WORKING OF THE

DIRECTORATE OF SCIENCE AND TECHNOLOGY,

GOVERNMENT OF MIZORAM

LALBIAKZUALA

DEPARTMENT OF PUBLIC ADMINISTRATION

MIZORAM UNIVERSITY

WORKING OF THE DIRECTORATE OF SCIENCE AND TECHNOLOGY, GOVERNMENT OF MIZORAM

BY

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in Public Administration of Mizoram University, Aizawl.

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CERTIFICATE

This is to certify that Mr. Lalbiakzuala has prepared a Dissertation under my Supervision on the topic Working of the Directorate of Science and Technology, Government of Mizoram in fulfillment for the award of the Degree of Master of Philosophy (M.Phil) in the Department of Public Administration, Mizoram University, Aizawl.

This Dissertation has been the outcome of his original work and it does not form a part of any other Dissertation substituted for award of any other degree.

He is duly permitted to submit his Dissertation for examination.

Dated Aizawl, (Dr. LALTANPUII RALTE)

The 31st January, 2020 Supervisor

DECLARATION

Mizoram University

January, 2020

I, Lalbiakzuala, hereby declare that the subject matter of this thesis is the record of word done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the degree of Master of Philosophy in the Department of Public Administration.

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(LALBIAKZUALA)

CONTENTS

LISTS OF CHARTS AND TABLES

ABBREVIATIONS

CDC	Consultancy Development Centre
CSIR	Council of Scientific and Industrial Research
CSO	Chief Scientific Officer
DBT	Department of Biotechnology
DoNER	Development of North Eastern Region
DSIR	Department of Science and Industrial Research
DST	Department of Science and Technology
GIS	Geographic Information System
ICT	Information and Communications Technology
IFC	Innovation Facility Centre
IMD	India Meteorological Department
IPR	Intellectual Property Rights
MIRSAC	Mizoram Remote Sensing Application Centre
MISTIC	Mizoram Science, Technology and Innovation Council
MSC	Mizoram Science Centre
NAPCC	National Action Plan on Climate Change

NESDR	North Eastern Spatial Data Repository
NIC	National Informatics Centre
NISSAT	National Information System for Science and Technology
NITI	National Institution for Transforming India
NMSHE	National Mission for Sustaining the Himalayan Ecosystem
PIC	Patent Information Centre
RMC	Regional Meteorological Centre
SCCC	State Climate Change Cell
SEED	Science for Equity, Empowerment and Development
SIPMIU	State Investigation Programme Management and Implementation Unit
SMC	State Meteorological Centre
SRSAC	State Remote Sensing Application Centre
STEC	Science, Technology and Environment Cell
ZEDA	Zoram Energy Development Agency

Chapter - I

INTRODUCTION

Science and technology have always been important factors in shaping human society. Technological efforts have tended to manipulate and control the physical world while scientific pursuits have primarily attempted to comprehend it. These separate efforts have now joined into an inseparable whole and has helped improve the economy and quality of life of many nations and individuals. It has also brought about crises such as resource depletion and environmental pollution.

Development at any phase is always linked with technology and technology happens when there is advancement in science. Hence, science, technology and development are all proportional to each other. Development is required in all aspects, be it of an individual or a nation, and for development to occur, science and technology go hand in hand. Basically, science is known as the study of knowledge, which is made into a system and depends on analyzing and understanding facts. On the other hand, technology is basically the application of this scientific knowledge.

For any successful economy, particularly in today's quest for knowledge based economies, 'science', 'technology' and 'engineering' are the basic requisites. If nations do not implement science and technology, then the chance of getting themselves developed becomes minimal and thus could be even rated as an underdeveloped nation. Hence, science and technology are associated in all means with modernity and it is an essential tool for rapid development.

Modernization in every aspect of life is the greatest example of the implementation of science and technology in every nation. With the introduction of modern gadgets in every walk of life, life has become simple and this is possible only because of advancement of science and technology. Without the presence of modern equipment in all sectors, be it in the field of medicines, infrastructure, aviation, electricity, information technology, etc. the advancement and benefits that are experienced today would not have been possible. Such is the influence of science and technology for the development of a nation.

For every nation to get developed, the application of both science and technology has to go hand in hand. Villages are developed into towns, and towns to cities, and cities are expanding to greater horizons. This expansion has occurred through the expansion of science and technology. In the twenty first century, the competiveness of a country in the global market place depends on the strength of its economy, its contribution to existing and emerging branches of science and technology, and its ability to respond to the imperatives of a globalizing world. Knowledge and skills have increasingly become the primary determinants of economic growth and development. Countries with higher and better levels of skills adjust more effectively to the challenges and opportunities of growth in a globalized world.

Today, countries are classified as developed and developing countries. The major categorization is based on economy and the application of science and technology. Even through a careful analyzation, one can understand that countries which have a strong base in science and technology are the ones that developed faster.

It is estimated by the World Bank that seven of the ten largest economies of the world by 2020 would be in Asia, namely China, Japan, India, Thailand, Indonesia, South Korea and Taiwan.

Science and technology have contributed to the advancement of medicines and analysis on diseases. Apart from the medicine, there has been remarkable development in agriculture, education, communication, industry, etc. In spite of the advancement in various sectors, the world is still not free from hunger, disease, pollution, illiteracy and poverty. With the right application of research, development, and implications of science and technology a major difference could be brought about. It goes without saying that, a nation's development and prosperity is judged to a large extend by the status of science and technology of that nation. It is easily understood when analyzing that countries like Japan and United States of America who invest a decent amount for research and development are in the highest stratum of development whereas, countries like Nepal who invest very less amount in research and development remain in the lowest ladder of development. Therefore, without proper implementation of science and technology, no nation could grow in today's modern world.

In India, science and technology developed early in the history of our civilization along with the development of our society. Such science and technology being indigenous constituted an important part of our growth in social and cultural spheres. India is one of the top-ranking countries in the field of basic research. Indian

science has come to be regarded as one of the most powerful instruments of growth and development, especially in the emerging scenario and competitive economy[1].

A country like India where the spread of Government and its institutions is extensive, training of Government decision makers and upgrading their skills acquires very high priority. Applications, which can make an enormous difference to the lives of the people in both urban as well as rural areas, include the spread of microprocessors, biotechnology and nanotechnology innovations. In the coming decades, developments in various fields will lead to breakthroughs in health services and education. Thus, it is necessary to embark on some major science projects which have relevance to national needs and which will also be relevant for tomorrow's technology.

The Ministry of Science and Technology is the Indian government ministry charged with formulation and administration of the rules and regulations, and laws relating to science and technology in India. There are three departments which work under the Ministry of Science and Technology which are:

1) Department of Biotechnology (DBT)
2) Department of Science and Technology (DST)
3) Department of Science and Industrial Research (DSIR)

The Department of Biotechnology is responsible for identifying and supporting specific Research and Development programmes in biotechnology and

[1]https://dst.gov.in/administrationfinance/administration-finance accessed on (14.10.2019)

biotechnology-related manufacture. DBT also supports training of young scientists in the field of biotechnology at various universities and institutes.

The Department of Science and Industrial Research has two autonomous institutes under its wing namely, Council of Scientific and Industrial Research (CSIR) and Consultancy Development Centre (CDC). Dedicated to research and development, CSIR is the major organization under DSIR.

DST is a department within the Ministry of Science and Technology in India which was established in May 1971. It is the nodal department for promoting new areas of science and technology and strengthening of national capacity in science, technology and innovation in the country. The agenda has been served through implementation of several planned initiatives focused on enabling the Indian Science and Technology community for increasing its scientific and technological outputs in terms of quality and quantity. DST provides the largest extramural research and development support in the country to strengthen national science and technology capacity and capability through a competitive mode to scientists cutting across institutions and disciplines. This strategically important function mutually reinforces the outcomes of India's educational, scientific and industrial Research and Development initiatives and helps transform the science and technology ecosystem of the country.

The Department of Science and Technology, Government of India was established with the objective of promoting new areas of Science and Technology and to play the role of a nodal department for organizing, coordinating and promoting Science and Technology activities in the country. The post of the Secretary is the

highest rank under this Department. DST has two subordinate departments under its administrative control, namely the National Atlas and Thematic Mapping Organization (NATMO) and the Survey of India (SOI).

The Department of Science and Technology, Government of India supports open access to scientific knowledge, which originated from the public-funded research in India. In December 2014, DST and DBT had jointly adopted their Open Access Policy.

In addition to it, the Department of Science and Technology, Government of India also supports twenty (20) autonomous science and technology institutions in India such as – the Aryabhatta Research Institute of Observational-Sciences (Nainital), North East Centre for Technology Application & Reach (NECTAR), etc., for the promotion of science and technology. Apart from this, DST also supports professional bodies in India such as the Indian Science Congress Association in Kolkata, Indian National Science Academy in New Delhi, Indian Academy of Sciences in Bangalore, Indian National Academy of Engineering in New Delhi, and National Academy of Sciences in Allahabad.

The initiative to establish State Councils for Science & Technology was first taken in 1971 when the then Minister for Science and Technology and Chairman, National Committee for Science and Technology (NCST), Shri C Subramaniam wrote to Chief Ministers of all the States stressing that irrespective of large investments of the Central Government in Science and Technology in various sectors and institutional infrastructure.

The State Science and Technology Councils have been set-up in all the States and Union Territories. Several States have also formed a separate Department of Science and Technology. The State Councils are normally chaired by Chief Ministers of the respective States or by an eminent scientist.

The Department of Science and Technology, Government of India played a catalytic role by facilitating the State Governments in establishing and developing the State Science and Technology Council by providing support for their technical assistance. Concurrently, Department of Science and Technology, Government of India in collaboration with respective State Council, organized all India thematic meetings/workshops whose recommendations helped identify activity-areas for promotion by the State Science and Technology Councils[2]. The DST also organized periodic review meetings to discuss the status of various Science and Technology programmes and to plan the strategy for the future. Regional Meetings organized by DST facilitated review of state Science and Technology structures and identification of areas of mutual cooperation between States.

On completion of 10 years of this programme, a Decennial Review was held to assess the strengths and weaknesses of this programme vis-à-vis Department of Science and Technology's performance. This review indicated the desire for a phase change geared towards programmatic support and strengthening linkages between the State Science and Technology Councils and the Central Science and Technology Agencies by suitably dovetailing various programmes of State Science and Technology Councils with those of Central Science and Technology Agencies.

[2] dst.gov.in/sites/default/files/guidelines.pdf (accessed on 16.09.2019)

It was also realized that these State Science and Technology Councils, since their formation have now come of age to initiate a phase where resources in terms of expertise and technology promoted and generated by the Central and State Science and Technology Agencies be pooled together to undertake joint Science and Technology programmes.

REVIEW OF LITERATURE

A thorough review of literature forms an important part of a research as it helps in the success of the research. Realizing this, the Researcher has reviewed the following literatures concerning the subject.

A.P.J. Abdul Kalam and Y.S. Rajan (1998), in their book, *India 2020: A Vision for the New Millennium* has mentioned that India can reach a developed country status by 2020, the country can have considerable technological strengths, so crucial for its strategic strengths and for economic and trade-related strengths. Their book has also disclosed elements of a few action plans, which can be missions for many young people in the country.

B.V. Rangarao and N.P. Chaubey (1982), in their book, *Social Perspective of Development of Science and Technology in India* has pointed out that in spite of the advances in science and technology and in many production sectors, the standard of living in many developing countries, including India, is very low and nearly one-half of the population in these countries lives in appalling conditions of poverty, malnutrition, hunger and disease. Indian experience in the development of science and

technology and their application is more diverse than that in any other country, advanced or otherwise.

C.S.R. Prabhu (2012), in his book, *E-Governance: Concepts and Case Studies* has explained that the government employees and staff who are the stake-holders in all e-government projects as the end users and operational users of such projects, are required to be appropriated, trained and oriented for change management from a manual government environment to e-governance environment. Only after such training will they be competent and capable of handling such e-governance projects and operational environments.

D.S. Yadav (2006), in his book, *Foundations of Information Technology* has mentioned that the management of an organisation involved in the business today requires high speed processing of huge amount of data, fact and figures. High speed communication between organisation, customers, clients, etc. is playing an important role to achieve high business goal. These requirements of modern business led to development of a business information system which provides appropriate information to appropriate person in desired format and at correct time. He has further stated that the timely processing of data also helps and enables management to take important decision at earliest possible time.

Digumarti Bhaskara Rao (2001), in his book, *Popularization of Science and Technology Education* has highlighted the role of adult education in science and technology. He has stated that in many cases the reasons for supporting adult education in the area of science and technology is to make people accept new

technology or even to break the resistance against it for economic reasons. He has further mentioned that in promoting science education, the structure of scientific knowledge should be carefully borne in mind, otherwise the investment of human and material resources might not bear the desired fruits.

Niranjan Pani, Santap S. Mishra and Bijaya S. Sahu (2004), in their book, *Modern Systemof Governance: Good Governance vs. E-Governance* have stated that in the science of administration, whether public or private the basic 'good' is efficiency. The efficiency can be achieved only through good governance. With the rapid expansion of public administration, the need for public good and transparency in administration is extremely felt. Government after all is a rendezvous with trust, a commitment of the people for the people, a social action for the greatest good. They have further stated that good governance should be ensured for a better future.

S.C. Datt and S.B. Srivastava (1984), in their book, *Foundation Course: Science and Society* have mentioned that scientific knowledge alone provides a body of verified and tested truth and always tries to eliminate what is vague, ambiguous and indefinite. A man with scientific temper is always open-minded and as such he is never under the illusion that science and technology can provide a panacea to all human ills. This book seeks to fulfil the basic requirements of university education by creating an awareness of the interaction between science and society.

S.P. Verma (2004), in his book, *Information Technology and Indian Administration* has mentioned that high credibility of the promise of Information Technology (I.T.) inputs in public administration is based on the fact that I.T. is

immensely capable of doing the impossible. This book reflects on Indian administrative culture – I.T. interface and its impact on structure and nature of administrative functions.

Stanley E. Manahan (2006), in his book, *Environmental Science and Technology: A Sustainable Approach to Green Science and Technology* referred to technology as the ways in which humans do and make things with materials and energy directed toward practical ends. He highlighted that in the modern era, technology is to a large extent the product of engineering based on scientific principles. He further pointed out that science deals with the discovery, explanation and development of theories pertaining to interrelated natural phenomena of energy, matter, time and space. Based on the fundamental knowledge of science, engineering provides the plans and means to achieve specific practical objectives. Technology obviously has enormous importance in determining how human activities affect Earth and its life support systems.

Upendra Kunwar (1991), in his book, *Science and Technology for Rural Development* has stated that in the context of rural development, it has to be seen what part innovations are likely to play and how science and technology can improve the productivity of the masses living in the rural areas. One basic objective of integrated approach for development is to create a scientific temper in our villages and use the knowledge to create better and more abundant crops, improve the health of the people by preventing and curing of diseases and to provide speedier and better transport facilities and to diversify employments in small and cottage industries.

Luis Fernando Baron and Ricardo Gomez (2016), in their article, *The Associations between Technologies and Societies: The Utility of Actor - Network Theory* have discussed the strengths and limitations of Actor-Network Theory (ANT) as a framework for Science and Technology Studies (STS). While ANT was originally rooted in Social Construction of Technology (SCOT) approaches, ANT has become a theoretical framework commonly used by scholars in numerous discipline beyond STS, including information sciences. ANT provides an alternative to better understand how society and technology have become entangled, and ways to understand such entanglement in STS.

M.K. Paliwal and M.P. Tyagi (2010), in their article, *Study on the Role of Infrastructure, Technological, Institutional and Socio-Economic Factors in Promoting Agricultural Diversification* have expressed that the studies of socio-economic characteristics provide a strong base for the formulation of policies for planning of the human resources in the perspective of development. It helps in pinpointing the dominating characteristics and throws light on other lagging behind. Thus, the identification and proper planning of such variables can prove useful in stimulating the future growth of economy.

R.K. Bhattacharyya and Utpal Das (2018), in their article, *Exploitation of Potentials of Organic Fruit Production in North East India*have stated that the North Eastern Region of India has huge potential for organic crop production, but the productivity of the region is far behind the national average, which may be increased by the adoption of suitable agro-techniques. With the existing diversified tropical, subtropical and temperature fruit crops in NER, exploitation of potentials of organic

fruit production in the region would definitely be a giant step in making the entire NER as the Organic Hub for fruits in the country.

Commendable though they are in their respective areas of study, the literatures under review have not dealt with the Working of the Directorate of Science and Technology, Government of Mizoram. Hence, the study has been undertaken to throw light on the development of science and technology in Mizoram.

STATEMENT OF THE PROBLEM

In most developing countries, there is lack of trained scientific talent that could be used to promote understandings of science and technology and help towards a symbiosis of tradition – the old wisdom, and science – the new wisdom. Enhancing scientific manpower is critical for the country in order to meet the ever increasing requirement of Science and Technology manpower for teaching, research and private sector.

The Directorate of Science and Technology, Government of Mizoram in its endeavour to bring about inclusive growth in governance of the state has made a number of worthwhile contributions for the successful planning and execution of state level and national schemes. It is also noteworthy for the state government that these contributions are at par with the technological advances happening at the national level which boosts the socio-economic development and well-being of the society. As per the Government of Mizoram Allocation of Business Rules, this new Directorate has many responsibilities such as ‘promotion and popularization of science and technology’ for the development of the state.

However, no studies have been undertaken on the Directorate of Science and Technology, Government of Mizoram. This proves the need to have a clearer perspective of the Directorate and its functioning in the realm of science and technology in Mizoram.

. Hence, it is essential to study the current status of the Directorate of Science and Technology, Government of Mizoram and its contribution for the development of science and technology in Mizoram.

SCOPE OF THE STUDY

The present study covers the origin, historical background, structure and working of the Directorate of Science and Technology, Government of Mizoram. The main focus of the study includes the major plans, programmes and projects that are implemented by the Directorate of Science and Technology, Government of Mizoram for the promotion and development of science and technology in Mizoram. The study highlights the Climate Change Programme and covers the programmes which are undertaken for the promotion of innovation and facilitation of Intellectual Property Rights. The study also focuses on the main problems and challenges faced by the Directorate of Science and Technology, Government of Mizoram.

OBJECTIVES

The following are the objectives of the present study:

i. To study the structure and organization of the Directorate of Science and Technology, Government of Mizoram

ii. To study the plans, policies and programmes of the Directorate of Science and Technology, Government of Mizoram

iii. To find out the problems and challenges faced by the Directorate of Science and Technology, Government of Mizoram

RESEARCH QUESTIONS

The following research questions have been formulated for the present study:

i. What is the structure and working of the Directorate of Science and Technology, Government of Mizoram?

ii. What are the major schemes and programmes implemented by the Directorate of Science and Technology, Government of Mizoram?

iii. What are the problems and challenges faced by the Directorate of Science and Technology, Government of Mizoram?

METHODOLOGY

Methodology adopted for the present study is qualitative in nature. The proposed work has been undertaken on primary and secondary data. The primary data was collected from the officials and staff of the Directorate of Science and Technology, Government of Mizoram with the help of semi-structured interview schedule.

