organizations in the state as adopted by Returning Singaporean Scientists Scheme.⁴
- Collaborative programs will be launched to promote interlinkage among STI stakeholders (academic & research institutes, young scholars, and industry practitioners, Government units) to capitalize on their knowledge and gain practical experience⁵ to promote interdisciplinary/multidisciplinary/transdisciplinary research activities.
- An earmarked budget of 1% will be allocated for Research and Development by the concerned department.

2.2 Innovation and Entrepreneurship

At a time when policy makers are pooling efforts to restore growth and overcome the global health and economic crisis, specific attention must be given to innovative entrepreneurship, as it can play an important role in contributing to economic growth, job creation and poverty reduction, and can help address key social challenges.

a) Overall Innovation and Enterprise

There is a need to encourage innovation and enterprise across the state. Any and all support via improvement in infrastructure, establishment of clusters, parks, etc. can improve the health of the enterprise ecosystem.

2.2.1 Strategies

- Institutional mechanism will be created to increase the number of patents.

³ <http://www.projbridge.org/>

⁴ <https://www.nrf.gov.sg/programmes/returning-singaporean-scientists-scheme>

⁵ STIP Document 1.4 https://www.psa.gov.in/psa-prod/psa_custom_files/STIP_Doc_1.4_Dec2020.pdf

- Establishment of innovation clusters and technology parks for collaborative activities, cost sharing and creation of intellectual property will be done. Incentives will be provided to stakeholders occupying these clusters and parks based on performance and periodic assessments.
- Partnership with private enterprises will be done to launch missions that address the local issues of the tribal populations.
- Incentives (financial and otherwise) will be provided to enterprises that successfully utilize their Corporate Social Responsibility funds against STI activities that are aligned with Schedule VII of Companies Act 2013. The state will also consider awarding such enterprises annually which would encourage such enterprises to pursue STI activities.
- Universities Act will be amended to promote commercialization of in-house capabilities and enable Professors and Researchers of R&D institutions to float their companies.

b) MSMEs, Startups, Grassroot Innovators

In addition to creating strategies for any and all public and private enterprises, the policy shall give special focus to Micro, Medium and Small Enterprises ('MSMEs') for their significant role in the state economy in terms of generating revenue and employment at a comparatively lower capital cost than bigger enterprises. MSMEs also bring in commercialization and urbanization to rural and backward areas, thereby contributing to economic development. Given that the contribution of MSMEs to the GDP and employment is likely to increase in the coming decades.

2.2.2 Strategies

- Grassroot innovators will be supported for registration, trademark, design, claiming the IPR, filing of patent, or any type of legal claim with the help of Higher Education Institutes.
- Training for marketing innovations, establishing start-ups and market networks in the territories of tribal hamlets and placing adequate systems for quality control and commercialization will be developed to support grassroots innovations.
- Avenues for entrepreneurship development will be created to foster a vibrant grassroots startup ecosystem. Incubators and accelerators will be commercialized to

support scaling and commercialization of grassroots innovations, developed by social R&D organizations. This would generate opportunities to innovate full-fledged alternative solutions to local problems.

- Innovation Agency will be established that is responsible for supporting research-based innovation and encouraging the transfer of knowledge between public research institutes and industry. The agency will also support science-based start-up companies. The agency will be responsible in providing financial support to MSMEs / startups working in the area of technology and innovation.
- Establish innovation parks that can house technology and innovation startups as well as boost the marketable technologies in major cities (Bhopal, Indore, Gwalior, Jabalpur etc.).
- Support startups and MSMEs in applying for patent applications.
- Encourage the incorporation of MSMEs in the areas of financial technology, distributed ledger technology (such as blockchain technology), insurance technology, artificial intelligence.

2.3 Science Dissemination through Data & Regulatory Framework

To encourage and promote STI ecosystems in state, the data sharing and access to government and private institutes/ agencies owned data with other stake holders is essential. The data could be used for planning, research and development, etc. However, some of the data can also be sensitive, being critical to national security or Intellectual Property Rights, which may require approval of concerned departments/ agencies to be accessed. Data sharing and privacy policy of the State may also be mulled upon, due to substantial data sharing of concerned agencies, institutions and other stakeholders.