The secondary data was gathered from books, journals, booklets, articles related to the study and documents of the concerned Directorate. Electronic mediums such as internet were also used as important sources for collection of information.

CHAPTERIZATION

The first chapter is the introductory part of the study. It highlights the relevance of science and technology in our modern world, and the contributions they have made in developing a nation. It also includes an introduction of the Department of Science and Technology under the Government of India, Review of Literature, Statement of The Problem, Scope of the Study, Objective of the Study, Research Questions and method of data collection. A brief profile of Mizoram is mentioned at the end of this chapter.

The second chapter consists of the details of the organizational structure and working of the Directorate of Science and Technology, Government of Mizoram. The role played by the three autonomous bodies of the Directorate viz. Mizoram Science, Technology and Innovation Council (MISTIC), Mizoram Remote Sensing Application Centre (MIRSAC) and Mizoram Science Centre (MSC) are also included in this chapter.

The third chapter deals with the implementation of programmes and projects under the Directorate of Science and Technology, Government of Mizoram for the promotion and development of science and technology in Mizoram.

The fourth chapter consists of some reflections on the research findings and discussion on the topic of study, Working of the Directorate of Science and Technology, Government of Mizoram. The problems and challenges faced by the employees in the Directorate of Science and Technology, Government of Mizoram are also highlighted.

The fifth chapter is the concluding chapter. This chapter is divided into two parts – Part I and Part II. The first part contains a brief summary of all the previous chapters. The second part contains the major findings and suggestions regarding possible measures to be taken for the successful implementation and functioning of the programmes and activities of the Directorate of Science and Technology, Government of Mizoram.

PROFILE OF MIZORAM

Mizoram is one of the states situated in the north-eastern region of India with a total population of 10,97,206 (5,55,339 males and 5,41,867 females) according to the 2011 Census. Mizoram was previously part of the Assam state. It became a Union Territory in 1972 and on 20 February 1987, it became the 23rd state of India[3].

The geographical area of Mizoram is 21,081 square kilometres. It is located between 92.15 to 93.29-degree east longitude and 21.58 to 24.35-degree north latitude. Its length from north to south is 277 kilometres long, and 121 kilometres long from east to west. Mizoram shares international borders with Myanmar in the east and south covering 404 kilometres long, and in the west with Bangladesh covering 318 kilometres long. The State also shares inter-state borders with Assam in the north (123 km), Manipur in the east (95 km) and Tripura in the west (66 km).

The capital city of Mizoram is Aizawl which is 3,576 square kilometres wide. It is located in the northern part of Mizoram at an altitude of 1132 metres above sea

[3]https://mizoram.gov.in/page/know-mizoram (accessed on 20.10.2019)

level[4]. The state has a total number of eleven (11) districts namely, Aizawl, Champhai, Kolasib, Lawngtlai, Lunglei, Mamit, Siaha, Serchhip, Hnahthial, Khawzawl and Saitual.There are three (3) Autonomous District Councils in Mizoram namely, Lai Autonomous District Council, Chakma Autonomous District Council and Mara Autonomous District Council. Apart from these, there are twenty-three (23) Sub-Divisions and twenty-six (26) Rural Development Blocks. According to the 2011 Census, there are eight hundred thirty (830) villages in Mizoram out of which 704 villages are inhabited and 126 villages are uninhabited.

The total number of household in Mizoram is 2,22,853 as per the 2011 Census. The rural areas have a population of 5,25,435 and the urban areas have a population of 5,71,771 within the State. The State has a density of 52 persons per square kilometres. The decadal growth rate of the population of the State has grown by 23.48 percent over the period 1991-2001. The sex ratio of Mizoram is at 976 females to 1000 males. The literacy rate of Mizoram is the second highest in India which is 91.33 percent (93.35 percent male and 89.27 percent female) according to the 2011 Census.

Mizoram has twenty-one (21) major hill ranges or peaks of different heights which run through the length and breadth of the state, with plains scattered here and there. Phawngpui also known as the Blue Mountain, situated in Lawngtlai District is the highest mountain in Mizoram with an elevation of 2157 metres. On the other hand, Tlawng River is the longest river in Mizoram measuring 185.15 kilometres. It originates in Zopui Hill, near Zobawk in Lunglei at an elevation of 1,395 metres.

[4] Government of Mizoram, Statistical Handbook, Mizoram 2018, Op. cit, p. x

As per the Forest Survey of India Report, 2015, the forest area of Mizoram is 18,748 square kilometres, which is 88.93% of the state geographical area.

Mizoram is abounding with diverse flora and fauna. Senhri (Red Vanda) and Iron Wood (Herhse) are the state flower and state tree respectively. The state animal of Mizoram is Saza (Serow), and the state bird is Vavu (Pheasant). There are two (2) National Parks in Mizoram which are: Murlen National Park and Phawngui National Park. The most significant lake in Mizo history, Rih Dil, is ironically located in Myanmar, a few kilometres from the Indo-Burma border. It was believed that the departed souls pass through this lake before making their way to Pialral or heaven.

Chapter - II

STRUCTURE AND WORKING OF THE DIRECTORATE OF SCIENCE AND TECHNOLOGY, GOVERNMENT OF MIZORAM

In recent years, there have been a lot of developments in Science and Technology sector in Mizoram. The initiative for the development of science and technology in the state was taken by the Planning and Programme Implementation Department, Government of Mizoram which is the nodal Department for all development activities in the state. The Department functions as a liaison body between the NITI (National Institution for Transforming India) Aayog, Government of Mizoram. It consists of two branches under the overall administrative control of the Secretary/Commissioner namely, the Establishment and Accounts Branch, and the Research and Developmental Planning Branch.

The Establishment and Accounts Branch deals with all administrative, establishment, accounts and service matters relating to the Research and Developmental Planning Branch, Directorate of Economics and Statistics, Directorate of Science and Technology, State Planning Board and District Planning Machinery. Hence, the Directorate of Science and Technology functions under this branch.

The Directorate of Science and Technology, Government of Mizoram, is the main administrative office of Science and Technology in Mizoram. The Directorate was first created as a Cell under the Planning and Programme Implementation Department, Government of Mizoram in the year 1986. The Cell functioned under the name ‘Science, Technology and Environment Cell’. It was created with a view to

utilize Science and Technology inputs for various developmental activities and to take up scientific projects and schemes pertaining to frontier areas of Science.

The Science, Technology and Environment Cell (STEC) office was located at the Planning and Programme Implementation Department building in Khatla, Aizawl. The Cell was headed by a Scientific Officer, who later on got promoted to the post of a Principal Scientific Officer in 1999. STEC continued to function under the Principal Scientific Officer along with three other Scientific Officers until it was elevated to a Directorate.

In the year 1988, STEC under the Planning and Programme Implementation Department, Government of Mizoram created the State Remote Sensing Application Centre (SRSAC) as requested by the central government. SRSAC started operations in the scientific field as an agency for exploring the natural resources for planning and execution of various developmental activities using Remote Sensing and Geographic Information System (GIS) technology. Apart from SRSAC, the Science, Technology and Environment Cell also looked after the Mizoram Pollution Control Board until it was handed over to the Department of Environment, Forest and Climate Change, Government of Mizoram.

The Science, Technology and Environment Cell under the Planning and Programme Implementation Department was upgraded to a Directorate on 30th August 2011. With the establishment of the new Directorate, STEC was renamed as the Directorate of Science and Technology, Government of Mizoram. The post of the Chief Scientific Officer was also created. Hence, the new Directorate started

functioning with the Chief Scientific Officer (CSO) as its head. Dr. R.K. Lallianthanga was appointed as the Chief Scientific Officer. The office of the Directorate was still located at the Planning and Programme Implementation Department building in Khatla, Aizawl, while the new Directorate building was under construction.

The office of the Directorate of Science and Technology, Government of Mizoram was relocated at New Capital Complex, Khatla, Aizawl. The newly constructed building of the Directorate was inaugurated by the then Chief Minister of Mizoram Shri Lal Thanhawla on 19th October 2016.

At present, there are three autonomous bodies functioning under the guidance of the Directorate of Science and Technology namely:

i. Mizoram Science, Technology and Innovation Council (MISTIC).
ii. Mizoram Remote Sensing Application Centre (MIRSAC).
iii. Mizoram Science Centre (MSC).

Figure 1: The Directorate of Science and Technology, Government of Mizoram building at New Capital Complex, Khatla, Aizawl.

The Directorate is functioning as the administrative office with the Chief Scientific Officer (CSO) who acts as the Member Secretary in these bodies. The Directorate also houses several centres such as the State Meteorological Centre, Patent Information Centre and State Climate Change Cell. These centres/cells play specific roles for science and technology promotion and popularization in various fields. Besides these Centres, the Directorate also acts as a nodal department for the National Informatics Centre (NIC). NIC offers a wide range of Information and Communications Technology (ICT) services including Nationwide Communication

Network for decentralized planning, improvement in Government services and wider transparency of national and local Governments[5].

The vision of the Directorate of Science and Technology, Government of Mizoram is 'Science and Technology for Sustainable Development'[6]. Its mission is to harness the potential of science and technology for sustainable development and to create knowledge based society through innovation and application of science and technology.

The objectives of the Directorate of Science and Technology, Government of Mizoram are:

i. To create and develop natural resources database for planning and development;
ii. To promote applied Research and Development through universities, Research and Development institutions and other state and national science and technology bodies;
iii. To identify, demonstrate, replicate and promote technologies relevant to the development needs of the state;
iv. To popularize science and to spread a scientific temper and attitude among the people of the state;
v. To promote innovation and facilitate filing of the 'Intellectual Property Rights' which are the exclusive rights given to any person over the

[5]https://www.nic.in/services-main-page/ (accessed on 27.09.2019)
[6]https://dst.mizoram.gov.in/page/vision-mission (accessed on 27.09.2019)

creations of his/her mind and use his/her creation for a certain period of time;

vi. To generate and disseminate meteorological data;

vii. To enhance the capacity of utilizing bio-resources and harnessing the advanced techniques of biotechnology for socio-economic growth[7].

The main functions of the Directorate of Science and Technology, Government of Mizoram include the following:

i. Application of space technology viz. Remote Sensing (RS), Geographic Information System (GIS) for natural resource management, planning, and development.

ii. Technology development and demonstration.

iii. Popularization of science and technology.

iv. Promotion of matters relating to innovation and facilitation of filing Intellectual Property Rights (IPR).

v. Generation and dissemination of meteorological data

vi. Scientific study on climate change[8].

As per the Government of Mizoram Allocation of Business Rules, the Directorate of Science and Technology, Government of Mizoram has a number of responsibilities for the development of the state i.e. Mizoram.

The following points highlight the business allotted to the Directorate:

[7] Directorate of Science and Technology, Government of Mizoram. Annual Report 2017-2018, p. 2
[8] Directorate of Science and Technology, Government of Mizoram. Annual Report 2018-2019, p. 1

i. Promotion and Popularization of Science and Technology.

ii. Remote Sensing, Geographic Information System (GIS) and Space Applications.

iii. Matters relating to Intellectual Property Rights including Copyright Act, 1957; Patent Act, 1970 involving establishment of Patent Information Centre; Design Act, 1999; Trademarks Act, 1999; and all rules and regulation there under.

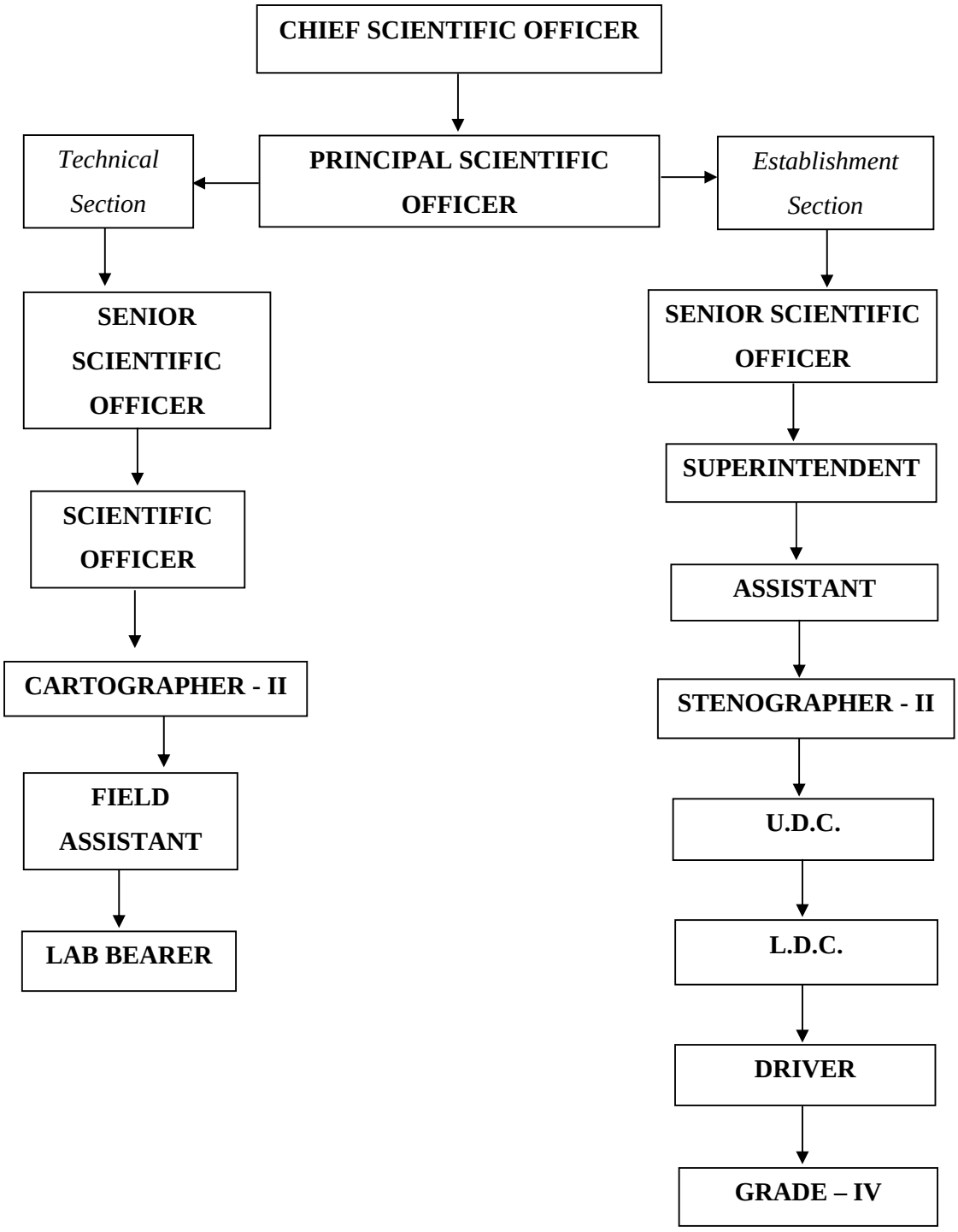
iv. Meteorology

v. Bio-resources and Biotechnology[9].

From the given chart i.e., Chart No. 1, the Directorate of Science and Technology, Government of Mizoram is headed by the Chief Scientific Officer. The Chief Scientific Officer receives a monthly salary of level thirteen (13) in the pay matrix with corresponding pay band four (4). The main function of the Chief Scientific Officer is to look after the Directorate and its functioning in the state. The Chief Scientific Officer also acts as the Member Secretary in the three autonomous bodies – MIRSAC, MISTIC and MSC.

[9] Directorate of Science and Technology, Government of Mizoram. Annual Report 2018-2019, p. 1

Chart No. 1: Organizational Structure of the Directorate of Science and Technology, Government of Mizoram.



Just below the rank of the Chief Scientific Officer is the Principal Scientific Officer (PSO). The rank of the PSO is similar to that of the Deputy Secretary under the state government. The monthly salary of the PSO is covered under level twelve (12) with corresponding pay band three (3). The other employees of the Directorate office are grouped into two sections: technical section and establishment section, both functioning under the supervision of the Principal Scientific Officer.

In the technical section, the Senior Scientific Officer is subordinate to the Principal Scientific Officer. There are two (2) posts for this rank which are currently vacant under the Directorate. These two posts are vacant for two reasons. Firstly, the employee who used to hold this position was given a temporary upgradation to the post of the Principal Scientific Officer. Secondly, the Scientific Officers below the post of the Senior Scientific Officer are not eligible for promotion yet. The post of the Senior Scientific Officer is covered under the 11^{th} pay level.

The post of the Scientific Officer is the officer entry level post in the office of the Directorate of Science and Technology. There are six (6) sanctioned posts for the Scientific Officer. However, four (4) posts are filled and the other two (2) posts are lying vacant in the Directorate office. The monthly salary for the post of the Scientific Officer is covered under the 10^{th} level pay.

One post of the Cartographer – II comes below the Scientific Officer. The Cartographer – II is the entry level, and the incumbent can be promoted to Cartographer – I. The pay scale of the Cartographer – II is level six under the state

government. The main function of the Cartographer is to prepare or make maps and charts. The post of the Cartographer – II is currently lying vacant.

In the office of the Directorate of Science and Technology, one post of the Field Assistant comes under the post of the Cartographer – II. The 4th level pay covers the monthly salary of the Field Assistant. Two posts of the Laboratory Bearer come last in the hierarchical structure of the technical staff. At present, there is one post lying vacant for the Laboratory Bearer under the Directorate of Science and Technology.

In the establishment section, the Superintendent, comes under the Principal Scientific Officer. The Superintendent is in charge of handling the clerical works of the Directorate. There is one sanctioned post for this rank under the Directorate and the monthly salary is covered by the 10th level pay. The post of the Superintendent is equivalent in rank to that of the Scientific Officer. Below the Superintendent comes the post of the Assistant with one sanctioned post in the office of the Directorate. The monthly salary for this rank is level eight (8) in the pay matrix with corresponding pay band two (2). The post of the Upper Division Clerk comes under the post of the Assistant. There are three sanctioned posts for this rank and all posts are lying vacant.

There is one sanctioned post for the Stenographer – II. The post of the Stenographer – II can be promoted to Stenographer – I. The Stenographer – II acts as the Personal Assistant to the Chief Scientific Officer under the Directorate. The monthly salary of this post is equivalent to that of the Upper Division Clerk with level eight (8) pay scale. The Lower Division Clerk has a monthly salary of level seven (7),

and at present, there are three sanctioned posts for this rank, out of which one post is currently lying vacant. Apart from these employees, there are four posts of Driver, out of which one post is lying vacant under the Directorate. Grade – IV rank which includes the Peon comes last in the hierarchical structure of the establishment staff.

The main office of the Directorate of Science and Technology, Government of Mizoram is located at the first floor of the Directorate building. At present, there are overall nineteen (19) state government employees in the office of the Directorate. There are overall thirty-one (31) posts, of which twelve (12) posts are currently vacant in the office of the Directorate.

The Directorate of Science and Technology established the 'State Meteorological Centre' in 2005. At present, it is stationed at the top floor of the Directorate of Science and Technology office building, just next to the office of the Mizoram Science, Technology and Innovation Council. Prior to the establishment of the State Meteorological Centre in 2005, recording of various meteorological data such as rainfall, temperature, relative humidity, etc., had been started by the Directorate since the year 1997 with technical help from the India Meteorological Department. One of the main reasons why the State Meteorological Centre was established is to have trained expertise among the concerned officials so as to develop technological advancement in the state of Mizoram.