The promotion of research and innovations in ICT (Information and Communication Technology), GIS (Geographical Information System), AI (Artificial Intelligence), Biotechnology, Genomics, Nano-Science, etc., may allow STIs to become part of the general public and collaborative for achieving Sustainable Development Goals thereof. This technology driven participatory innovation mechanism will also help in streamlining the processes related with documentation and sharing of grassroots innovations. Consequently, an efficient and flexible governance mechanism with autonomy and transparency needs to be established for effective data management. Integration of

multiple databases will help in data sharing with the stakeholders. Provision of a bottom-up approach for feedback mechanism in this data architecture will impart the much needed communicative and collaborative capabilities to this system. The policy aims for creation of state repository of STI database for science dissemination.

2.3.1 Strategies:

- An integrated database will be created for the state STI data having provision of regular upgradation.
- A state level metadata infrastructure will be developed by taking inputs from line departments to complement STI database in decision making process.
- The implementing agency of STI will coordinate with the state universities / institutes, agencies, research organisations, for creating and updating the central repository of STI database of Madhya Pradesh.
- Strengthening of existing science centres will be prioritised for delivery and dissemination of scientific knowledge to the bottom level including the deprived sections of the state.
- A Centralized robust infrastructure will be created to facilitate data sharing between centre and state.

2.4 Equity and Inclusion

Madhya Pradesh has an unequal distribution of participation in STEM under the factors of gender, social structure, geography, and economic diversity. Furthermore, there is a lack of an inclusive culture in scientific practices as well as inadequate incentives and institutional arrangements.

This policy aims to achieve a society free of all forms of gender-based discrimination and violence, with equal opportunities for equitable participation in governance and leadership for all, and with adequate access to all markets, resources, and services for developmental opportunities without any biases.

As per Madhya Pradesh Sushasan Development Report, Madhya Pradesh is emerging as potential producer of research-oriented students in different sectors, according to the statistics illustrated, that the trends over the last five years indicate a 42.29% enhancement in the PhD enrolment, and 40.87% increment in the Post-Graduate courses. In the last five

years, overall female students' enrolment in courses is higher as compared with male students, i.e., 54.00% female and 34.01% male students enhanced in the last five years in Ph.D. and 52.51% female and 28.43% male student enrolment has increased in post-graduation courses.⁶ State will provide economically and socially self-reliant environment with equal opportunity ecosystem for Scheduled Castes, Scheduled Tribes, Women, Other Backward Classes, Minorities, Elderly and Differently Abled by deploying following strategies-

2.4.1 Strategies

- Awareness programs (like e-Shakti program for women in Madhya Pradesh) will be in place to make deprived section aware of potential of STI intervention in their socio-economic upliftment.
- More STI hubs/Technology enabled resource centres will be set up in order to cover the vast tribal population of the state for their trainings, value addition to their products, soil testing, water and products testing etc. Presently a STI hub is active in Madhya Pradesh working for socio-economic empowerment of tribal people covering merely a population of 3997 tribal population Rajaborari estate in Harda district of Madhya Pradesh which looks at value addition to commodities through scientific and technological interventions.⁷
- Impact assessment will be done to ensure that all the vulnerable groups (women, different abled persons, LGBTQ+ etc.) of the society are equally benefited in the STI field.
- To promote science, technology and innovation intervention in various sectors, gender-responsive budgets and audits of policies will be done.

2.5 Indigenous, Disruptive and Strategic Technology

Technology plays a significant role in socio-economic development, along with improvement in quality of life and transformation in any society. A crucial instrument of economic growth and development is the ability to generate scientific and technological knowledge and transfer it into new products or processes. In addition, Goal 9 of the Sustainable Development Goals (SDGs)- “Industry, Innovation and Infrastructure”,

⁶ Source: Madhya Pradesh Sushasan Development Report, AIGGPA.

⁷ Source: Press Information Bureau, GoI, Ministry of Science & Technology, 2021

emphasizes the importance of stimulating innovation and technological advances in achieving inclusive and sustainable industrial development.

With the emergence of varied technologies, the state continues its transformation with the adoption of technology-led innovations to solve the societal challenges in the critical areas of education, agriculture, healthcare, smart mobility, affordable energy and rural development etc. Also, in the fast-changing environment, MSMEs must consistently improve and innovate with the support of technology in order to be competitive both locally and globally. There is need to support MSMEs by carrying out technology need assessment of various industrial clusters and encourage them in adopting technological innovations to enhance their operations, resulting in increased productivity and competitiveness. In addition, with the “Make in India” initiative, which aims to strengthen manufacturing there, is emphasis on technology utilisation to leapfrog in terms of industrial growth leading to economic development.

a) Indigenous Technology for Atmanirbhar Madhya Pradesh

The policy will focus on the development of indigenous technology in varied sectors which would propel entrepreneurial inclinations and foster the creation of small firms, since they are regarded as flexible drivers of innovation. Appropriate policy imperatives for promoting innovations can play a catalytic role in building indigenous technological capability to augment sustained rural development.

Furthermore, creating supportive ambience for the adoption and adaptation of existing technologies, and creation of new technologies are suitable for the local economy instead of over reliance on the imported technologies. Hence assessment, testing and vetting of various kinds of traditional knowledge applicable in Agriculture, biodiversity, healthcare, climate change and other locally relevant thematic areas will be encouraged. There will be increased focus towards promoting efforts in the development and demonstration of indigenous technologies to achieve the larger goal of “Atmanirbhar Madhya Pradesh” through technology self-reliance and indigenization.

In addition, indigenous innovation and knowledge, and its utilization for solving practical local developmental challenges will be explored through creation of “regional centres for technological innovation” along with linkages with Research & Development institutes.

b) Disruptive Technologies

Disruptive technology is an innovation that expressly alters the way customers, industries or businesses operate. Disruptive technology enhances the way disruption can be positive for the economy. The policy will focus on identifying and evaluating potentially disruptive technologies to solve development challenges.

The policy will focus on building Centre of Excellences (CoEs) to provide a platform for various stakeholders including industry, government, academia, user enterprises, and innovators to collaborate and co-create technology-based solutions and products in varied sectors which include healthcare, agriculture, education, smart mobility, energy and environment etc. In addition, the policy will focus on implementation of frontier/disruptive technologies by different government department to improve governance, public service delivery and creation of new jobs.

c) Strategic technologies

Technology-based innovative process involves development of new products, processes and services. Technology management practices may be applied to arrange and harmonize all the activities starting from idea generation to commercialization. It is significant for the state to increase its technology potential in strategic sectors which include agriculture & food processing, biotechnology, healthcare, cyber etc. and hence there is a need for a careful policy approach. The policy will focus on technologies which result in values addition of products in varied sectors which include agriculture & food processing, MSME etc.

2.5.1 Strategies

- Identification and evaluation of potential technologies to solve societal and developmental challenges.
- Inclusion of traditional knowledge systems and grassroots innovations as key driving forces to capitalize on our rich scientific heritage and facilitate the required strategic transformations.
- Separate guidelines will be rolled-out to emphasise the importance of free and prior informed consent (FPIC) of the knowledge holders in the process of Commercialization of traditional knowledge. Access benefit sharing (ABS) protocols will be put in place to fairly distribute the benefits of such commercialization with all

stakeholders involved in the process of documenting and furthering oral/indigenous/folk/tribal/non-codified Traditional knowledge.

- Promotion of technologies in selected thrust areas that have potential for faster growth like Information & Communication Technology (ICT)/Internet of Things (IoT)/Artificial Intelligence(AI) Machine Learning(ML), Virtual Reality(VR)/Augmented Reality(AR), Embedded Technology, Manufacturing including Electronics systems design, Robotics and 3D printing, Manufacturing 4.0, Healthcare and Bio Pharma, Genomics, Agriculture and allied fields, Clean and Green-Tech, Energy, Water and its recycling, Education, Nanotechnology and Composites.
- Centre for excellence in frontier technologies (AI, IoT, Block-chain, Robotics) will be established to develop technology solutions for its implementation in the state.
- A dedicated STI fund will be created to support technology developments in the priority sectors which includes healthcare, agriculture, education, smart mobility, energy and environment etc.
- Funding for early stage/Idea2PoC (Proof of Concept) will be provided to encourage innovators for early-stage financial assistance to stimulate commercialization of technologies.
- Creation of network of agencies for delivery and effective dissemination of new technologies and entrepreneurship to generate economic and social value.