The State Meteorological Centre is responsible for meteorological observations and weather forecasting. Its main mission is to generate reliable information related to weather and climate of Mizoram. In order to achieve these, the

Centre runs its own Weather Station at Cherry Blossom Avenue, Mizoram Secretarial Complex, Aizawl. Apart from this, two Automatic Weather Stations were installed at Aizawl and Lunglei in the year 2009 and 2010 respectively. These stations are monitored by two assigned employees holding the posts of Scientific Officer and Data Collector respectively. The daily weather data such as rainfall, temperature, relative humidity, wind speed and direction, and barometric air pressure are generated from the Weather Stations. An Automatic Weather Station was also installed at Champhai. However, the Automatic Weather Station at Champhai no longer functions due to harsh weather and lightning strikes leading it to burn out.

The State Meteorological Centre collaborates with other agencies like India Meteorological Department (IMD), Regional Meteorological Centre (RMC) and Pushpak (Zemabawk). The daily weather data and forecasts from these agencies are being updated on the online website of the Directorate and distributed to different Government Departments such as the Secretary to the Governor of Mizoram; Personal Secretary to the Chief Minister of Mizoram; Personal Secretary to the Minister, Disaster Management and Rehabilitation, Government of Mizoram; Deputy Commissioner, Aizawl, Government of Mizoram; Station Director, All India Radio, Aizawl, etc. The daily weather data and forecasts are also distributed to private organizations such as Zonet Cable TV, LPS Cable TV, etc. The daily weather data and forecasts can be distributed to private individuals upon special requests. The State Meteorological Centre also collaborates with the Directorate of Economics and Statistics and have installed Meteorological Observatories at the district headquarters

of Mizoram, namely, Aizawl, Lunglei, Champhai, Mamit, Siaha, Lawngtlai, Serchhip and Kolasib during the year 2018-2019.

Figure No. 2: Self Recording Rain Gauge for recording rainfall data.

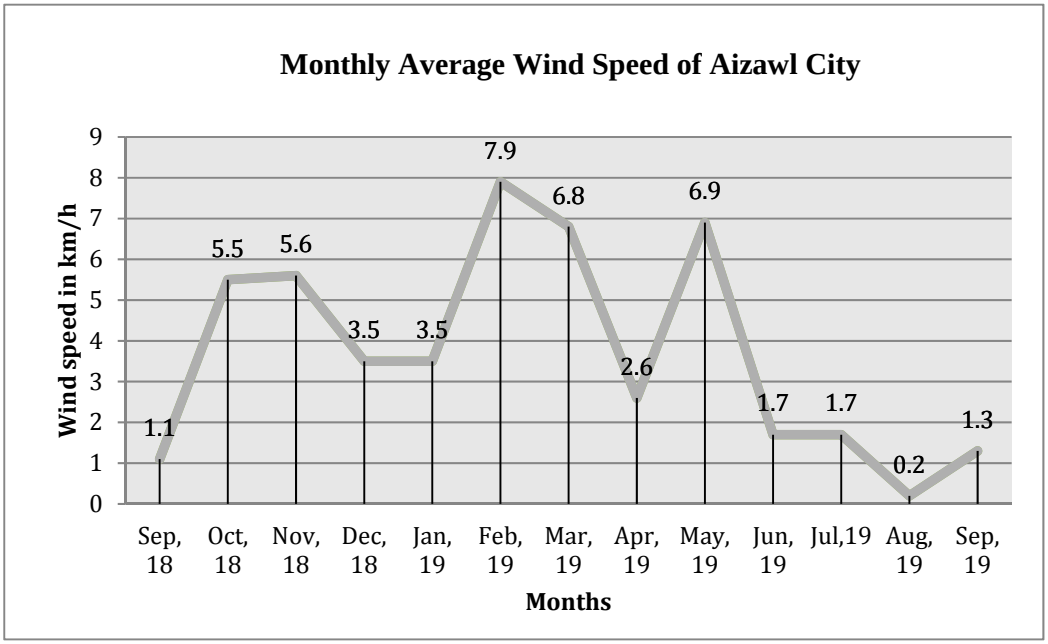


Figure No. 3: Wind speed (in km./hr.) of Aizawl city from September 2018 to September 2019.

The meteorological data like Temperature, Rainfall, Humidity and Wind speed are collected from the department's Meteorological Observatory located at Tlaizawng Mual (Cherry Blossom Avenue) near Mizoram Secretariat Main Building, New Secretariat Complex, Khatla. In collecting the meteorological data, the collection procedure of the Indian Meteorological Department (IMD) is followed and the data is collected twice a day i.e. at 8:30 am in the morning and at 2:30 pm in the afternoon on a daily basis. The raw data collected are then stored in soft copy, analyzed as per the requirement of the users, and then disseminated to various users like research fellows, various government departments, NGOs and other private entrepreneurs, etc. Some of the instruments used for recording the daily weather data are - Self-recording rain gauge, Stevenson Screen or thermometer screen, Anemometer Cup Counter, etc.

MIZORAM REMOTE SENSING APPLICATION CENTRE

As advised by the Department of Science, Government of India, the State Remote Sensing Centre (SRSC) was established in the year 1988 under the Science, Technology and Environment Cell, Planning and Programme Implementation Department, Government of Mizoram. The State Remote Sensing Centre was re-constituted as the Mizoram Remote Sensing Application Centre (MRSAC), an autonomous institution under the Science, Technology and Environment Cell, Planning and Programme Implementation Department, Government of Mizoram on 5th October, 2006 (Reference File No. B.12019/1/06/SRSC, Dated 5th October, 2006). MRSAC was registered under the Mizoram Societies Registration Act, 2005 (Act No. 13 of 2005) on 19th January, 2007, having Registration No. of MSR – 30 of 19.1.2007 (Reference File No. B.14016/122/06-RFS, Dated 24th January, 2007).

The first Governing Body meeting was held under the Chairmanship of Shri Lalmalsawma, Commissioner/Secretary, Planning and Programme Implementation Department, Government of Mizoram on 16th March, 2007 (Reference File No. B.12012/1/07-MRSAC, Dated 23rd March, 2007). With the approval of the Mizoram Council of Ministers held on 18th and 19th August, 2008 MRSAC was again declared as an autonomous government institution under Science, Technology and Environment Cell, Planning and Programme Implementation Department, Government of Mizoram on 2nd September, 2008, and the abbreviation, MRSAC was changed to MIRSAC (Reference File No. B.13015/1/2007-PLG, Dated 2nd September, 2008).

On 18th May, 2009, the Governing Body of the Mizoram Remote Sensing Application Centre (MIRSAC) was reconstituted with partial modification i.e., the Chairman of the Governing Body was changed from the Secretary/Commissioner, Planning and Programme Implementation Department, Government of Mizoram, to the Principal Secretary/Commissioner/Secretary, Planning and Programme Implementation Department, Government of Mizoram (Reference File No. B.13015/1/2007-PLG, Dated 18th May, 2009).

The Chairman of the Governing Body was again changed from the Principal Secretary/Commissioner/Secretary, Planning and Programme Implementation Department, Government of Mizoram to the Chief Secretary, Government of Mizoram on 10th April, 2012 (Reference File No. B.13015/1/2007-PLG, Dated 10th April, 2012).

At present, the Mizoram Remote Sensing Application Centre is administered by a Governing Body which consists of a Chairman, Vice Chairman and Members from the sixteen (16) line departments under the Government of Mizoram. The Chief Secretary, Government of Mizoram is the Chairman of the Governing Body, while the Secretary, Planning and Programme Implementation Department, Government of Mizoram acts as the Vice Chairman. The Chief Scientific Officer of the Directorate of Science and Technology is the Member Secretary. The State government appoints the members from the 16 line departments which are mentioned as follows:

i. Principal Adviser cum Additional Secretary, *Planning and Programme Implementation Department.*

ii. Additional Secretary (Budget), *Finance Department.*

iii. Principal Chief Conservator of Forest, *Department of Environment, Forests and Climate Change.*

iv. Engineer-in-Chief, *Public Works Department*.

v. Engineer-in-Chief, *Public Health Engineering Department*.

vi. Engineer-in-Chief, *Power and Electricity Department.*

vii. Chief Engineer, *Irrigation and Water Resources Department.*

viii. Director, *Agriculture Department (Crop Husbandry*).

ix. Director, *Horticulture Department*.

x. Director, *Rural Development Department*.

xi. Director, *Land Revenue and Settlement Department.*

xii. Director, *Land Resources, Soil and Water Conservation Department.*

xiii. Director, *Disaster Management and Rehabilitation Department.*

xiv. Director, *Urban Development and Poverty Alleviation Department.*

xv. Director, *Department of Sericulture.*

xvi. Director, *Department of Geology and Mineral Resources.*

Apart from the Governing Body, the Executive Committee of MIRSAC is comprised of a Chairman i.e. the Secretary, Planning & Programme Implementation Department, Member Secretary i.e., the Chief Scientific Officer, Directorate of Science and Technology, and three other members who are appointed by the State government. They are:

i. Adviser-cum-Joint Secretary, *Planning and Programme Implementation Department.*

ii. Director, *Directorate of Economics & Statistics.*

iii. Joint Secretary (Budget), *Finance Department.*

MIRSAC has the following vision/mission:

i. To act as a nodal agency and an apex organization in the State for advising and disseminating Remote Sensing Technology, Geographic Information System and related technologies to various user departments/agencies in the State.

ii. To promote and diffuse knowledge in the area of Remote Sensing Applications and Geographic Information System (GIS) in various field of developmental activities undertaken by the Government and other agencies.

iii. To co-ordinate, interact and collaborate with other remote sensing organizations in the country and various user departments/agencies in the State to identify, formulate, initiate, promote undertake and implement projects related to Remote Sensing Application and GIS in different fields of developmental activity.

iv. To provide useful information on natural resources as an input to the socio-economic development activities in the State.

v. To provide facilities for interpretation and analysis ofair borne as well as space borne remotely sensed database to Government, Semi-Government and other organizations in various usable forms.

vi. To provide consultancy service for preparation of project report on utilization and harnessing of natural resources using remote sensing technology.

vii. To provide information and documentation facilities in remote sensing, disseminate information and furnish result of remote sensing investigations in suitable forms[10].

MIRSAC is the nodal agency and apex organization for Remote Sensing (RS) and Geographic Information System (GIS) applications in the state. It is equipped with RS and GIS laboratories, library and hardware/software for executing RS and GIS related works.

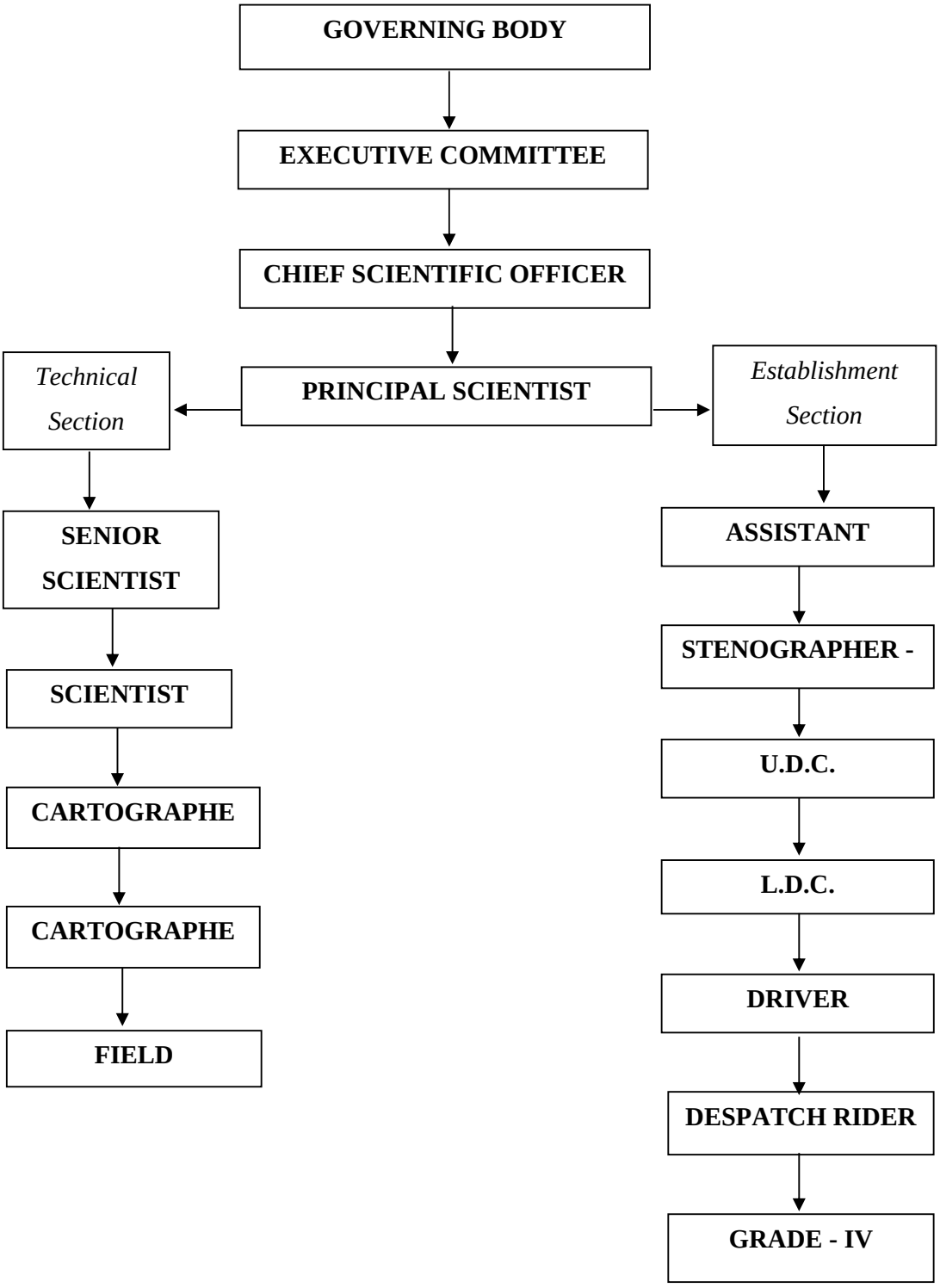
The state government supports MIRSAC by providing Grant-in-aid for administration- salary and non-salary. Here, salary refers to the monthly salary of the

[10] https://mirsac.mizoram.gov.in/page/mission-vision (accessed on 24.09.2019)

employees covered by the state government, while non-salary refers to the TA, DA bills, office expenses, etc. MIRSAC is actively involved in the state level projects such as Village Profile Mapping of Mizoram, GIS based Study of Bamboo Management in Kawnpui and Zanlawn area, etc., and the national level projects such as Indian Regional Navigation Satellite System (IRNSS) Data Collection, North Eastern Spatial Data Repository (NESDR), etc., where space technology inputs are required. The data and services extended by the Centre to user Departments (16 line departments) and public/private organizations have covered various themes of space technology input such as natural resources, mapping of various land use or land covers, land and water resource development, potential area analysis, infrastructure mapping, disaster management, etc. These have provided value-addition to the schemes and projects for the development of the state.

MIRSAC also provides the data and services to other public and private organizations/institutions such as Central Ground Water Board (Shillong), Zoram Energy Development Agency (ZEDA), State Investment Programme Management and Implementation Unit (SIPMIU) Aizawl, Zirtiri Residential Science College (Aizawl), ICFAI University (Mizoram), NextComm Consultancy (Mizoram), Tantia Construction Ltd., King Marketing Pvt. Ltd., Research Scholars from Mizoram University, etc. MIRSAC is currently engaged in various levels of mapping i.e. '*remote sensing*' and '*geographic information system*' and aims to cover wider applications of space technology for the benefit of the state.

Chart No. 2: Organizational structure of MIRSAC.



From the given chart i.e. Chart No. 2, MIRSAC is headed by the Principal Scientist. The Principal Scientist is a single post and receives a monthly salary from the pay scale of Level 12 under the state government. Under the supervision of the Principal Scientist, the office of MIRSAC is grouped into two sections namely, technical section and establishment section.

In the technical section, subordinate to the Principal Scientist are two (2) posts of Senior Scientists under MIRSAC. The monthly salary of this post is covered by the state government pay scale of level 11. The post of Scientist comes under the Senior Scientist. There are ten (10) posts of Scientists out of which, two (2) posts has been lying vacant since inception. The monthly salary of this post is covered by the state government pay scale of level 10. Subordinate to the rank of the Scientist is the Cartographer – II. There is one post for this rank, which receives monthly salary from the state government pay scale of level six (6). Subordinate to the Cartographer – II is the Cartographer – III. Here, the former is the promotion post for the latter. Hence, the Cartographer – III is the entry level with two posts. The monthly salary is covered by the level five (5) pay scale of the state government. There are three (3) posts of Field Assistants, which comes last in the hierarchy of the technical staff. The monthly salary is covered by the level four (4) pay scale of the state government.

Under the establishment section, the post of the Assistant comes directly under the Principal Scientist of MIRSAC. The Assistant receives a monthly salary of level seven (7) under the pay matrix of the state government. There is one post for this rank which is also equivalent to the rank of the Stenographer – II. The subordinating rank is the Upper Division Clerk (UDC) with one post, and the monthly salary is covered

under level six (6) pay scale. The Lower Division Clerk comes under the UDC with three posts, out of which two posts are presently vacant under MIRSAC. The monthly salary of this rank is level 4 pay scale of the state government. There is one post each for the Driver, Despatch Rider and Grade – IV under MIRSAC.

At present, there are twenty-four (24) regular employees working at the office of the Mizoram Remote Sensing Application Centre. There are overall four (4) vacant posts. Hence, MIRSAC has a total of twenty-eight (28) sanctioned posts under the Directorate of Science and Technology. Apart from this, MIRSAC also appoints seven (7) employees on a non-regular basis to assist the regular employees. They are classified into two categories namely, Muster Roll (Skilled – II) and Muster Roll (Unskilled). The former consists of two Field Assistants and one Typist, while the latter consists of four Peons cum Sweepers.

MIZORAM SCIENCE, TECHNOLOGY AND INNOVATION COUNCIL

MISTIC is the oldest Science and Technology body in the state formed on 12th February 1985 (Notification No. T.13013/1/84-Sc&Tec, Dated 12.02.1985) under the name Mizoram Council on Science, Technology and Environment (MCSTE). However, it was felt that there was a need to introduce the concept of innovation in the state of Mizoram, which was still very new to the people. Acting upon the letter received by the then, Chief Minister of Mizoram from the Central Government, the Mizoram Council on Science, Technology and Environment was changed to Mizoram Science, Technology and Innovation Council on 17th March 2015. The only difference

between the MCSTE and MISTIC in their functions is that the former focused on the environmental aspect, while the latter focuses on innovation.

The Mizoram Science, Technology and Innovation Council plays an advisory role as well as implementing body for science and technology promotion in the state. In order to make it more effective, MISTIC was registered under the Mizoram Society Registration Act, 2005, having Registration No. MSR-630 of 1.5.2015.