2.6 Traditional Knowledge System

Traditional Knowledge (TK) is important part of cultural identity. It is essential to the food security of millions of people in the developing world especially in countries with rich biodiversity and TK, like India. Recently, the international community has sought to recognize and protect TK. Documenting the TK is the first step towards eliminating any attempt for its biopiracy, which is on the rise in India and other developing countries. There is also a possibility of developing economically profitable products by utilizing TK. TK should be refined as sustainable model and transferred to the other communities from generation to generation.

The policy aims at promoting and sustaining Traditional Knowledge in the areas of agriculture, fisheries, AYUSH, Biodiversity, Ethnobotany, Forestry, Microbiology and Pharmacology/Ethnomedicine etc. For integrating Traditional Knowledge Systems (TKS)

and grassroots innovation into the overall education, research and innovation system, an institutional architecture will be established in different technical and research institution campuses, to recognise and involve grassroots innovators, which in turn will inspire students to innovate. Avenues for collaborations between grassroots innovators and scientists will be initiated/facilitated through joint research projects, fellowships and scholarships. Also, crowdsourcing will be encouraged, wherever possible, to improve the innovative capabilities and productivity.

2.6.1 Strategies

- Promotion & documentation of traditional knowledge system, wisdom, tribal medicines and practices by developing State Natural Resources Data Centre (NRDC) and its linkage with the National Data Centres (NDC).
- Traditionally, employment has been available in every village of the state through artisanal and craft-based products like bamboo crafts, leather crafts, soil crafts, natural colours, natural fibres, leaf-based products etc. Gradually, this system is on its extinction. They can be restored through proper science and technology interventions required for providing necessary support in terms of tools and techniques, automation, training and market linkages.
- Facilitating Bio-prospecting and Intellectual Property Rights (IPRs).
- Establishment of knowledge cells, incubation, IPRs and entrepreneurship skill centers to train tribal youth in areas of traditional wisdom.
- R&D and academic institutions will focus on the commercialization of products based on the traditional knowledge of indigenous herbs of local tribes.
- Establishing good linkages with S&T institutions & setting up an incubation center in nodal institutes with infrastructure development to promote usage of traditional knowledge systems as sustainability models.
- Traditional Knowledge will be utilized for the implementation of effective water resources management plans to conserve water and adequate soil management in soil erosion areas.
- Institutional mechanism will be created for transfer of traditional knowledge of tribal areas to non-tribal areas
- Establishment of institutional mechanisms for promotion of functional genomics and proteomics-based research on herbs and ayurvedic drugs.

- Institutional mechanism will be developed for specific knowledge translation from districts and its global marketing through online platforms.

3. Sectoral themes

3.1 Healthcare

Science, technology, and innovation can facilitate the achievement of Sustainable Development Goal (SDGs) 3, which particularly focuses on guaranteeing healthy lives and fostering well-being for people of all ages. Although there are many elements needed to ensure healthy lives for all, science, technology and innovation are critical contributors to the development of improvements in the quality and inclusiveness of healthcare. Science, technology and innovation are conceived broadly to include not only scientific and technical innovations, but also well-established low-technology solutions and organizational and social innovations applied in health care. New technological developments in artificial intelligence, digital health, gene-editing and other areas can advance efforts in achieving SDGs-Goal 3. However, for the effective application of frontier or well-established science, technology and innovation tools in health care requires investments in research, human capital and infrastructure development, support for research and development commercialization and a whole-of-government and multisectoral approach. Another area of concern in the specific context of Madhya Pradesh is the behavioural rigidities against medical interventions. In the tribal belts of the state, behavioural rigidities have been proven to be a major hindrance for the successful implementations of various disease control programs.

This policy will focus on the ensuring affordable and accessible healthcare for all citizen of Madhya Pradesh through STI interventions and extending the medical services to traditionally underserved populations such as rural areas that do not have the required infrastructure or enough primary physicians, and economically weaker sections of society who may not be able to afford certain medical facilities.

3.1.1 Strategies

- Promotion of research and development of technologies will be done for:
 - Public health
 - Medical devices

- Generic medicines
 - Targeted delivery
 - Application of biotechnology for prevention cure and support etc
- New technologies will be adopted such as:
 - Synthetic biology
 - Genetic Engineering
 - Nanotechnology
 - Nutraceuticals
 - Liquid Biopsy
 - Regenerative medicines
 - Biomedical Engineering
 - State level centralized repository of disease information & control will be created.
 - A digital platform will be developed to impart technical and behavioural trainings to healthcare staffs, SHGs, ASHA workers and Anganwadi Karyakarta. These grassroots level workforces will then communicate the message with people in local dialect and try to overcome behavioural rigidities of the population towards medical intervention.
 - Mechanism will be devised for improving collaboration among academia, enterprise, research organization and healthcare systems to develop new healthcare technologies, products and services in addressing state priorities, public health, maternal and child health issues.
 - An enterprise wide platform will be developed by concerned department for medical service delivery to create reference data for validation, mining of disease patterns & trait database for deployment in Government health infrastructure.
 - The academic faculty at Medical colleges will be incentivized/motivated by concerned department to pursue inter/multi/trans-disciplinary research.
 - A fund of 1% of the Concerned Department's annual budget will be earmarked every year for developing Scientific Human Capital and supporting research in the following areas:
 - Infectious diseases in addition to antibiotic resistance
 - Epidemics and Non-communicable Diseases
 - Malnutrition, mother and child related health problems

- Health issues related to sanitation and hygiene
 - Infectious diseases and antibiotic resistance
 - Genetic disorders
 - Life style diseases such as obesity, cardio-vascular, diabetes etc.
 - Cancer
 - Neurological diseases
 - Precision medicines
 - Medical Devices
 - Generic medicines
- Incentivize/subsidies the start-up/grassroot innovator for development and production of polyclonal/ monoclonal antibodies for immunological detection and treatment.
 - Incentivize/subsidies the start-up/grassroot innovator to develop DNA/RNA based diagnostic i.e., infectious disease diagnostic kit/ non-infectious disease diagnostic kit/genetic disorder diagnostic kit/ cancer screening diagnostic kit etc.
 - In the health sector, an enabling environment for large scale and low-cost manufacturing of essential products such as drugs, vaccines and medicines will be promoted, including innovative licensing approaches where necessary.
 - At least 25% assurance of procurement of healthcare products from the start-up/grassroot innovator of Madhya Pradesh by the concerned department to be Atmanirbhar Madhya Pradesh.

3.2 Agriculture

MP is primarily an agrarian state, with a substantial portion of the state's working population dependent on agriculture and allied activities for livelihood, directly and indirectly. Unfortunately, the agriculture sector is also littered with challenges including over-dependence on rainfall and climate; lack of mechanization, infrastructure, and storage facilities; harvest and post-harvest losses; fragmented landholdings; and surplus production. To make matters worse, the COVID-19 pandemic and the consequent reverse migration ended up burdening the agriculture sector with excess labour force.

One of the best solutions to tackle the abovementioned challenges is to encourage modern post-harvest management practices, mechanisation of agriculture, as well as diverting the surplus production and the excess labour from agriculture into food processing sector

(primary and value-added processing). This would essentially enable farmers and small-scale entrepreneurs to set up micro food processing units and fetching an alternative source of income. For this move to be successful, there is a need to infuse skilled entrepreneurs and workforce into the food processing sector from floor-level positions to managerial positions.