The objectives and functions of MISTIC are as follows:

i. To identify areas in which Science, Technology and Innovation can be utilized for the achievement of the socio-economic objective of Mizoram and in particular, its objectives of tackling the problems of backwardness, unemployment and poverty, and of addressing itself to the problems of rural areas, and under-privileged section of the society.

ii. To advise and support the State Government on policies and measures necessary to promote Science, Technology and Innovation for achievement of socio-economic objectives.

iii. To initiate, support, promote and co-ordinate preferably by establishing networks, such research design and development projects and programmes, including demonstration projects, as are likely to be relevant to the specific objectives, problems, surveys and optimum utilization of natural resources of the state.

iv. To prepare, or assist in preparation of science and technology plans and innovation roadmap for the state.

v. To advise the government on policies and measures relating to the development and deployment of science & technology man power resources.

vi. To promote the popularization of science, environmental awareness and spread of a scientific temper and attitude among the people of the state.

vii. To supplement and compliment the ongoing technical efforts of the state government.

viii. To interact with other state and National Science & Technology bodies having similar or related objectives and help create innovation eco-system.

ix. To identify priority areas of Science, Technology and Environment needed for long term development of the state.

x. If essential, to establish or to assist in the establishment of the infrastructures in institutions, organizations etc. necessary to achieve the foresaid objectives.

xi. To accept donations, raise subscriptions and receive grants, loans and subsidies from Government of India, Government of Mizoram and other supporting agencies in India and abroad, and to invest the resources towards the achievement of the objectives of the Council.

xii. To take any other steps which are relevant to the application of Science & Technology for the state of Mizoram.

xiii. To identify and encourage young talents in local universities, colleges, Micro, Small & Medium Enterprises (MSME), R&D Institutes and reward talents in innovation and disseminate success stories.

xiv. To organize seminars, lectures, workshops on innovation and create State innovation portal[11].

The Governing Body of MISTIC is constituted by the State government. It is the apex body having sole authority over the Council. It is chaired by the Chief Minister, Government of Mizoram, while the Minister of Planning and Programme Implementation Department acts as the Vice Chairman. The Chief Scientific Officer of the Directorate of Science and Technology acts as the Member Secretary of the Governing Body. The members of the Governing Body of MISTIC are appointed by the state government, they are:

i. Vice Chairman, *Mizoram Planning Board*.

ii. Parliamentary Secretary, *Planning and Programme Implementation Department.*

iii. Chief Secretary, *Government of Mizoram.*

iv. Commissioner/Secretary, *Planning and Programme Implementation Department.*

v. Commissioner/Secretary, *Finance Department*.

vi. Commissioner/Secretary, *Higher and Technical Education Department.*

[11]https://mistic.mizoram.gov.in/page/objectives-and-functions (accessed on 13.10.2019)

vii. Commissioner/Secretary, *School Education Department*.

viii. Commissioner/Secretary, *Information and Communication Technology Department.*

ix. Vice Chancellor or his representative, *Mizoram University*.

x. President, *Mizoram Science Society*.

xi. President, *Mizo Academy of Sciences*.

xii. President, *Science Teachers' Association Mizoram*.

Apart from the Governing Body, the members of the Executive Committee are also appointed by the State government. It is chaired by the Secretary, Planning and Programme Implementation Department, Government of Mizoram. The Chief Scientific Officer, Directorate of Science and Technology acts as the Member Secretary. The other members of the Executive Committee include:

i. Principal Adviser cum Additional Secretary, *Planning and Programme Implementation Department.*

ii. Director, *Higher and Technical Education Department*.

iii. Director, *School Education Department.*

iv. Chief Informatics Officer, *Information and Communication Technology Department.*

v. Principal, *Pachhunga University College*.

vi. Principal, *Government Zirtiri Residential Science College*.

MISTIC also acts as a partner as well as a nodal body of the Department of Science and Technology (DST), Government of India in the state. It receives yearly

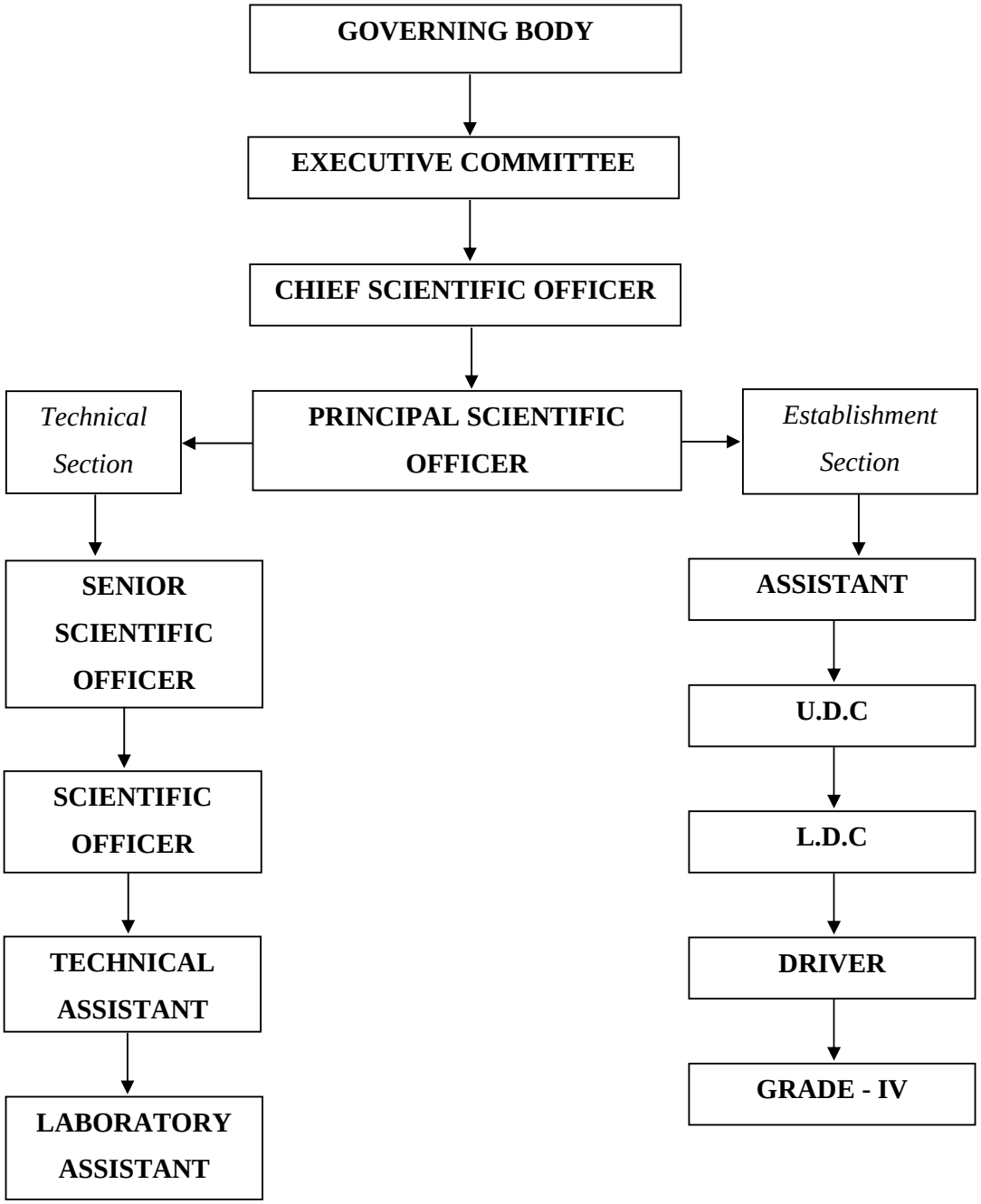
Grant-in-aid from DST for salary of the limited scientific or technical employees as well as funds for implementing various projects undertaken by MISTIC in the state. The state government supports MISTIC for salary of administrative staff and for non-salary in the form of Grant-in-aid for its effective functioning.

For the promotion of science and technology activities in the state of Mizoram, MISTIC has been undertaking various projects and programmes such as:

i. Science Popularisation.
ii. Research and Development.
iii. Grassroots Technological Innovation.
iv. Intellectual Property Management.
v. Climate Change Study.

Chart No. 3, shows the organizational structure of the Mizoram Science, Technology and Innovation Council under the Directorate of Science and Technology is headed by the Principal Scientific Officer. There is one post for this position, with a monthly pay scale of level 12. However, this post is lying vacant since neither of the two employees holding the post of the Senior Scientific Officer are qualified/eligible for promotion yet. There are two sections under MISTIC, namely, the technical section and establishment section. One of the reasons why MISTIC is different as compared to the other autonomous bodies of the Directorate of Science and Technology is that the monthly salaries for the technical staff under MISTIC are provided by the central government. On the other hand, the monthly salaries of the establishment staff are provided by the state government.

Chart No. 3: Organizational Structure of MISTIC.



Subordinate to the Principal Scientific Officer is the Senior Scientific Officer with two (2) posts under MISTIC. The monthly salary for these posts is covered by level 11 pay scale. Subordinate to this rank are four (4) Scientific Officers with a monthly salary of level 10 pay scale. This rank supervises the Technical Assistants. There are five (5) posts of Technical Assistants under MISTIC. At present, one post is vacant. The monthly salary for this rank is provided under the pay scale of level 7. The Laboratory Assistant with a monthly salary provided under level four (4) pay scale comes last in the hierarchy of the technical staff. There are two (2) posts for this rank which are currently vacant.

In the establishment section, the Assistant rank comes at the top of the hierarchy. This post is currently vacant. Subordinate to this rank is the Upper Division Clerk (UDC) with one post under MISTIC. The monthly salary of the UDC is covered by the level six (6) pay scale. The Lower Division Clerk (LDC) comes next with a monthly salary covered by the level four (4) pay scale. There is one post for this rank. Subordinate to the post of the LDC is the Driver with two (2) posts created under MISTIC. At present, one post is vacant. The monthly salary is covered by the level 2 pay scale. Grade –IV rank comes last in the hierarchy of the establishment staff of MISTIC. There are three (3) posts out of which one post is currently vacant.

At present, there are fifteen (15) regular employees working at the office of the Mizoram Science, Technology and Innovation Council. There are a total of twenty-two (22) regular posts under MISTIC, out of which seven (7) posts are vacant.

The Mizoram Science, Technology and Innovation Council administers three (3) cells viz. Patent Information Centre, State Climate Change Cell, and Innovation Facility Centre. MISTIC is undertaking various works like science popularization, innovation, facilitation of intellectual property rights and its management, technology demonstration, replication, and other research & development works and programmes.

1. Patent Information Centre

The Patent Information Centre (PIC) in Mizoram was established during the financial year 2010-2011 with financial support and guidance of the Department of Science & Technology, Government of India. PIC was established to foster, create awareness and promote Intellectual Property Rights and its management in the state.

Intellectual Property Rights (IPR) is a collective term which includes: Patent, Trade Marks, Geographical Indications, Copyrights, Designs Layout, design of Integrated Circuits, Plant Variety Protection and Farmers' Rights and Trade Secrets. Six IPR Cells have been created in Mizoram viz., Mizoram University IPR Cell, Pachhunga University College IPR Cell, Government Lunglei College IPR Cell, Government Zirtiri Residential Science College IPR Cell, ICFAI University Mizoram IPR Cell and NIELIT Mizoram IPR Cell.

The main activities of PIC include – organizing of workshop, creation of awareness, facilitate filing of various IPRs. There are two employees under the Patent Information Centre who hold the post of Scientist and Project Scientist respectively. The Scientist and the Project Scientist receive their monthly salaries from the state government which is based on a fixed pay.

2. State Climate Change Cell

The State Climate Change Cell (SCCC) in Mizoram was created on 3rd March, 2015 with the financial support of the Department of Science and Technology, Government of India under the National Mission for Sustaining the Himalayan Ecosystem (NMSHE) programme of the National Action Plan on Climate Change (NAPCC). It is functioning under the aegis of MISTIC, Directorate of Science Technology, Government of Mizoram.

SCCC conducts scientific study of climate change and related activities including simulation of climate modeling and prediction of future scenario change in different sectors. It conducts research on climate change issues for database and information generation for the state. SCCC also conducts capacity building and training programmes for different stakeholders especially for adaptation strategies in response to climate change for integration into developmental activities by including policy makers, concerned departments, Government officials, NGOs and the local masses.

The State Climate Change Cell is administered by three employees. There is one post of a Scientist and two Project Scientists who receive their monthly salaries on a fixed pay.

3. Innovation Facility Centre

The Innovation Facility Centre (IFC) is currently being set up at the lower part of the Mizoram New Secretariat Complex, Khatla, Aizawl with funding from the

Government of Mizoram. At present, the construction work is almost completed, in which the first phase of machine procurement and recruitment of technical manpower are completed. IFC is expected to be opened by the month of December, 2019.

MIZORAM SCIENCE CENTRE

The Mizoram Science Centre (MSC) is a non-formal science and technology institution in the state. It is situated at Berawtlang, Aizawl, near Tourist Complex. MSC was established by the Government of Mizoram with the financial assistance of National Council of Science Museums, Ministry of Science Museums, Government of India. It was inaugurated on 26th July 2003. Right from its inception, MSC has been serving the people by communicating science and technology through its exhibits and activities in the state.

MSC supplements Science and Technology education and serves as a recreational centre in the State. It helps to develop scientific temper amongst the general public, particularly school children by inculcating a spirit of inquiry and fostering creative talent through activity-based learning process incorporating methods of science. It promotes creative activities in school to supplement formal science education. It also develops scientific exhibits, temporary exhibitions, kits and aids for use in the Centre in order to portray the development in science and technology.

Pursuant to the resolution of the Governing Body Meeting of Mizoram Science, Technology & Innovation Council (MISTIC) under the Chairmanship of Shri Lal Thanhawla, the then Chief Minister, Government of Mizoram, Mizoram Science

Centre was made an Autonomous Government Institution under the Directorate of Science & Technology vide Government's Notification No.B.12019/9/2016-PLG, on 2nd March, 2017. It was also registered under the Mizoram Society Registration Act, 2005 vide Society Registration No. MSR 819 of 30.03.2017.

MSC has been implementing various science and technology popularization and communication programme in the DST and MISTIC right from its inception. The objectives and functions of MSC include to promote the growth of science and technology and their applications in industry and human welfare, with a view to develop scientific attitude and temper and to create, inculcate and sustain a general awareness amongst the people of Mizoram; to collect, restore and preserve important historical objects, which represent landmarks in the development of science, technology and industry[12] etc.

The Governing Body of the Mizoram Science Centre is constituted by the State government. The Chief Secretary, Government of Mizoram acts as the Chairman, while the post of the Vice Chairman is held by the Secretary, Planning and Implementation Department. The Chief Scientific Officer, Directorate of Science and Technology acts as the Member Secretary to the Governing Council.

[12]https://msc.mizoram.gov.in/page/objective-of-the-centre (accessed on 31.10.2019)

The members of the Governing Body of MSC are mentioned below:

i. Principal Chief Conservator of Forests, *Environment, Forest and Climate Change Department.*

ii. Secretary, *Finance Department*.

iii. Secretary, *School Education Department*.

iv. Commissioner/Secretary, *Higher and Technical Education Department*.

v. Secretary, *Art and Culture Department*.

vi. Secretary, *Tourism Department*.

Apart from the Governing Body, the State government appoints the members of the Executive Committee of the Mizoram Science Centre. The Secretary, Planning and Programme Implementation Department is the Chairman of the Executive Committee. The Chief Scientific Officer, Directorate of Science and Technology acts as the Member Secretary. The other members of the Executive Committee include:

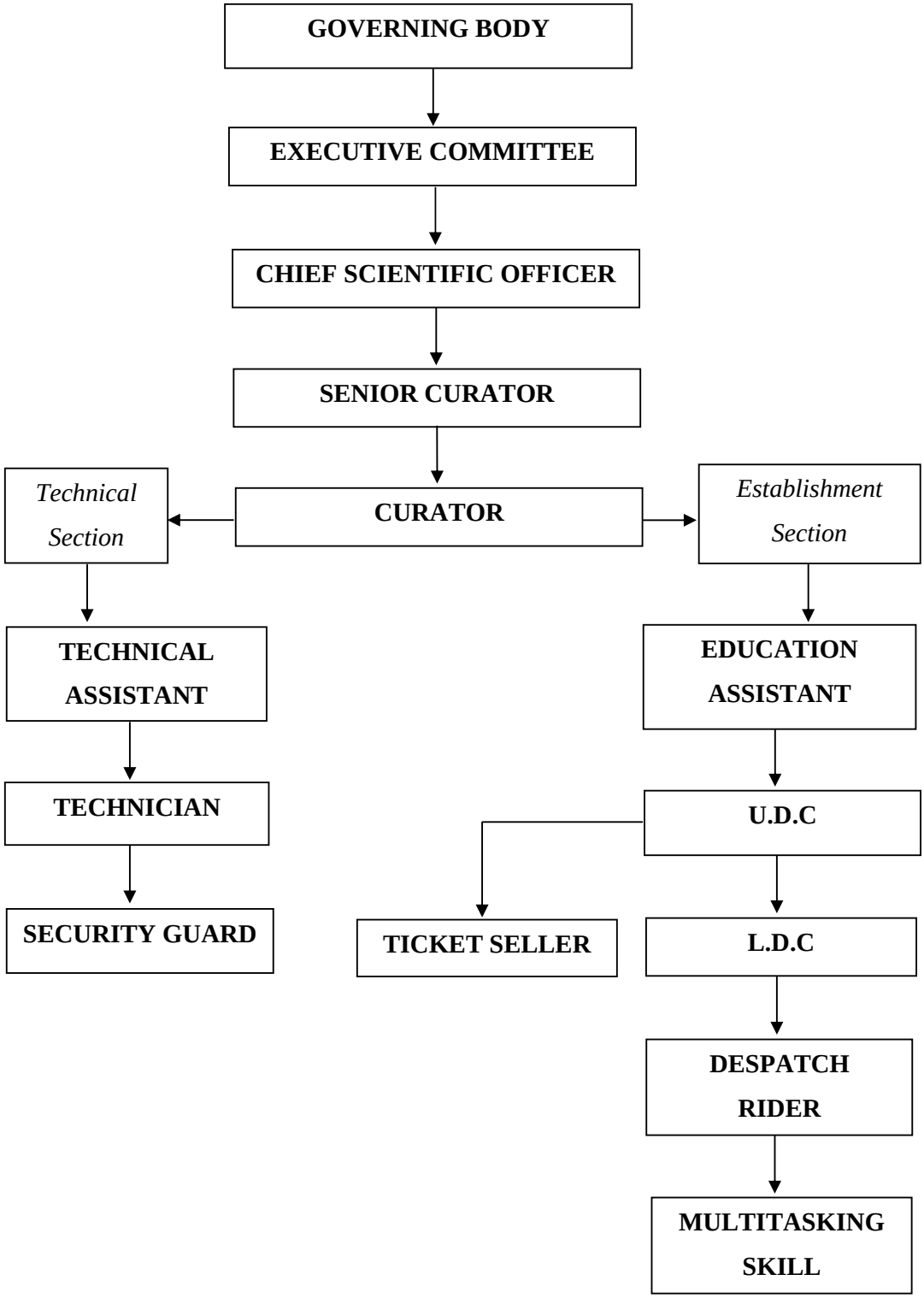
i. Principal Adviser cum Additional Secretary, *Planning & Programme Implementation Department*.

ii. Additional Secretary (Budget), *Finance Department.*

iii. Director, *School Education Department.*

iv. Director, *Higher and Technical Education Department.*

Chart No. 4: Organizational Structure of MSC.



From the given chart i.e., Chart No. 4, the Mizoram Science Centre is headed by the Senior Curator with a monthly salary covered by the pay scale of level 11. However, this post is currently vacant, and one of the Scientific Officers from the office of the Directorate of Science and Technology is currently taking charge of the Senior Curator. The Curator comes next in the hierarchy. The pay scale for this rank of level 10 under the state government. Apart from the Senior Curator and the Curator, the employees under the Mizoram Science Centre are grouped into two sections namely, technical section and establishment section.

The post of Technical Assistant comes under the Curator in the technical section. There is one post for this rank under the Mizoram Science Centre, with a monthly salary covered by the level 7 pay scale. Subordinate to this rank, there are four (4) Technicians which are grouped into: Carpentry, Painting, Fitting and Electronics. The Technician handling the electronics has a monthly salary covered by the level 4 pay scale, while the other Technicians receive their monthly salary covered within the pay scale of level 5. There are three posts of the Security Guard. This rank has a monthly salary covered by the pay scale of level two under the state government.

In the establishment section, the Education Assistant is subordinated by the Curator. There is one post for this rank with a monthly salary covered by the pay scale of level seven (7). Subordinate to the rank of the Education Assistant is the Upper Division Clerk. There is one post for this rank with a pay scale of level six (6). The subordinates of the UDC rank include the Lower Division Clerk and the Ticket Seller, both having one post under the Mizoram Science Centre. These two share the same pay scale i.e. level four (4) under the state government. The Despatch Rider comes

next in the hierarchy having a single post with a pay scale of level two. The Multitasking Skill with a pay scale of level 1 comes at the bottom of the hierarchy. There are five (5) posts for this rank.

Overall, there are twenty-two (22) regular posts under the Mizoram Science Centre. At present, there is a single vacant post and the other twenty-one (21) posts are filled by the employees of different ranks.

The Mizoram Science Centre has launched and inaugurated a new 'Innovation Hub' and 'Space Education Centre' on 11th September, 2018 with the initiative and financial support of the National Council of Science Museums, Kolkata.

The Innovation Hub is equipped with various facilities for young students to assist the experimenting of their innovative ideas. It also encourages multidisciplinary activities with the primary objective of engaging, promoting and supporting young minds in undertaking various science and technology based projects in a user-friendly environment.

The Innovation Hub has various sections, which are:

i. The 'Hall of Fame: Inventions and Inventors' section which uses several multimedia kiosks that bring about the stories of major inventors and their inventions in various fields and photo gallery.
ii. The 'Innovation Resource Centre' where broadband internet terminals provide online access to innovation-centric resources, e-journals, books and grass-root innovation portals, etc.

iii. The ‘Innovative Laboratory’ which provides physics, chemistry, biology, mechanical, electrical and electronics laboratories for carrying out innovative activities, experiments and projects in a multi-disciplinary set up.

iv. The ‘Tech Lab: Robotics and Microprocessor Programming Facility’ which is a facility for creative and innovative projects in robotics and microprocessor programming for practical applications.

v. ‘3D Printer facility with Design Studio’, which is a facility for designing different types of 3D models and printing through 3D Printer.

At present, there is four (4) staff working at the Innovation Hub of Mizoram Science Centre. The Hub is managed by the Chief Mentor who is assisted by three Junior Mentors. Since its establishment, the staff monthly salaries are provided by the National Council of Science Museums, Kolkata, which will extend up to three years from 2018. The main work of these staff is to supervise the students in developing and implementing their projects. They also visit different schools within the state and invite the students to be active users of the Innovation Hub. Brochures are distributed in every school they have visited.

New ideas that are likely to benefit the society are encouraged by the Innovation Hub. The membership fees for this Hub have been fixed as follows:

i. For High School, Higher Secondary and Polytechnic students, 1000 rupees per head per annum or 3000 rupees per group per annum (not more than 15 students per group).

ii. For Science, Technology and Engineering College students, 2000 rupees per head per annum or 6000 rupees per group per annum (not more than 10 students per group).

Apart from the Innovation Hub, the Space Education Centre has a Digital Planetarium equipped with a highly sophisticated projector and a hemispherical dome screen. The planetarium provides state of the art facilities for night sky simulation, star gazing and observation of other astronomical and celestial bodies.

The Space Education Centre serves a major role in disseminating knowledge about Space Science, and for this purpose, the planetarium is equipped with other attractions like multimedia kiosks and posters which depict facts about the Solar System, Milky Way, Weird facts about Space and Galaxies, etc.

Chapter - III

PLANS, POLICIES AND PROGRAMMES OF THE DIRECTORATE OF SCIENCE AND TECHNOLOGY, GOVERNMENT OF MIZORAM

The Directorate of Science and Technology, Government of Mizoram has developed various projects and programmes over the past years. The three autonomous bodies of the Directorate namely, the Mizoram Remote Sensing Application Centre (MIRSAC), Mizoram Science, Technology and Innovation Council (MISTIC) and Mizoram Science Centre (MSC) act as implementing agencies for these projects and programmes.

Space technology with reference to the application of Remote Sensing and Geographic Information System has emerged as one of the mainstream pre-requisites in planning and implementation of many resources based schemes and projects taken up by the Government and private organizations. Since its inception, the contribution of MIRSAC in avenues of Space technology applications are management of natural resources, mapping of various land use/land covers, land and water resource development, potential area analysis, infrastructure mapping, disaster management, etc.

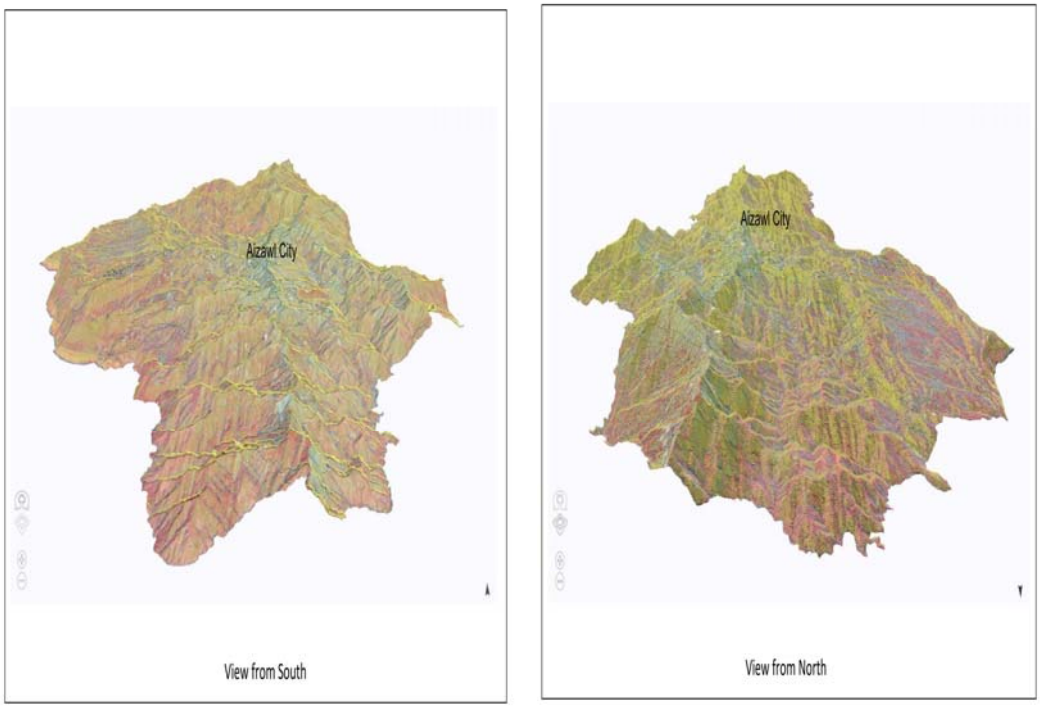
Some of the projects undertaken by MIRSAC that have been completed during 2018-2019 are mentioned as follows:

1. **Digital 3D Terrain Mapping and Modeling of Mizoram**

The project on 'Digital 3D Terrain Mapping and Modeling of Mizoram' is an important initiative to conduct a detailed digital survey and generation of 3D terrain for eight districts of the state namely, Aizawl, Lunglei, Mamit, Champhai, Siaha, Lawngtlai, Kolasib and Serchhip, which is applicable for operational level mapping. The North Eastern Council (NEC), Shillong, funds the project. The updated spatial data generated through this project will provide valuable information for the concerned Departments of eight districts for planning, management and formulating developmental programmes. Here, the concerned Departments are the 16 line departments of the Directorate of Science and Technology. The digital database generated through this project would also form a platform for evolving effective implementation strategies in the district headquarters of Mizoram. The project maps prepared through this project consist of contours, 3D models and other topographical layers like drainages, rivers, roads, settlements, etc.

The Digital 3D Terrain Mapping and Modeling of Mizoram was released on 13th September 2019. The 3D model of each village in the districts has been prepared which can be panned, zoomed, rotated and scaled. Thus, the terrain of each village can be visualized in a 3D environment which will help in better understanding of the terrain and planning activities.

Figure 4: Digital 3D Terrain Map of Aizawl city (view from the south and the north)



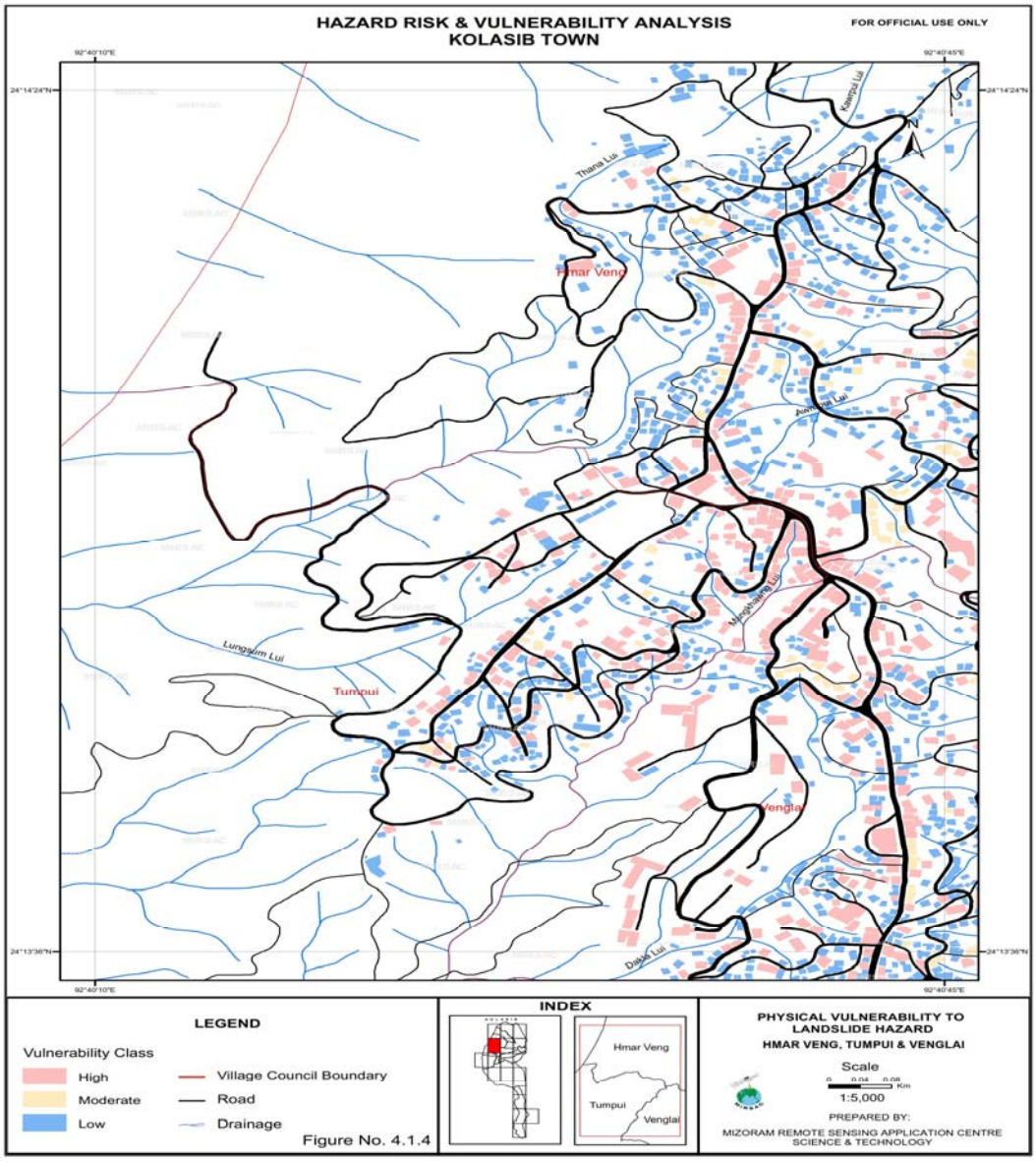
(Source: Pictures obtained from the office of MIRSAC on 11.11.2019)

2. Hazard, Risk and Vulnerability Analysis for Eight District Headquarters of Mizoram

Hazard, Risk and Vulnerability Analysis (HRVA) is a major project sponsored by North Eastern Council (NEC), which involves mapping the major and prevalent natural hazards and their subsequent analysis in eight district headquarters of Mizoram namely, Aizawl, Champhai, Kolasib, Lawngtlai, Lunglei, Mamit, Siaha and Serchhip. The hazard includes landsides, earthquakes, and wind and cyclone. Hazard mapping and assessment or analysis has been done with co-relational vulnerability and risk analysis.

The main objectives of this project are to generate basic data, undertake in-depth analysis and to quantify disaster risk levels and associated causal factors for the eight district headquarters, and propose solutions for reducing the risks.

Figure 5: Hazard, Risk and Vulnerability Analysis of Kolasib district.



(Source: Picture obtained from the office of MIRSAC on 11.11.2019)

For vulnerability and risk analysis, various physical and socio-economic data such as building type, population density, sex ratio, children and elders' population, low-income group, etc., have been collected in the field. Vulnerability and risk were assessed for infrastructure and population through socio-economic data using the samples of buildings derived from high-resolution data. The use of space technology, especially the high-resolution satellite data, 'Quickbird' or 'World View Data' has made it possible to identify building types in the study area.

3. Village Profile Mapping of Mizoram

The project was executed with funding from the Directorate of Economics and Statistics, Planning and Implementation Department, Government of Mizoram for mapping the entire state of Mizoram. This mapping was done for use by the concerned department. The project provides location-based information of all villages in Mizoram, including their demographic and necessary attributes that will assist in planning and development activities. Training for updation of GIS system was also provided by MIRSAC to officials of the Planning and Implementation Department. The GIS data along with computer systems were handed over to the funding department i.e., the Directorate of Economics and Statistics, Planning and Programme Implementation Department, Government of Mizoram on 14th August 2018 for effective use in planning and work execution of the department.

4. Mizoram Election e-Atlas

With the main focus to promote use of space technology for effective planning, monitoring and management of the Mizoram Legislative Assembly Elections 2018,

MIRSAC in collaboration with North Eastern Space Applications Centre (NESAC) and Directorate of Election, Government of Mizoram had taken up an ambitious project on design and implementation of the Mizoram Election e-Atlas.

The Mizoram Election e-Atlas is designed as a GIS based web portal with a set of map based modules and embodies a flexible architecture of database management system to enable a platform for updating election related data for management of the election processes by the Election Department. The portal also provides a public online map-platform (Dashboard) for users to view spatial information about polling stations, voter's distribution, minimum assured facilities, etc., with options to filter data in terms of districts, constituencies and sectors. The portal's Live Dashboard was also used to view spatial distribution of Live Vote percentage of polling stations during the Election Day as well as Live Election Result updates on the vote counting day.

Even though the Mizoram Election e-Atlas was meant only for official use, it was put up on the dedicated websites of the State Election Commission, Mizoram at the state level and the Election Commission of India at the national level for public viewing during the election.

The Mizoram Remote Sensing Application Centre also executes a number of on-going projects at present, which may be mentioned as follows:

1. **Site Suitability analysis of Dragon Fruit in Aizawl and Serchhip District under Coordinated Programme on Horticulture Assessment and Management using Geo-informatics (CHAMAN) 2nd Phase**

The main target of the project is to carry out site suitability analysis for cultivation of Dragon fruit in Aizawl and Champhai districts. It is a joint project conducted with Mahalanobis National Crop Forecasting Centre (MNCFC), New Delhi, Space Applications Centre (SAC), Ahmedabad and North Eastern Space Applications Centre (NESAC), Umiam.

Mapping for suitable areas are done within target areas of shifting cultivation and wastelands at 1:10,000 scale. The analysis considers all possible parametres required for identifying potential areas for cultivation of Dragon fruit such as soil, terrain and climatic factors.

To find the potential areas, MIRSAC collaborates with the Horticulture Department, Government of Mizoram.

2. **Indian Regional Navigation Satellite System (IRNSS) – Data collection**

This initiative is an on-going exercise to validate and experiment the use of the recently launched (on 12th April, 2018) constellation of Indian navigation satellites – IRNSS under the guidance and support of Indian Space Research Organization (ISRO), Department of Space. An IRNSS receiver node is installed at MIRSAC like

other Space application Centres, to collect daily positional datasent from the IRNSS satellites, which is used to validate positional accuracy and functional operations of the satellites in orbit.

MIRSAC is currently dealing with the testing phase, where signals are tested every day.

3. North Eastern Spatial Data Repository (NESDR)

The NESDR project is funded and executed in collaboration with North Eastern Space Application Centre (NESAC), Department of Space and Ministry of DoNER with an objective to bring spatial data on a unified platform to promote the use of space technology and to be used for various developmental activities in the northeast. Spatial data has been shared and state node/portal for Mizoram is being prepared. The main target of the project is to provide a common GIS based repository to store, standardize and catalog various GIS data which is connected to a main node centre at MIRSAC and NESAC for providing geospatial data and services to the user departments of the state.

4. Fostering Climate Resilient Upland Agriculture Farming System (FOCUS) - Mizoram

The project is funded by the International Fund for Agriculture Development (IFAD), United Nations and executed in collaboration with Agriculture Department, and allied line departments namely, Horticulture Department, Animal Husbandry and Veterinary Department, and Land Resources, Soil and Water Conservation Department of the state. The Agriculture Department is designated as the Nodal

Department. FOCUS aims to bring improvement of jhum cultivation and promote families who are willing to go for settled agriculture.