3.2.1 Strategies

- To focus on problem-based research, Citizen science will be promoted/incentivized to understand challenges effective manner at the field level and prioritise research accordingly.
- Percentage of budget will be earmarked by the concerned for funding R&D activities relating to STI in universities, research institutions and enterprises (especially MSMEs) operating in the agriculture sector. Funds will be extended for topics, including but not limited to, agriculture technology ('Agri Tech'), satellite imagery, GIS software and GPS agriculture, drone and other aerial imagery, agri-robotics, AI in agriculture, food processing technology, farming software and online data, traditional knowledge etc.
- Increase in demand of food, fibre and fuel with rising population needs innovation in farm mechanisation through entrepreneurship and encouraging local innovation for local challenges.
- Fellowships for mid-career professionals / scientists / technologists will be launched by the concerned departments, in collaboration with academic and research institutions to encourage them to undertake STI activities in the agriculture and allied sectors.
- Institutes will be incentivized by the concerned departments that are able to successfully utilize the earmarked budget towards STI activities that led to the development of new innovations and technologies.
- Mission mode programmes will be launched that provide *inter alia* funding, subsidies, loans, incentives, and support to enterprises (especially MSMEs) that are engaged in innovations and developing new technologies in agriculture and allied sectors.
- As per Madhya Pradesh SDR, the State lacks diversification in cropping pattern along with high proportion of low value crops in cropping patterns (coarse cereals 20.6 per cent in kharif particularly), low use of HYV seeds, fertiliser and less mechanisation in

the domain⁸. Therefore, scientific **diversification of cropping pattern** will be adopted/promoted for resource optimization and addressing challenges of overproduction.

- The concerned department will facilitate international collaborations between institutions and universities in MP and abroad which would help to bring in new and emerging forms of technologies that have the potential to be commercialized.

3.3 Energy, Environment and Climate Change

Energy is one of the most important inputs for economic development. From a physical viewpoint, the use of energy drives economic productivity and industrial growth and is central to the operation of any modern economy. Consequently, the existence and development of sound energy infrastructure is essential for continued growth of Indian economy. The rising fuel prices of December 2021 demonstrates that now, more than ever there is a need to utilize new and improved sources of energy. There is also a rising need for sustainable consumption, which consequently leads to a rising need to utilize more alternative and / or renewable forms of energy that is efficient and cost-effective.

Environment and climate change are another priority area for all of India and MP as well. Due to accelerated urbanization and industrialization, several environmental challenges have amplified over the past decade. Some of the major environmental concerns are *inter alia* air pollution, river pollution erratic rains, floods, deforestation, increasing temperatures, depletion of natural resources. It is essential to pursue innovation and technology that not only sustainable but also actively protects the environment against pollution, climate change etc. New technologies offer considerable promise for decoupling economic growth from long-term environmental degradation.

3.3.1 Strategies

- Madhya Pradesh is a state with vast potential of solar and wind energy. Presently in the field of wind energy Madhya Pradesh is contributing with 2519.89 MW against the potential of 10.48 GW (at 100 m) and 15.40 GW (at 120m). Alongside currently, installed capacity of Madhya Pradesh in terms of Solar energy is 1586.25 MW⁹ against the potential of good sites offering 5.5 KWh/sq. m./per day with high solar

⁸ Madhya Pradesh State Development Report, Niti Aayog

⁹ Source: Ministry of New and Renewable Energy, GoI.

radiation of around 300 days of clear sun¹⁰. Efficient steps will be taken to harness this potential and fulfill the deficit.

- Special status will be given to enterprises looking to develop clean and affordable alternatives in energy along with special tax-incentives to start-ups, residential and commercial set-ups will be imparted.
- Cross-institutional linkages will be established to undertake joint studies in the field of Sedimentology, Geoarchaeology and Climate Science to address the issues related to Global warming and effect on climate change on natural resources.
- Innovations will be promoted for waste management, pollution mitigation and improving quality of the environment, conservation of biodiversity, prevention of soil and land degradation, groundwater recharge, and energy efficiency.
- Budget will be earmarked for funding R&D activities relating to STI in universities, research institutions and enterprises operating in MP. Funding may be extended for topics, including but not limited to, clean and green energy, renewable energy (solar, wind, water etc.), energy storage, green hydrogen, smart electricity grids, heat pump technology, carbon capture, AI solutions in energy to manage complexity of operations, vertical farming, green architecture, waste-water electricity generator, biofuel, electric automobiles, carbon capture, molten salt storage, artificial photosynthesis, smart meters etc.
- To mitigate climate change, stringent step will be taken towards decarbonisation as recommended by IPCC in their sixth assessment report (AR6) by carbon dioxide removal (CDR) using negative emissions technologies such as direct air capture and bioenergy with carbon capture and storage, or using natural sinks like forests to sequester carbon.¹¹
- As a substitute of fossil fuels, bio-fuels are being used from a long time, and in present scenario, Governments are pushing their efforts to promote these bio-fuels, so, potential of Madhya Pradesh will be harnessed in production of energy crops along with development of value chain for the sector.
- Fellowships for mid-career professionals / scientists / technologists will be launched by the concerned department to encourage them to undertake STI activities in the energy, environment and climate change sector.

¹⁰ Source: Madhya Pradesh Urja Vikas Nigam Limited.

¹¹ As per IPCC Sixth assessment report (AR6). <https://www.ipcc.ch/report/ar6/wg2/>

3.4 Skill Development, Employment Generation and Self Employment

Science, Technology & Innovation (STI) plays a huge role in Skill development, Employment Generation, and Self-employment in state. People living in remote areas need to find the sustainable mode of livelihood. STI plays an important role in this domain, whether it is agriculture and allied activities, food processing, poultry, etc. Technology also played a stupendous role amid the COVID-19 pandemic, when the only way to interface with the outside world was through Computers and Mobiles. Forwarding skill to areas where it was formerly not possible has now become quite comfortable because of leveraging technology. Although the Government of India is strengthening the scenario by putting its efforts through **Pradhan Mantri Kaushal Vikas Yojana (PMKVY)**, **Pradhan Mantri Kaushal Kendra (PMKK)**, **Seekho aur Kamao** (Learn and Earn), **Skilled Workers Arrival Database for Employment Support (SWADES)**, **SWAYAM**, **National Programme on Technology Enhanced Learning (NPTEL)**, etc. to ameliorate the domain, still more emphasis is to be laid upon few areas at the State level.

3.4.1 Strategies

- Sector-specific Skill-based knowledge will be promoted for regional communities to sustain the traditional skills.
- Digital platform like SWAYAM portal will be introduced to impart sector specific skill-based knowledge and the end user will be certified after an evaluation process, which will provide a wide skill enhancement opportunity to the people of Madhya Pradesh.
- Establish R&D and academic institutions in rural and remote areas, particularly in tribal areas.
- Support and incentivization will be provided for innovation-based self-employment.
- Curriculum review and revision mechanism will be created for skill-based training courses periodically as per industry's requirements.
- In collaboration with higher education institutions, private industry, and local communities, **Cluster school** and **Innovation hubs** will be established to share resources and capacities related to curriculum renewal and faculty development.
- Incentive-based support mechanism will be introduced to retain skilled manpower in the state.

- Faculty development programme will be promoted for upgrading skills and knowledge of faculty in emerging areas of technology in their respective fields.
- Increased focus will be put upon **skill-building through hands-on training**. For this purpose, academic institutions will be encouraged to create long-term working relationships with regional MSMEs to address locally relevant issues.

3.5 Tribal Development

Madhya Pradesh is the largest state of the country in terms of tribal population with 14.7 per cent of the total tribal population in India according to 2011 census¹². The biggest road block towards the sustainable development of tribal community is the lack of awareness of policies and programmes made for them which need to be strengthened and it can be only possible by enhancing literacy rate among tribal. The policy aims for enhancing the literacy level of tribal population through technology solutions. In addition, the policy aims to bring the tribal into mainstream and make them participate in the development process while making efforts for preserving their identity and heritage.

3.5.1 Strategies

- The mission-oriented efforts will be address to resolve issues of the tribal population of MP in partnership with private enterprises such as launching missions to address local issues of the tribal populations, establish institutions in tribal dominated districts etc.
- Application of Science Technology & Innovation for skill development to generate alternate sources of income/livelihood through sustainable cultivation systems/diversified agriculture and the establishment of non-farm enterprises at the micro and small-scale level;
- Promoting indigenous tribal medicines alongside other systems to create additional livelihood opportunities and Access benefit sharing (ABS) with the knowledge holders will be put in place for everyone.
- Documentation of Tribal Medicines/other products and practices through Tribal Research Institutes to delivery along with protection of rights and livelihoods of the knowledge holder(s).