The Agriculture Department assigned MIRSAC for technical assistance. The main objective under this project that is entrusted to MIRSAC is to map the current land use/land cover for four (4) districts in Mizoram viz. Kolasib, Mamit, Champhai and Serchhip, and also to prepare site suitability maps for cultivation of selected crops in these selected districts. The selected crops are ginger, turmeric, bird's eye chili and rice. The initial stage of mapping and analysis will assist the line departments and stakeholders of this project to further plan for agricultural development and align the objectives to fulfill the main goals of the FOCUS project i.e., to increase household agriculture income of 64,500 households and enhance their resilience to climate change. This would be achieved through the development objective of increasing the environmental sustainability and profitability of the farming systems practiced by the highland farmers of Mizoram.

POPULARIZATION OF SCIENCE AND TECHNOLOGY

Science popularization has been one of the main programmes organized throughout the years by the Mizoram Science, Technology and Innovation Council (MISTIC). Every year, a series of programmes such as Workshop, Symposia, celebration of various International Year, National Science Day and Mathematics Day, Talk Show, nature study, campaigns, lectures, demonstration, etc., are organized to popularize science among the students and the masses.

1. National Science Day Observation and Activities

In order to promote and popularize Science and Technology in Mizoram, the Directorate of Science and Technology, Government of Mizoram observe and celebrate the National Science Day every year on 28th February, to mark the discovery of Raman Effect by an Indian Physicist Sir C.V. Raman. Besides celebration of the day, the main objective of the programme is to generate scientific awareness among the students and general public across the state of Mizoram. The Department of Science and Technology, Government of India selects a particular theme for each year. The selected theme for 2019 is 'Science for the People and the People for Science'.

The main celebration for the National Science Day 2019 in Mizoram was held at Assembly Annexe Hall, Aizawl where the Chief Guest, Dr. R. Lalthangliana, Hon'ble Minister, Higher and Technical Department, Government of Mizoram gave a speech on the importance of science and technology for the growth and development of the state. A presentation on this year's theme "Science for the People and the People for Science" was delivered by the CSO of the Directorate. Students from the Regional Institute of Paramedical and Nursing Sciences (RIPANS) and District Institute of Education and Training (DIET), Aizawl presented their special numbers which was based on the theme. A hallway exhibition on local grassroots innovation and technology was also organized on this occasion where local innovators from different parts of Mizoram exhibited their innovations. More than two hundred (200) invitees from institutions and civil societies like DIET, RIPANS, Central YMA, Mizoram Science Society, Mizo Academy of Sciences, Science Teachers Association Mizoram, etc., attended the event.

Apart from Aizawl, the celebration of National Science Day, 2019 held at Lunglei, Champhai, Serchhip, Mamit, Lawngtlai and Kolasib were successfully organized where presentations on the selected theme were delivered by Science Professors, followed by discussions and interactions amongst the students and teachers.

2. Science Exposure Tour

The Science Exposure Tour aims to promote innovative thinking among young students and to inculcate the importance of science and technology particularly for the students in rural areas. It was conducted during 12th June – 14th June, 2018, for science students of Class XI within the state of Mizoram.

The Chief Scientific Officer of the Directorate of Science and Technology, Government of Mizoram, inaugurated the tour programme on 12th June, 2018, at Science and Technology Conference Room. A presentation on the topic of 'Career in Science and Technology' was delivered for the students.

A total of thirty-four (34) participants attended and participated in the programme. The participants were selected from higher secondary schools of different districts within Mizoram having science stream. The schools which participated include Government Higher Secondary School (Lunglei), Boston Higher Secondary School (Aizawl), St. John's Higher Secondary School (Kolasib), St. Joseph Higher Secondary School (Aizawl) and Sentea Memorial School (Zemabawk, Aizawl).

The three-day tour programme was started with a visit of the Directorate of Science and Technology Office in New Secretariat Complex, Khatla, Aizawl. The

participants visited the office and laboratories of Mizoram Remote Sensing Application Centre (MIRSAC) and Mizoram Science, Technology and Innovation Council (MISTIC) where they witnessed and observed the various functions and activities of the Directorate. Brief explanations on the use of Google-Earth, remote sensing applications, wind speed and direction, etc., were also given by the office personnel. The first day of the tour ended with a visit of Pachhunga University College (PUC) where visual demonstrations and thought provoking presentations were delivered to them by the Professors and Research Scholars from the science departments. Different kinds of experiments were also performed for the students.

On the second day of the Science Exposure Tour 2018, the participants visited the Mizoram University Campus at Tanhril, Aizawl. A thorough visit of the departments under the School of Life Sciences and Earth Sciences along with respective laboratories, and the Central Library was done where a brief lecture on specific topics with visual demonstrations was conducted by respective Professors and Research Scholars of each department under the two schools. Some of the topics and instruments which were shown and studied include Biotech HUB and its components, pollution monitoring laboratory, computerized book borrowing system, etc. The participants also visited the Indbro Poultry Farm undertaken by Mizoram Poultry Development Society, Tanhril which is under the Department of Animal Husbandry and Veterinary Science, Government of Mizoram. Explanations and demonstrations were given on scientific management of poultry farming. Techniques like egg incubation, brooding, breeding, inoculation/vaccination, feeding, etc., were demonstrated and visually shown to them.

On the third and last day of the tour, the Regional Institute of Paramedical and Nursing Sciences (RIPANS), Zemabawk was visited wherein different departments of the Institute were explained with their admission criteria, and experiments at nursing laboratory like working of electrocardiogram (ECG), ward management by Nurse, blood pressure test, etc., were conducted. The final destination of the tour was Mizoram Science Centre (MSC) which is located at Berawtlang, Aizawl. The participants were given a guided tour of different galleries of the Centre with constant explanation of different exhibits which were observed by the participants.

Science Exposure Tour is not yet organized for the current year, 2019. However, MISTIC is still planning to organize the tour programme.

3. National Mathematics Day Observation and Activities

The National Mathematics Day has been observed by the Directorate of Science and Technology, Government of Mizoram every year since 2012, with activities to promote and develop the knowledge of mathematics among the people in Mizoram. The latest observation and celebration of this day in the state was held on 21st December, 2018 at the Auditorium of Mizoram Science Centre, Berawtlang, Aizawl under the chairmanship of Dr. R.K. Lallianthanga, Chief Scientific Officer and Member Secretary, MISTIC. In coordination with Mizoram Mathematics Society as part of the National Mathematics Day 2018 celebration, two activities were held in the state, namely, the State Level Mathematics Competition and the Mathematics Summer Camp.

The 10th State Level Mathematics Competition, 2018 was organized with Mizoram Mathematics Society as part of National Mathematics Day observation on 10th November, 2018 at seven (7) different centres in various districts of Mizoram which are: Aizawl, Lunglei, Serchhip, Champhai, Saitual, Mamit and Kolasib, where each Centre was assigned with a Centre Superintendent. The competition was held in four categories for Classes V, VIII, X and XII. The total number of participants for the year's competition was 3357 students belonging to classes V, VIII, X and XII respectively. The total registration in each participating classes of the different centres are listed as shown in Table No. 1.

As part of observation of the National Mathematics Day in Mizoram, the 5th Mathematics Summer Camp was organized during 11th to 15th March, 2019 at Pachhunga University College, Aizawl. The objective of the Summer Camp was to induce mathematical aptitude to the school students of Mizoram. The focus of the programme was students reading in classes X and XII. The Camp was held during school break so as to get maximum benefit and whole hearted participation of the students, and it was attended by a total number of 95 students, out of which 65 students were from class X and 30 students were from class XII. Research Scholars and Lecturers/Professors from different colleges of Mizoram gave lectures on the Camp.

Table No. 1: Total Registration of the 10th State Level Mathematics Competition, 2018.

Class	CENTRE							
	Aizawl	**Lunglei**	**Serchhip**	**Saitual**	**Champhai**	**Mamit**	**Kolasib**	**Total Class wise**
V	599	160	104	52	21	5	71	**1012**
VIII	562	165	27	47	39	10	43	**893**
X	486	250	101	96	57	20	18	**1028**
XII	321	50	32	6	7	0	8	**424**
Total	**1968**	**625**	**264**	**201**	**124**	**35**	**140**	**3357**

(Source: Annual Report 2018-2019, Directorate of Science and Technology, Government of Mizoram).

4. Sci-Connect of North East – Science Quiz and Hands on Training

Sci-connect means connecting young talents with science[13]. The project is funded by Vigyan Prasar, an autonomous body under the Department of Science and

[13] vigyanprasar.gov.in/sci-connect-2018-nurturing-young-talents-of-north-east-on-science/ (accessed on 22.09.2019)

Technology, Government of India. This programme is initiated by the Vigyan Prasar especially for children of classes VIII and IX in North-Eastern states of India, i.e. Assam, Mizoram, Nagaland, Tripura, Manipur, Sikkim, Meghalaya and Arunachal Pradesh. The principal objective of Vigyan Prasar is to serve the Ministry of Science and Technology, Government of India's science popularization agenda[14]. It aims to nurture young talents of northeast India on science.

The programme in Mizoram was taken up by MISTIC which was divided into three stages: Screening Examination, State Level Quiz and Final Quiz Competition.

The written screening examination was organized at eight districts in Mizoram during the month of March 2018. The top 15 (fifteen) candidates were selected from the screening examination and were divided into 5 (five) groups consisting of 3 students each. The 5 (five) teams competed among themselves in the State Level Quiz held at Aizawl. The winner of the State Level Quiz represented the state of Mizoram for the Final Quiz Competition and competed with other North-Eastern States at Agartala, Tripura. The Mizoram team bagged the 2nd Prize.

5. Participation in India International Science Festival 2018

India International Science Festival (IISF) launched in 2015 is a celebration to promote Science and Technology and demonstrate how science could lead India towards a developed nation within a short span of time. Three Technical Assistants from MISTIC participated and attended the 4th edition of India International Science

[14] vigyanprasar.gov.in/about-us/introduction/ (accessed on 22.09.2019)

Festival (IISF) held during 5th – 8th October, 2018 at Indira Gandhi Pratishthan, Lucknow, Uttar Pradesh with the focal theme 'Science for Transformation'.

6. Organizing of Mizoram Science Congress

The Mizoram Science Congress is organized every alternate year since the year 2014. The latest one was organized on the 4th and 5th October, 2018 at Pachhunga University College by Mizoram Science, Technology and Innovation Council (MISTIC) in collaboration with various science NGOs in Mizoram such as Mizo Academy of Sciences (MAS), Mizoram Science Society (MSS), Science Teachers' Association Mizoram (STAM), Geological Society of Mizoram (GSM), Mizoram Mathematics Society (MMS), and Biodiversity and Nature Conservation Network (BIOCONE). The main objectives of the Congress are – to revitalize scientific Research and Development (R&D) activities in the state, to promote science and technology to tackle socio-economic issues in the state, and to spread awareness for conservation of natural resources.

The two-day event focused on the theme 'Perspective and Trends in the Development of Science Education and Research'. It provided a forum for interaction of the researchers, academicians, and students from the state and elsewhere, and to exchange knowledge and share advances in their research findings and development of technologies of relevance especially to the state. The event consisted of technical sessions covering theme lectures by eminent scientists, research presentation by young researchers, post graduate dissertation presentation and Children Science

Congress. Exhibitions by various institutions and indigenous works were also held in parallel with the technical sessions.

Apart from this, MISTIC also participated in the 105th Indian Science Congress which was held at Manipur University, Imphal during 16th – 20th March, 2018. The Prime Minister of India, Shri Narendra Modi inaugurated the year's congress with a focal theme of 'Reaching the Unreached Through Science and Technology'.

7. Popularization of Science through Mizoram Science Centre, Berawtlang

Since its establishment in the year 2003, Mizoram Science Centre (MSC) has been contributing valuable non-formal science education which caters to different groups of the society, the general public and specifically students of varying ages. Visitors abound from outside and from all corners of the state particularly the school going students, brought forth by enthusiastic teachers, to give them out-of-the-classroom experiences in learning and observing various scientific concepts which are portrayed through many indoor and outdoor exhibit items like the multimedia kiosks, digital planetarium, etc.

Table No. 2: *Month-wise visitor statistics of Mizoram Science Centre during 2018-2019 (financial year).*

MONTH	**NO. OF VISITORS**			
	General	**Students**	**Teachers**	**TOTAL**
April	767	375	24	**1166**
May	674	29	5	**708**
June	762	78	15	**855**
July	870	68	20	**958**
August	961	190	9	**1160**
September	1247	361	21	**1629**
October	1222	950	75	**2247**
November	848	1485	128	**2461**
December	1474	814	14	**2302**
January	646	146	17	**809**
February	601	630	65	**1296**
March	2277	511	40	**2828**
TOTAL	**12,349**	**5,637**	**433**	**18,419**

(Source – Annual Report 2018-2019, Directorate of Science and Technology, Government of Mizoram)

8. Science Demonstration Programmes

In collaboration with Mizoram Science, Technology and Innovation Council (MISTIC, five schools within Aizawl city which are of Higher Secondary level were invited for Science Demonstration Programme) as a continuation of National Science Day 2018 celebration. The schools visited were Government Zemabawk Higher Secondary School, Government Republic Higher Secondary School, Government K.M. Higher Secondary School, Government Chaltlang Higher Secondary School and Government Mizo Higher Secondary School during 17th – 23rd April, 2018. Education Assistants of Mizoram Science Centre presented science demonstration lectures and science demonstration shows for students in the five schools visited. Interactions were conducted with the students in each school where the students participated by raising queries on various topics of science.

Apart from this, a Seminar cum Science Demonstration programme with Mizo Hmeichhe Insuihkhawm Pawl (MHIP) General Headquarters was organized on 13th April and 27th April, 2018 at the Auditorium of Mizoram Science Centre, Berawtlang in collaboration with MISTIC. Various branches of MHIP in Aizawl district were invited to attend the seminars where presentations on the theme of the seminar 'Science and Technology for a Sustainable Future' were given by the staff of Mizoram Science Centre. Science demonstration shows were performed. Interactive sessions on various issues including environmental awareness and the role of women in these issues were discussed with members of the MHIP who participated in the seminar. Planetarium show, 3D show and exhibit demonstration were conducted for all the participants after the formal sessions on these two days.

9. Science Popularization Through Printed Scientific Journals

Three regular scientific journals have been published by various scientific organizations. The magazines are ‘Meithallawn’ with Mizoram Science Society, ‘Science Vision’ with Mizo Academy of Sciences and ‘Mizoram Science Journal’ with Science Teachers Association Mizoram. The journals are widely circulated in educational institutions from Primary level to University students all over the state and it also reaches the general masses. The demands for these three magazines continue to rise in Mizoram.

‘Mizoram Science Journal’ is mainly intended for young scholars and school children. ‘Science Vision’ is mainly research oriented and it includes original research papers and valuable scientific articles. It covers all branches of natural science which is published quarterly in the months of March, June, September, and December by the Mizo Academy of Sciences with financial assistance from MISTIC. ‘Meithallawn’ magazine focuses mostly on science popularization, science with applied aspects and its contents fit for all sections of people.

PROMOTION OF RESEARCH DEVELOPMENT AND INNOVATION

The Directorate of Science and Technology enhances their relevance to society by developing partnerships with the local community and educational institutions. To meet the needs of the local industries, local research and development programmes are selected as far as possible in order to avoid mismanagement of limited funding. In order to achieve the mission and objectives of the Directorate of Science and Technology, several activities were carried out by different centres and cells.

Towards research and development endeavor, several activities are annually taken up. Different projects and programmes are formulated with successive implementation. Different supporting and funding agencies are approached such as the Department of Science and Technology, Government of India, National Council for Science and Technology Communications (NCSTC), Vigyan Prasar, North Eastern Council (NEC), National Council of Science Museums (NCSM), etc. and the State Government.

1. Scientific Research and Technological Innovation Project

The main objective of this project is to meet the expenditure incurred on research work from scientists working in the research and development institutions, science based NGOs and innovators in the form of grant with a view to promote research and education in the field of science and technology in Mizoram.

The guidelines for grant of financial assistance under the Scientific Research and Technological Innovation Project was approved by the State Government vide No. G.28014/04/04-PLG (part III), Dated 18.10.2017 which was vetted by the Finance Department, Government of Mizoram vide I.D. No. FIN (EC) 817/2017-PLG, Dated 13.10.2017.

The Selection Committee for the Scientific Research and Technological Innovation Project was constituted under the Chairmanship of the Secretary, Planning and Programme Implementation Department, Government of Mizoram vide Notification No. G.29012/1/2017-PLG, Dated 15.12.2017. The Selection Committee, after careful consideration of the Expert Evaluation Report selects the research

proposals for grant of financial assistance. At present, there are seven (7) selected scientific research proposals for grant of financial assistance during the year 2018-2019. The project titles are:

i. Assessment of Locally Available Materials for the Reliable and Safety of Construction Works.
ii. Assessment of Carbon Sequestration Potential of Selected Native Tree Species.
iii. Evaluation of the Anticarcinogenic Activities of Mussaenda Macrophylla Wall. (Family: Rubiaceae).
iv. Study of Health Hazards of Cell Tower Radiations and Mobile Phone Usage in Particular to DNA Damage (Micronuclei formation).
v. Inventorization and Conservation of Herpetofauna in the Hmuifang-Sialsuk-Sailam hill range of Mizoram, Northeast India with Local Participation.
vi. Classification, Mapping and Structural Analysis of Mass Wasting activities in parts of Northern Flanks of Aizawl Anticline, Mizoram, India.
vii. Assessment of Heavy Metal Contamination in Road-Side Sediments in Aizawl.

2. Science and Technology International Travel Support Scheme

The main objective of the Science and Technology International Travel Support Scheme is to provide financial assistance for presenting a research paper or chairing a session or delivering a keynote address in an international scientific event such as conference, seminar, symposium, workshop, etc., organized by institutions or organizations abroad. The scheme enhances scientific researchers' experience, qualitatively foster their enthusiasm and make further progress for the advancement of scientific research and development in Mizoram.

The financial assistance under the Science and Technology International Travel Support Scheme is meant for scientific researchers (with Ph.D.) residing permanently in Mizoram, whose papers are accepted for oral presentation or who are invited to chair a session or to deliver a keynote address in international scientific events organized by institutions/organizations abroad, preferably among the top 200 universities by Quacquarelli Symonds (QS) world university ranking. The applicant should have at least three (3) publications in journals approved by University Grants Commission (UGC). The applicant will be allowed to avail financial assistance under this Scheme once in two years[15].

The Directorate of Science and Technology prepared the guidelines for Science and Technology International Travel Support Scheme. It was then approved by the State Government and the same was notified under Planning and Programme Implementation Department vide Notification No. D.12019/2/2015-PLG, Dated

[15]https://dst.mizoram.gov.in/uploads/attachments/b856543445adb2a548a58d0fd9b3c21f/international-travel-support-scheme.pdf (accessed on 8.09.2019)

19th February, 2018. The same was vetted by the Finance Department, Government of Mizoram, vide their I.D. No. FIN (EC) 134/2017-PLG, Dated 09.02.2018.

As insisted in the approved guidelines, the Selection Committee for Science and Technology International Travel Support Scheme was constituted under the Chairmanship of the Secretary, Planning and Programme Implementation Department vide Notification No. D. 12019/2/2015-PLG, Dated 28.02.2018.