¹² Source: Census 2011

- Establishment of multilingual language laboratory will pivotal role in bridging the language barrier and embraced cultural sensitivity of the students.
- Focus on a long-term strategy to enhance educational status of tribal children through digital education in schools.
- Developing institutional mechanisms for promotion of tribal products and marketing through science and technology interventions.

3.6 Natural Resource Management

The world is facing challenges, which include the pressures of increasing population, greater health risks, changing demographics, degraded natural resources, and dwindling farmlands. There is need for new science and technologies, new priorities, and new paradigms to address these fundamental challenges.

Madhya Pradesh is the state with largest forest cover of the country with 8708 thousand hectare that is of 28.31 % of overall state area¹³. Alongside the state has 11 agro-climatic conditions and a variety of soils to support cultivation of wide variety of crops¹⁴. Madhya Pradesh is also leading the front in its mineral resources like Diamond and Copper, following with other ores like Diaspore, Pyrophyllite, Rockphosphate, Manganese etc.

Science & technology interventions are needed for efficient management of natural resources for conservation of forests, soil, forecasting floods, cyclones, earthquakes, drought, prevention, and mitigation of natural hazards.

3.6.1 Strategies

- Digital technology solutions will be adopted to strengthen the development programs which will enhance the quality and efficiency of data collection, empower local communities to be engaged in conservation efforts, and aid real-time decision-making for efficient NRM.
- Judicious resource mapping of 52 districts will be done for documentation in form of atlases, so that district specific projects and schemes can be launched to harness the potential accordingly.

¹³ Source: India State of Forest Report, 2021. Forest Survey of India

¹⁴ Source: IBEF data

- The state will develop the Natural Resource Management Framework which will provide a focus on involvement and partnership with local communities/Gram Panchayat in protecting and managing natural resources.
- Assessment of mineral deposits will be done as per standards defined in United Nations Framework of Classification.
- Strengthening of Geographical Information System and Global Positioning System will be done for effective risk assessment in forest areas.
- The state will put effort to mitigate soil erosion and increase the land productivity
- Infrastructural support must be strengthened to build improvised ecological profile of Madhya Pradesh, so that appropriate action must be taken for Natural resource management.
- For flood related issues, the state will focus to utilize the satellite data that can be effectively used for mapping and monitoring the flood inundated areas, flood damage assessment, flood hazard zoning, and post-flood survey of rivers configuration.

4. Monitoring and Periodic Review

MP-STIP is step towards promoting science, technology and innovation in MP. This policy shall have an institutional framework that will implement and monitor the accomplishment of the policy objectives as well as periodically review the policy in its entirety. This will be done considering any developments in science, technology and innovation, in India and globally. In its bid to implement, monitor and periodically review, the Govt. of MP shall follow a participatory approach by involving relevant stakeholders, including representatives from the Government, industry and civil society.

4.1 Monitoring

A **STEERING COMMITTEE**, consisting of relevant representatives from the Government shall be appointed. MPSPPC, MPCST and Department of Science and Technology, may suggest representatives from relevant Ministries / Departments / other government bodies, as may be deemed appropriate for the effective implementation of MP-STIP. The constitution order of the Steering Committee shall envisage that the committee shall be responsible for monitoring the implementation and progress of MP-STIP. In pursuance of which, the Steering Committee shall meet periodically to track the progress on the strategies.

An **INTRA-DEPARTMENTAL STANDING COMMITTEE ('IDSC')** shall also be constituted to serve as a forum for introduction of new strategies and revising the old, taking feedback from relevant departments, ministries, and stakeholders for tracking the implementations of aforesaid strategies. The IDSC may extend special invitations to stakeholders and experts from industry, civil society, academia or domain experts for consultations. Alongside, a digital platform/portal will be introduced for monitoring, assessment, and evaluation of STI activities, so that proper steps can be taken to ameliorate the policy.

A thorough consultation process is also required from all the stakeholders (academic/research institutes, Private investor/ industries, Research scholars, Government departments, NGOs, and CSOs etc.) to fix the targets and aspirations for the State. During the process trainings and participatory mapping also needs to be done by the committees.