The Selection Committee selected Dr. Lalthanzuala Rokhum, Assistant Professor (Stage II), Department of Chemistry, National Institute of Technology Silchar, Assam for grant of financial assistance during the year 2018-2019. The title of his paper was 'An Efficient Protocol for Highly Selective Tetrahydropyranylation/ Depyranylation of Alcohols and Phenols using Mesoporous Polymeric Acid Catalyst'. He presented this paper at George Washington University, Washington D.C., United States of America during 22nd - 24th July, 2019.

3. Establishment of Digital Planetarium at Lunglei

In order to establish a Digital Planetarium at Zohnuai, Lunglei, the North Eastern Council (NEC) has allocated the required fund of Rs. 3.25 crores to the MISTIC. The required land for the Digital Planetarium at Lunglei has been made available by the State Government free of cost. The Department of School Education, Government of Mizoram has granted No Objection Certificate (NOC) for occupation of Zohnuai Primary School II and Zohnuai High School Land. The Village Council and all other concerned local NGOs in Zohnuai welcome the proposed construction of

Digital Planetarium/Science Centre. The construction work of the building has been given to the Public Works Department, Government of Mizoram.

There are two projects which are necessary to be completed for the establishment of Digital Planetarium at Zohnuai, Lunglei. The projects are: 'Widening of Approach Road to Digital Planetarium' and 'Dismantling and Reconstruction of Mizo Upa Pawl (MUP) Building at Zohnuai for widening of approach road to Digital Planetarium'.

The 'Widening of Approach Road to Digital Planetarium at Lunglei' project is funded by the State Government at a total cost of Rs. 44.21 lakhs. The main objective is to widen the approach road to the proposed Digital Planetarium at Zohnuai, Lunglei, which is an NEC sponsored project. The existing road is narrow and not easily penetrable by vehicles especially the heavy motor vehicle (HMV) which cannot access the site, widening of the road at two locations to enable easy supplying of materials to the construction site is required. The widening of the approach road for Digital Planetarium is inevitable as the Centre is likely to enlarge and develop into a District Science Centre. The ease of access to the Centre will contribute towards the number of benefits the centre could produce.

The widening of road is implemented at two different sites and a retaining wall to stabilize the slope of land is constructed. The work was transferred to the Executive Engineer, Public Works Department, Lunglei Division for speedy execution and is now completed.

The ‘Dismantling and Reconstruction of MUP Building at Zohnuai for widening of approach road to Digital Planetarium’ project is financed by the State government at a cost of Rs. 32.25 lakhs. The widening of approach road to the proposed Digital Planetarium runs through the existing private lands and structure namely, MUP Building, which requires dismantling and reconstruction. A joint meeting was conducted on 2nd May, 2018 in which all the stake holders were invited. In this meeting, it was decided that all private land owners will donate their land free of cost for the widening of the road. Regarding the MUP Building, the meeting agreed that it may be dismantled on the condition that local the Village Council and the State government may consider the reconstruction. In pursuance of the decision of the Joint Meeting, the proposal for dismantling/demolition and reconstruction of MUP Building at Lunglei, Mizoram, was submitted to the Government of Mizoram which gave financial allocation for the project. for widening of approach road is approved by the State Government under the New Economic Development Policy. The project work is ongoing.

4. **Development of Sawdust Briquetting and Charcoal Making Plant at Baktawng**

The project is funded by the State Government at a cost of Rs. 38 lakhs. It is taken up with objectives such as:

i. To generate sustainable employment to increase the income of the households of the rural poor.

ii. To enhance the capabilities of the rural poor to manage new technologies and institutions at the village level.

iii. To harness the Self Help Groups as a productive means for economic empowerment through managing their own resources.

iv. To create awareness among the rural people about the importance and usefulness of charcoal briquette as an alternative to LPG/ non-renewable source of energy.

v. To create better agricultural waste management technique for people who are engaged in shifting cultivation.

The building or plant for sawdust briquetting and charcoal making was constructed at Chhuanthar, Baktawng where raw materials for the project are freely available and abundant. All the mechanics required for the project are procured, installed and trial run is performed at present.

The project inauguration and handover to the briquetting society at Baktawng was organized on 28th March, 2019 at Baktawng village. The inauguration programme was chaired the Senior Scientific Officer and Dr. R.K. Lallianthanga was the Chief Guest. The programme was attended by Baktawng and Chhuanthar VC, YMA, MHIP, MUP and various civil societies – Baktawng Tea Growers Association, Aluminium Industry, Aloe Vera Growers Association and Carpentry Association. Technicians from Shree Engineering Works, Hyderabad were also present in the inauguration.

5. **Community based Environment Conservation and Eco-Tourism at Ailawng**

The project is funded by the State Government at a total cost of Rs. 100 lakhs. The main objectives are:

i. To conserve natural environment in the project area.

ii. To attract tourists to Mizoram.

iii. To create employment for local people.

The community forests, beautiful landscape and views, rich vegetation, caves and other historical/cultural places present in and around Ailawng village make it an ideal tourist spot. The involvement of local people will also generate jobs and income which will make the project sustainable in future. Festivals, creation of historical/traditional Mizo villages and souvenirs are intended to be taken up by the villagers to boost their income and to attract tourists at the same time. The Ailawng Village Ecotourism Development Society (AVEDSOC) is yet to be trained for taking up the project in future.

The various components of the project are – renovation of Khuangchera Memorial Stone; construction of gallery cum café/multipurpose hall; development of Dilzawl Lake; construction of Rest House and Parking lot; establishing trekking routes; construction of Cable Foot Bridge from Khuangchera Khawthlir to Tlawngnuar view; establishment of Orchid Park inside the Ngawbing (Virgin Forest); renovation of Visitors Information Centre and site development works including the construction of Toilet, Main Gate, Parking Lot, Artefacts Collection, 3D Theatre,

Khuangchera's Museum, etc.; training on hospitality and ecotourism of community stakeholders including exposure tour to Sikkim Eco-Tourism Projects and homestays, etc.; directional signage, information boards, posters, etc. This project is ongoing and is expected to be completed by January, 2020

6. **Development of Water-Based Preservation Technology of Orange at Thingsai Village**

The project is funded by the State Government. This water-based preservation technique of Orange Project is set up at Thingsai Village, Lunglei district. The project costs Rs. 8.97 lakhs. The objectives of the project are:

i. To develop simple and working water-based preservation technology for orange.
ii. To better ascertain various parametres affecting the storage life of orange.
iii. To create orange market system such that the orange produce of Mizoram may be retained completely inside the state.
iv. To create awareness among the people about the importance and usefulness of simple and innovative means of preservation for various seasonal foods and fruits of Mizoram.

The construction of enclosure for orange reservation is almost completed. However, various equipment like water storage tank, temperature and humidity sensors, solar cell, etc., under this project are yet to be procured. The project is still ongoing.

7. Enhancement of Livelihood Options for Rural Women in Aizawl, Mizoram

This project is funded by the Government of India at a total cost of 17.29 lakhs and it falls under the Science for Equity, Empowerment and Development (SEED) Division. SEED division has been set up under the Department of Science and Technology, established with the broad objectives of providing opportunities to motivated scientists and field level workers to take up action oriented and location specific projects aiming towards socio-economic upliftment of poor and disadvantaged sections of the society through appropriate technological interventions especially in the rural areas. Under this Division, efforts have been made to associate concerned National Labs or other specialist Science and Technology institutions with each major programme so as to build-in expert input, utilize national Science and Technology infrastructure and link it up with grassroots Science and technology interventions/initiatives[16].

The main objectives of the Enhancement of Livelihood Options for Rural Women in Aizawl project are:

i. To provide technology input for production of healthier food products such as dried and pickled products.
ii. To provide better skills to women in production of food products at local or domestic levels.
iii. To provide technology input for improving poultry and pig farming, thereby producing better quality and quantity outputs.

[16]https://dst.gov.in./about-us-0 (accessed on 9.09.2019)

iv. Creating network of women or self-help groups in which skill development will be introduced and thereby creating chance for income generation.

The project aims at upliftment of the condition of women in rural areas. The area selected is Zemabawk which is a peri-urban area, situated on the eastern outskirt of Aizawl, capital of Mizoram. The selected area Zemabawk constitutes of different localities, they are: Zemabawk, Zemabawk North, Thuampui, Berawlui and Bungbangla.

The main problem faced by women of the proposed site is unemployment. More than 70% women of the selected target are unemployed, either at government or private sector. They involved either in their private farms or seek daily wages in different fields of work like daily labour, vendors, house maids, sweepers, cleaners, etc. The project is undertaken by MISTIC in collaboration with the MHIP Branch of Zemabawk. The construction of training shed is completed and will be inaugurated this year i.e., 2019.

8. Phytochemical Screening and Identification of Secondary Metabolites and Nutritional Profiling of Alocasia fornicata (Baibing)

This project is funded by the Government of India and was started on 1st December, 2017 at a total cost of Rs. 7.5 lakhs. Alocasia fornicata (Baibing) is a popular food in Mizoram, with potential medicinal value. It has been used as a traditional medicine in India and studies have also shown that this plant has

antioxidant, antibacterial and cytotoxic activities. However, the constituents of Alocasia fornicata that contribute to its medicinal properties are yet unknown.

The project aims to study the phytochemical and nutritional constituents of Alocasia fornicata. Using different solvents, Alocasia fornicata extracts were prepared and presence and analysis of the different secondary metabolites was performed. Furthermore, the nutritional content of the edible part Baibing plant, the spadix of Alocasia fornicata was also determined being a popular side dish in Mizo meals. The project is now completed.

9. Development of Portable Agarbati Round Stick Producing Machine

This project is funded by the Government of India at a cost of Rs. 5.99 lakhs. The main objective of this project is to construct an efficient machine, portable and requiring less manpower that could produce high quality bamboo round sticks suitable for agarbati stick, etc., at high production rate. The project will indirectly add value to bamboo project in the state through better processing and faster product generation, promote forest-based livelihood activity options for the rural poor by using bamboo as a resource, and establish linkages with local and distant markets for regular supply of agarbati sticks.

The Development of Portable Agarbati Round Stick Producing Machine project is expected to help reduce the problem of environmental degradation by providing employment through creation of numerous small scale bamboo incense stick industry. The project is taken up in collaboration with local innovator and is now

completed. The product of this prototype is found to be satisfactory and could be improved further under field trial.

10. Development of Motor Cycle Trailer Suitable for Hilly Areas

This project is funded by the Government of India at a cost of Rs. 3 lakhs. The main objectives of the project are:

i. To introduce or intervene scientific technology to uplift the socio-economic problem faced by the people of Mizoram by introducing affordable transportation equipment for transporting agriculture product to the market at lower cost.

ii. To assist two wheeler riders by providing modernize and simpler trailer for carrying their luggage and gear easily while journey.

The project is taken up in collaboration with local innovator Mr. Jonah L. Pachuau from Ramhlun North, Aizawl and one of the two prototypes proposed to be designed and constructed under this project is completed. The prototype had been tested once and was found to be good and could be improved further under field trial.

11. Establishment of Colour Web-Offset Printing Press

The project is funded by the Government of Mizoram at a total cost of Rs. 400 lakhs. The centre for this Colour Web-Offset Printing Press is planned to be set up at Mizoram New Capital Complex, Aizawl within the premise of Innovation Facility Centre (IFC). The main objectives of the project are:

i. To be able to print school textbooks under the authority of SCERT in hopes of minimizing risk of various transaction problems and making the state fully independent in printing school textbooks.

ii. To create jobs for families working in printing related works and upgrade quality of printing in the state.

iii. To install highly modernized printing machineries to speed up printing works and upgrade quality of printing in the state.

The project is taken up in collaboration with Mizoram Press Owners' Association (MPOA) and is ongoing.

PROMOTION OF INTELLECTUAL PROPERTY RIGHTS

Technological innovation plays various roles for the upliftment of nations across the world. Hence, it is essential and important for a young and remote state like Mizoram to promote technology as well as contribute for its safeguard to achieve a sustainable development goal.

The 'Intellectual Property Rights' are the exclusive rights given to any person over the creations of his/her mind and use his/her creation for a certain period of time. Intellectual property rights are customarily divided into two main areas: Copyright and rights related to copyright; and Industrial property.

a) Copyright and rights related to copyright: The rights of authors of literary and artistic works (such as books and other writings, musical compositions, paintings, sculpture, computer programs and films) are protected by copyright, for a minimum period of 50 years after the death of the author.

Also protected through copyright and related (sometimes referred to as "neighbouring") rights are the rights of performers (e.g. actors, singers and musicians), producers of phonograms (sound recordings) and broadcasting organizations. The main social purpose of protection of copyright and related rights is to encourage and reward creative work.

b) Industrial property: Industrial property can usefully be divided into two main areas: One area can be characterized as the protection of distinctive signs, in particular trademarks (which distinguish the goods or services of one undertaking from those of other undertakings) and geographical indications (which identify goods as originating in a place where a given characteristic of the good is essentially attributable to its geographical origin). The protection of such distinctive signs aims to stimulate and ensure fair competition and to protect consumers, by enabling them to make informed choices between various goods and services. The protection may last indefinitely, provided the sign in question continues to be distinctive; Other types of industrial property are protected primarily to stimulate innovation, design and the creation of technology. In this category fall inventions (protected by patents), industrial designs and trade secrets. The social purpose is to provide protection for the results of investment in the development of new technology, thus giving the incentive and means to finance research and development activities. A functioning intellectual property regime should also facilitate the transfer of technology in the form of foreign direct investment, joint ventures and

licensing. The protection is usually given for a finite term, typically 20 years in the case of patents[17].

The main activities that have been undertaken by Patent Information Centre and Innovation Cell, MISTIC for the promotion of innovation and facilitation of Intellectual Property Rights include the following points:

i. Observation of the World Intellectual Property Rights Day on 26th April. This day has been observed every year since 2012. The Directorate of Science and Technology, Government of Mizoram has organized functions for paper presentation and group discussions on the chosen theme for each year. In 2017, the theme for the World Intellectual Property Rights Day was 'Innovative-Improving Lives' and in 2018, 'Powering Change: Women in Innovation and Creativity' was the chosen theme.

ii. Organizing workshops and seminars on various topics – 'Overview of Copyright and Case Studies', 'Intellectual Property Rights with Special Emphasis on Patent' and 'Innovation and Its Impact on Society' in various institutions in Aizawl such as Mizoram University, ICFAI University, Pachhunga University College, Government Hrangbana College and NIELIT.

iii. Awareness on Geographical Indication with special emphasis on Mizo Traditional Puan was organized by the Mizoram Apex Handloom and Handicraft Co-operative Society Ltd. (MAHCO) in collaboration with the Mizoram Science, Technology and Innovation Council (MISTIC) and the

[17]https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm (accessed on 29.10.2019)

Ministry of Textiles, Government of India. The Ministry of Textiles, Government of India introduced this programme under the initiative 'Hastkala Sahyog Shivir', which is a Pan India movement. Camps in 201 handlooms and 220 handicrafts clusters are organized across the country. In Mizoram, the Pan India camps were held at Aibawk, Hualngohmun and Samlukhai villages during the month of October in 2017.

iv. A presentation on 'Geographical Indication with regards to Mizo traditional puan (cloth)' was given by one Scientific Officer i.e. representative from the Mizoram Science, Technology and Innovation Council (MISTIC) at "Puan Talks of Handloom, Flower and Food Show" organized at by the University Grants Commission – Mizoram University Women's Studies Centre on 1st June, 2018 at Mizoram University Auditorium. This was part of the Intellectual Property Rights awareness programme.

v. Filing and management of various types of Intellectual Property have been initiated. The Patent Information Centre has assisted in filing of twenty-three (23) numbers of Intellectual Property from the state of Mizoram so far. They comprise of nine (9) Patents such as 'Power Hammer', 'New type of wind blade design', etc., eight (8) Trade Marks such as 'Occasional Nerd', 'Elevation Motion & Graphic', etc., five (5) Geographical Indications and one (1) Copyright.

Recently, five Mizo Puan, namely, Puanchei, Tawlhlohpuan, Hmaram, Ngotekherh and Pawndum were bestowed Geographical Indication tag. The initiative

for the Geographical Indication tag was successfully taken by the Art and Culture Department and MISTIC. Apart from this, Copyright was filed for Dr. R.K. Lallianthanga for his literary work 'Scientist Hmingthangte' on 15th January, 2019.

KNOWLEDGE MANAGEMENT ON CLIMATE CHANGE

The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is one of the eight missions under the National Action Plan on Climate Change (NAPCC). The NMSHE intends to evolve suitable management and policy measures for sustaining and safeguarding the Himalayan ecosystem along with developing capacities to continuously assess its health status. Recognizing the importance of scientific and technological inputs required for sustaining the fragile Himalayan Ecosystem, the Department of Science and Technology has been given the responsibility of coordinating the mission. As a part of the NMSHE activities, State Climate Change Cells (SCCC) have been set up and strengthened under NMSHE in the Indian Himalayan Region (IHR) states.

The Mizoram State Climate Change Cell was also established through NMSHE during 2014-2105 under MISTIC. Apart from the activities under NMSHE, the Mizoram State Climate Change Cell has been involved in various activities under the Strategic Knowledge Mission (SKM) of Mizoram State Action Plan on Climate Change (SAPCC).

The objectives of the Mizoram State Climate Change Cell include:

i. Vulnerability and risk assessment due to climate change.
ii. Institutional capacity building and research and development

iii. Training programmes for stakeholders

iv. Creating awareness programme

The Climate Change Cell has undertaken various awareness and capacity building programmes on climate change in Mizoram. The main activities are mentioned as follows:

i. The State Climate Change Cell organized programmes such as: One-day state level workshop on ‘Impact of Climate Change in Mizoram’; One-day seminar on ‘Effect of Climate Change on Herpetofauna’ (the reptiles and amphibians of a particular region, habitat, or geological period) in collaboration with Biodiversity and Nature Conservation Network (BIOCONE); Photography competition on the theme of ‘Climate Change in Mizoram’ in collaboration with Mizo Photographers Society; Three days capacity building programme for media personnel; One-day Level 2 training programme for state level officials on capacity building programme for climate change adaptation planning was organized in collaboration with NABARD Consultancy Services (NABCONS) through the support of Indian Himalayas Climate Adaptation Programme (IHCAP).

ii. One-day Sensitization Workshop on ‘Climate Change in Mizoram’ in collaboration with – Lunglei Government College, Government Champhai College, Government Kolasib College, Government Lawngtlai College, Government Saiha College, Government Mamit College and Government Serchhip College was organized at their respective colleges. The topics

covered in the workshop were ‘Overview of Climate Change’ and ‘Climate Scenario of Mizoram’.

iii. A Sensitization Workshop for Stakeholders on Climate Change and its related issues in Mizoram was organized on 5th April, 2018 at Secretariat Conference Hall, New Capital Complex, Aizawl. Climate change issues in Mizoram with respect to three sectors such as water resources, hazard and agriculture sectors were covered by three different invited speakers in the workshop with an aim to discuss and build the capacity of Government Line Departments within the state. A total of 29 participants from different Government Line Department, faculties from academic institutions within the states attended the programme.

iv. On 26th April, 2018, a Memorandum of Understanding was signed with the Administrative Training Institute (ATI), Government of Mizoram for institutionalizing capacity building programme on climate change in Mizoram. Following this, four days Level 3 training programme for District Level Officers on ‘Capacity Building Programme on Climate Change Adaptation Planning’ was organized in collaboration with NABCONS through the support of IHCAP during 4th to 7th September, 2018 at Administrative Training Institute, New Capital Complex, Aizawl. A total of forty-four (44) participants from district officials of different line departments, invited speakers, delegates and National Bank for Agriculture and Rural Development (*NABARD*) representatives attended the programme. A field visit to Chite was also held during the programme.

v. On 4th March, 2019, a half day workshop on ‘Assessment of Vulnerability due to Climate Change in Indian Himalayan Region with respect to Mizoram’ was organized at the Secretariat Conference Hall, New Capital Complex, Aizawl. The workshop aims to disseminate the result obtained from the recent vulnerability assessment study done by the Mizoram State Climate Change Cell on socio-economic and biophysical sectors in Mizoram as well as the study done in the Indian Himalayan Region by other states in India. A total of thirty-five (35) persons from different Government Line Departments, faculties from academic institutions within the state and NGOs attended the workshop.

vi. On 20th March, 2019, one-day awareness programme on ‘The Science of Climate Change in Mizoram’ was organized in collaboration with Sub Headquarters Young Mizo Association (YMA), Mamit at Siamliana Hall in Mamit. A total of seventy-five participants from village council members, Branch YMA, MHIP, MUP and invited persons within the town of Mamit attended the programme.

Chapter – IV

RESULTS AND DISCUSSION

The previous two chapters cover the organizational structure, functions and programmes carried out by the Directorate of Science and Technology, Government of Mizoram. These chapters give us a detailed study of the existing staff of the Directorate of Science and Technology, Government of Mizoram and the functions and activities performed by the Directorate along with the three autonomous bodies namely MIRSAC, MISTIC and MSC. This Chapter consists of some reflections on the research findings and discussion on the topic of study, 'Working of the Directorate of Science and Technology, Government of Mizoram'. The following are the major findings of the present study:

The office of the Directorate has an overall thirty-one (31) sanctioned posts by the State government. The researcher has found that only nineteen (19) posts are filled and the other twelve (12) posts are lying vacant in the office of the Directorate of Science and Technology, Government of Mizoram. This is a contributing factor for the inefficient work flow at the Directorate. These vacant posts at the Directorate of Science and Technology are not filled by the State government till date.

The study has revealed that due to the shortage of the clerical manpower in the office of the Directorate, the employees are not able to perform their work efficiently or effectively. They have to cover up the works of the vacant posts which takes a lot of extra effort and time leading to slow supervision of work in the office.

The main limitation in the working of Mizoram Remote Sensing Application Centre under the Directorate of Science and Technology, Government of Mizoram is the limited staff strength. Due to financial constraints on the part of the State government, four posts are lying vacant in the office of MIRSAC. The present numbers of employees of MIRSAC are not sufficient enough to manage the resource based schemes and projects taken up by the government and private organizations since the applications of Remote Sensing and Geographic Information System require trained expertise.

During the course of the study, the researcher found that the office of MISTIC has a total of twenty-two (22) regular posts. Out of the 22 posts, seven (7) posts are lying vacant. This has shown the lack of manpower and trained personnel in the office of MISTIC. These vacant posts are yet to be filled by the State government.

Based on the total registration of the 10^{th} State Level Mathematics Competition, 2018, which was obtained from the staff of MISTIC, the Aizawl Centre had the highest number of participants i.e. 1968 students, while Mamit Centre had the lowest number of participants i.e. 35 students. When it comes to class wise participation, Class X students contributed the highest number of participants with a total of 1028, while the lowest number of participating class was Class XII with a total of 424 participants. This has proven that the level of Mathematics awareness among the students in Aizawl is quite high. On the other hand, the data has also revealed that there is a discrepancy when it comes to mathematics awareness between Aizawl district and the other districts in Mizoram.

The study also revealed that the number of male rank holders on the 10th State Level Mathematics Competition, 2018 is greater than the number of female rank holders. The former is eight (8) and the latter is four (4). Out of the twelve (12) rank holders, nine (9) of them are from different schools in Aizawl, while the other three (3) rank holders are from schools in Lunglei, Champhai and Hnahlan respectively. This has also proven that, among the students in Mizoram, there is still a huge gender difference between male and female, in which the male performance in Mathematics appears to be better than that of the female.

The project – 'Development of Water-based Preservation of Orange at Thingsai village operates with the objective to create orange marketing system such that the orange produced in Mizoram may be retained completely within the state. However, in today's globalized world of foreign exchange, Mizoram being situated in the remote corner of the country still has a lot of developmental goals to achieve. Hence, the complete retention of orange produce of Mizoram within the state may hamper the growth and development of orange exports and productions beyond the state which would eventually lead to lesser income generation in this aspect.

Based on the month wise visitor statistics of the Mizoram Science Centre, the highest number of visitors during the reporting period of 2018-2019 falls in the month of March, 2019 and the lowest number of visitors falls in the month of May, 2018. This shows that the number of visitors during the month of March is high due to the end of academic sessions of the schools in Mizoram. On the other hand, the number of visitors is low in the month of May. This may have a bearing to the starting of the academic school sessions in Mizoram.

During the course of the study, the researcher found that the use of the Geographic Information System (GIS) based data is a good sign for development in the state. One of the reasons being – through this system, the landmarks of Mizoram can be studied effectively which helps in identifying the agriculture potential lands and other activities for settlement.

Space Technology such as Atmospheric Science needs to be introduced in the state of Mizoram which will improve and develop the working of MIRSAC to a larger extent and hence, widens the scope it covers. This can happen by elevating the Centre from being an autonomous body to a Directorate of its own and thus, be governed directly under the State department. This will lead to a wider scope of technological transfer and acceptance between the central government and the state government. MIRSAC being an autonomous body under the Directorate of Science and Technology, the general public is not aware of its working yet. The knowledge and awareness among the people about the remote sensing application and to a larger extent, the application of space technology within the state have much scope for improvement.

MIRSAC projects under the Directorate such as Digital 3D Terrain Mapping of Mizoram, Village Profile Mapping of Mizoram, etc., have been completed successfully for the effective use in planning and work execution of the Planning and Programme Implementation Department. The data collected through these projects have proven helpful in identifying the infrastructures of various villages and districts in Mizoram for further implementation of programmes and projects by the State government.

The project, ‘Site Suitability analysis of Dragon fruit in Aizawl and Serchhip districts under the Coordinated programme on Horticulture Assessment and Management using Geoinformatics (CHAMAN)’ helps to identify the potential areas for cultivation of dragon fruit within Aizawl and Serchhip districts by using GIS system. MIRSAC collaborates with the Horticulture Department, Government of Mizoram to classify the lands of the potential areas namely; High, Moderate and Marginal are used to identify the potential areas. The first phase was completed in 2018 where site suitability for grape fruit in Champhai district was studied. The first phase was successfully implemented for the Champhai local grape cultivators.

In the course of the research, it was found that the working of MISTIC towards achieving its objectives such as promoting the popularization of science, environmental awareness and spread of a scientific temper and attitude among the people of the state, etc., is efficient enough. Unlike the other two autonomous bodies of the Directorate of Science and Technology, the employees under MISTIC are funded by the central government and the state government. The technical staff are funded by the central government, while the establishment staff are funded by the Government of Mizoram.

A Memorandum of Understanding was signed with the Administrative Training Institute (ATI), Government of Mizoram on 26th April, 2018, for institutionalizing capacity building programme on climate change in Mizoram. Training programmes have been organized in collaboration with the NABARD Consultancy Services (NABCONS) through the support of the Indian Himalayas Climate Adaptation Programme (IHCAP) for the District Level Officers from

different line departments on ‘Capacity Building Programme on Climate Change’. Field visits have been organized which seem to have proven helpful for the concerned officials for institutionalizing capacity building programme on climate change in Mizoram.

The study also revealed that the 'Innovation Hub’ and ‘Space Education Centre’ launched by the Mizoram Science Centre with the initiative and financial support of the National Council of Science Museums have contributed for the development of science and technology in the state.

The Innovation Hub is equipped with various facilities such as the ‘Hall of Fame: Inventions and Inventors’ section which uses several multimedia kiosks that bring about the stories of major inventors and their inventions in various fields and photo gallery, the ‘Innovation Resource Centre’ where broadband internet terminals provide online access to innovation-centric resources, e-journals, books and grass-root innovation portals, etc., the ‘Innovative Laboratory’ which provides physics, chemistry, biology, mechanical, electrical and electronics laboratories for carrying out innovative activities, experiments and projects in a multi-disciplinary set up, the ‘Tech Lab: Robotics and Microprocessor Programming Facility’ which is a facility for creative and innovative projects in robotics and microprocessor programming for practical applications, etc. All these facilities have assisted young students of Mizoram to develop their innovative ideas and have continued to, inspire and nurture them by exposing them to new ideas.

Chapter –V

CONCLUSION

The final chapter is divided into two parts – Part I and Part II. The first part contains a brief summary of all the previous chapters. The second part contains the major findings and suggestions regarding possible measures to be taken for the successful implementation and functioning of the programmes and activities of the Directorate of Science and Technology, Government of Mizoram.

Part - I

The first chapter starts with the introduction. It highlights how science and technology have contributed to the development of the countries around the world. The role played by science and technology to bring technological advancements in a modern world and the contributions of science and technology in shaping the country's economy are mentioned. It further on gives a brief introduction of the Department of Science and Technology which is under the Ministry of Science and Technology, Government of Mizoram. This chapter introduces the statement of the problem, the scope of the study, the aims and objectives, and the methodology used for the study. The first chapter also highlights a brief profile of Mizoram.

The second chapter traces the origin and historical background of the Directorate of Science and Technology, Government of Mizoram along with the three autonomous bodies of the Directorate viz. Mizoram Science, Technology and Innovation Council (MISTIC), Mizoram Remote Sensing Application Centre (MIRSAC) and Mizoram Science Centre (MSC). This chapter further on mentions the

relationship between the Directorate and its autonomous bodies. This chapter also deals withthe organizational structure and working of the Directorate of Science and Technology, and the three autonomous bodies of the Directorate – Mizoram Science, Technology and Innovation Council (MISTIC), Mizoram Remote Sensing Application Centre (MIRSAC) and Mizoram Science Centre (MSC)

The third chapter covers the programmes, projects and schemes undertaken by the Directorate of Science and Technology, Government of Mizoram along with the three autonomous bodies of the Directorate viz. Mizoram Science, Technology and Innovation Council (MISTIC), Mizoram Remote Sensing Application Centre (MIRSAC) and Mizoram Science Centre (MSC).

The fourth chapter includes the results and discussions arising out of the study and highlights the problems and challenges faced by the Directorate of Science and Technology, Government of Mizoram along with the three autonomous bodies of the Directorate viz. Mizoram Science, Technology and Innovation Council (MISTIC), Mizoram Remote Sensing Application Centre (MIRSAC) and Mizoram Science Centre (MSC).

Part - II

The present study is based on primary and secondary data. The study focuses on the organizational structure and working of the Directorate of Science and Technology, Government of Mizoram. During the course of the study, the researcher found that the Directorate functions under the Planning and Programme Implementation Department, Government of Mizoram. The Directorate is looked after

by the Chief Scientific Officer who is the head of the Directorate. The Directorate has three autonomous bodies namely: Mizoram Remote Sensing Application Centre (MIRSAC); Mizoram Science, Technology and Innovation Council (MISTIC); and Mizoram Science Centre (MSC). These three autonomous bodies function under the Directorate with the Chief Scientific Officer as Member Secretary in each body.

In the course of the study, it was found that there is only one original sanctioned post of the Principal Scientific Officer, who comes second in rank below the Chief Scientific Officer in the Directorate office. At present, there are two posts for this rank. The reason for the creation of the second post was because the Principal Scientific Officer went on deputation as part of a public sector undertaking under the State government. During the absence of the Principal Scientific Officer, the Directorate appointed the Senior Scientific Officer to fill the post of the Principal Scientific Officer on the condition of a 'Super Numerary Post'.

The second post of the Principal Scientific Officer in the Directorate office is to be abolished as soon as the post holder attains superannuation. The study has revealed that due to the presence of two Principal Scientific Officers, the works assigned to them are different to each other. The original post deals with the administration of the Directorate, while the Super Numerary Post is handling the accounts of the Directorate office.

The Directorate of Science and Technology has undertaken various projects and programmes for the promotion and popularization of science and technology in the state of Mizoram. These include:

i. Science Popularization through Printed Scientific Journals.
ii. Scientific Research and Technological Innovation Project.
iii. Science and Technology International Travel Support Scheme.
iv. Generation and Dissemination of Meteorological Data.

The study revealed that for implementation of the 'Science Popularization through Printed Scientific Project', the Directorate of Science and Technology, Government of Mizoram collaborates with the Mizoram Science Society, the Mizo Academy of Sciences and the Science Teachers Association Mizoram by giving financial assistance for the publication of three regular scientific journals/magazines published by various Scientific organizations. The magazines are 'Meithallawn' with Mizoram Science Society, 'Science Vision' with Mizo Academy of Sciences and 'Mizoram Science Journal' with Science Teachers Association Mizoram. The journals are widely circulated in educational institutions from Primary level to University students all over the state and it also reaches the general masses. The demands for these three magazines continue to rise in Mizoram till date.

The Science and Technology International Travel Support Scheme is meant for scientific researchers (with Ph.D.) residing permanently in Mizoram, whose papers are accepted for oral presentation or who are invited to chair a session or to deliver a keynote address in international scientific events organized by institutions/organizations abroad, preferably among the top 200 universities by

Quacquarelli Symonds (QS) world university ranking. The applicant should have at least three (3) publications in journals approved by University Grants Commission (UGC). The applicant will be allowed to avail financial assistance under this Scheme once in two years. This scheme is projected to promote more number of research scholars in the years to come.

The 'Generation and Dissemination of Meteorological Data' falls under the State Meteorological Centre, with active supervision from the Scientific Officers of the Directorate of Science and Technology. The Meteorological Centre which was established in the year 2005 is responsible for meteorological observations and weather forecasting. The Centre runs its own Weather Station at Tlaizawng Mual (Cherry Blossom Avenue), near Mizoram Secretariat main building, New Secretariat Complex, Khatla. Apart from this, two Automatic Weather Stations are being monitored – one in Aizawl and another in Lunglei. Daily weather data such as Rainfall, Temperature, Relative Humidity, Wind Speed and Direction, Barometric Air Pressure are generated from Monitoring of the Weather Stations.

In collecting the meteorological data, the collection procedure of the Indian Meteorological Department (IMD) is followed and the data is collected twice a day i.e. at 8:30 am in the morning and at 2:30 pm in the afternoon on a daily basis. The raw data collected are then stored in soft copy, analyzed as per the requirement of the users, and then disseminated to various users like research fellows, various government departments, NGOs and other private entrepreneurs, etc. Some of the instruments used for recording daily weather data are Self-recording Rain Gauge, Thermometre Screen, Anemometer Cup Counter, etc.

The following points contain the suggestions and remedial measures in order to improve the working of the Directorate of Science and Technology and to make it more effective in its functioning:

1) If the Department of Science and Technology under the Ministry of Science and Technology, Government of India creates more schemes and programmes for the country, this would greatly help in the development of not only the people in the metropolitan cities, but also the states like Mizoram where technological advancement and innovation still go a very long way. The Directorate will be able to widen its scope and functioning within the state.
2) The vacant posts in the office of the Directorate need to be filled by the State government to avoid any further delay in its working. There needs to be sufficient staff which the Directorate is currently lacking.
3) If the Mizoram Remote Sensing Application Centre could be upgraded to an autonomous body, there would be more staff strength to handle various technical and establishment works, the projects and schemes would be implemented more effectively which would save time and would increase efficient work flow in the office as well. The projects undertaken by the Indian Space Research Organization and the Space Application Centre in the centre would also be well undertaken in the state and increase result in a better relationship between the state government and the central government. Awareness programmes on the space applications through Remote Sensing and Geographical

Information System such as the usefulness and relevance of these technologies, needs to be organized frequently for the people in Mizoram. This will instill technological knowledge and its importance among the people.

4) The main vision of MIRSAC, which is the application of Space Technology through Remote Sensing (RS) and Geographic Information System (GIS), needs to be expanded in a broader sense so as to get more recognition from the Central government. MIRSAC needs to be recognized not only as a Remote Sensing Application Centre, but as also a centre for Space Application Centre which will cover a broader perspective of functioning under the State government.
5) The scope of the 'Scientific Research and Technological Innovation Project' implemented by MISTIC needs to be expanded since the role of local innovators in evolving small or mini-innovative projects has become more and more intense. Hence, it is necessary to accomplish in-depth and more extensive researches in several sectors, especially technological innovations and biodiversity where the state has greater potential owing to its strategic location.
6) The Mizoram Science, Technology and Innovation Council through its project titled - 'Development of Water-based Preservation of Orange at Thingsai Village' needs to create orange marketing system such that the orange produced in Mizoram may not only be retained, but also exported outside the state. This will contribute to the increase in the growth and development of orange exports and productions beyond the

state which would eventually lead to bigger income generation in this aspect.

The Directorate of Science and Technology, Government of Mizoram, ever since its inception, has contributed for the development of science and technology in the state of Mizoram. The roles played by the Directorate along with the three autonomous bodies viz., Mizoram Remote Sensing Application Centre (MIRSAC), Mizoram Science, Technology and Innovation Council (MISTIC) and Mizoram Science Centre (MSC) have brought about technological advancement and innovation within the state of Mizoram. They have continued to earn a place for the state's development in the field of science and technology.

The study has revealed that despite all the problems that the Directorate is facing, it is still successfully running its programmes till date just with a small group of staff and is helping many people in the Mizo society. The findings and suggestions are hoped to have encouraged future researchers in studying and understanding the Directorate in general, and science and technology in particular, and contribute for the development in Mizoram.

APPENDIX

Glossary of Terms/Concepts

1. Geographic Information System – Geographic Information System is a computer system build to capture, store, manipulate, analyze, manage and display all kinds of spatial or geographical data. Its advantage is that it has the ability of improving the organizational integration. It would then integrate software, hardware and also data in order to capture, analyze, manage and so display all forms of information being geographically referenced.
2. Patent – A patent is a grant of protection for an invention. It is granted by the U.S. Patent and Trademark Office (P.T.O.) and has a term of 14 to 20 years. Owning a patent gives you the right to stop someone else from making, using or selling your invention without your permission. In India, the term of every patent is 20 years from the date of filing the patent application, irrespective of whether it is filed with provisional or complete specification. However, in case of applications filed under the Patent Cooperative Treaty (P.C.I.), the term of 20 years begins from the international filing date.
3. Patent Information – Patent Information is the term given to the technical information which is found in patent documents, plus legal and business-relevant information about them. Patent documents consist of a first page comprising basic information such as the title of the invention and the name of the inventor.
4. Remote Sensing – Remote Sensing is the scanning of the earth by satellite or high-flying aircraft in order to obtain information about it.

5. Difference between Geographic Information System and Remote Sensing – Geographic Information System is a computer-based tool for mapping and analyzing features and events on earth. On the other hand, remote sensing is the science of collecting data regarding an object or a phenomenon without any physical contact with the object.

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