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Gist of YOJANA

July 2021

North-East

Governance in **North Eastern Region (NER)**

Agriculture and **Sustainable Development**

Long-term Peace & **Development**

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Team BYJU'S

Gist of Yojana July 2021 Issue: North-East

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Chapter 1: Introduction

Northeast India (officially North Eastern Region, NER) is the easternmost region of India representing both a geographic and political-administrative division of the country. It comprises eight states – Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. The region is rich and flourishing since ages.

- The North-eastern Region (NER) has several unique and unparalleled features: fertile land, abundant water resources, evergreen dense forests, high and dependable rainfall, mega biodiversity, flora and fauna and a mixture of socio-economic, political, ethnic and cultural diversity.
- The region has its own unique challenges and opportunities.
- While the entire world is moving towards sustainability, it has been a way of life in the North East, innately linked to nature.
    - This needs to be amalgamated today between development and natural habitat at present, especially in our metropolitan cities amidst changing worlds.
- The North East does have a unique indigenous culture and this has to be protected yet made relevant to modern times today.

The prevalent view of 'mainstreaming' of the Northeast and its population is myopic and misplaced.

Under the aegis of the Ministry of Development of North Eastern Region, the government is committed to accelerating the pace of socio-economic development of the region so that it may achieve growth parity with the rest of the country.

Chapter 2: Governance in NER

North East India is an area blessed with abundant potential and opportunities. The region is populated by a number of different communities, with diverse cultures, languages and customs. It is also marked by difficult terrain, backward areas, and limited connectivity. This area was known for the active presence of a number of militant groups. However, peace has been achieved to a large extent, with notable recent examples being the Nagaland Peace Accord and the Bodo Peace Accord.

Read more on the Naga Insurgency in the link.

- The region is connected to mainland India only through a narrow stretch of land (about 22 km wide) in West Bengal called the 'Siliguri Corridor', sometimes known as the "Chicken's Neck".
- Except for this narrow Siliguri Corridor, the entire northeastern part of the country is bound by international borders.

The strategic position of the land entails a number of advantages as well as challenges. It is against this backdrop that governance must be delivered, for the overall development of the region.

Institutional Support:

- The Department of Development of North Eastern Region (DoNER) was established in the year 2001.
- It became a full-fledged Ministry of the Government of India in 2004.
- The Ministry of DoNER functions as the nodal Department of the Central Government to deal with matters related to the socio-economic development of the eight states of Northeast India.
- It handled the Non-Lapsable Control Pool of Resources (NLCPR) Scheme, which has been followed by the North East Special Infrastructure Development Scheme (NESIDS).
- The North Eastern Council (NEC) is a statutory regional planning body for North East India constituted under the North Eastern Council Act 1971.
- All the Governors and the Chief Ministers of the eight states in the North East are members of the NEC.
- The Union Home Minister is the Chairman, and the DoNER Minister acts as the Vice-Chairman.

Mizoram – Introduction

- Mizoram literally translates as "Land of the Mizo people".
- 'Mizo' is an umbrella term for a number of tribes and clans, such as Lusei (formerly Lushai), Lai Mara, Hmar, Paite, etc.

- The area that was known to the British as the Lushai Hills formally became a part of British India in 1895.
- After India attained independence, Lushai Hills (later changed to Mizo District) became a District under Assam.
- In 1972, it became a Union Territory as Mizoram.
- And after two decades of insurgency, Mizoram became a full-fledged state within the Union of India in 1987.

Culture & Religion

- Before the coming of the British, the tribes were primarily animistic. There was no written script.
- There were a few tribal dances, such as Cheraw (bamboo dance), Sarlamkai Chheihlam, Khuallam, etc.
- They observed three festivals called Pawl Kut, Chapchar Kut and Mim Kut.
- The British annexation was followed by the arrival of Christian missionaries, who invented a script and an alphabet for the Mizo language.
- All the ethnic Mizo population have converted to Christianity, making up around 87% of the total population of the State.
- Around 8% of the population of Mizoram are Buddhists, primarily from the Chakma tribe along the Indo-Bangladesh border.

Mizo Insurgency (1966-1986)

- In 1959, the Mizo Hills, which was then a District under the State of Assam, was hit by a famine.
- This was a phenomenon of bamboo flowering after every 48 years or so, followed by plagues of insects and rats, leading to agricultural famine.
- Mizo National Famine Front was formed, spearheaded by Laldenga.
- In 1961, the Mizo National Famine Front became a political party called the Mizo National Front (MNF), with Laldenga as its President.
- On 28 February 1966, the MNF launched an armed uprising against the Union of India, followed by a declaration of independence on 1 March 1966.
- After being swiftly suppressed by the Indian armed forces, the MNF retreated and continued its operations from East Pakistan and Burma (Myanmar), with training and support from China.
- The Mizo Insurgency dragged on for two decades, with allegations and counter-allegations of atrocities committed by both sides.
- Mizoram Peace Accord was signed by MNF leader Laldenga, Union Home Secretary R. D Pradhan and Mizoram Chief Secretary Lalkhama on 30 June 1986, within the framework of the Indian Constitution.

- Subsequently, Mizoram became the 23rd State of the Union of India on 20 February 1987.
- The MNF won the election and Laldenga became the first Chief Minister of the State of Mizoram.

Mizoram – International Borders

- Mizoram shares a 318 km-long hard border with Bangladesh on its western side, which is guarded by the Border Security Force (BSF).
- Fencing is done along the Indo-Bangladesh border.
- Along the eastern side of the State, the 404 km border with Myanmar is being manned by the Assam Rifles, a paramilitary force.
- Due to the cultural and ethnic affinity of residents at the border, under normal times, India agrees to a Free Movement Regime (FMR) with Myanmar, allowing residents within 16 km on either side of the border to travel freely without visa restrictions for 72 hours.
- Being sandwiched on either side by Myanmar and Bangladesh, Mizoram has the strategic advantage of acting as a land bridge between the two countries.
- It has a real potential to become India's 'Gateway to South East Asia' under our Act East Policy.

Minorities and Backward Areas

- Under the Sixth Schedule to the Constitution of India, there are three Autonomous District Councils (ADCs) in Mizoram called the Lai ADC, Mara ADC and Chakma ADC.
- Lai, Mara and Chakma are the names of the tribes found in the majority in each corresponding ADC.
- While the Lai and Mara are ethnically related to and come under the umbrella Mizo term, the Chakma are a tribe distinct from the Mizo in terms of culture, linguistics and religion.
- The Governor of Mizoram is entrusted with special roles and responsibilities in these areas by the Sixth Schedule to the Constitution of India, which includes certain discretionary powers.

Agriculture:

- Mizoram is primarily an agrarian State with a large section of the population especially in the rural parts, engaged in agriculture and allied activities.
- The Mission Organic Value Chain Development (MOVCD-NER) has been implemented since 2017 in Mizoram for the promotion of organic farming.
    - It aims to replace traditional subsistence farming with market-oriented farming, following a cluster approach for high valued crops such as turmeric, chillies, ginger and tea.
- The Sub Mission on Seeds and Planting Material (SMSP) aims to ensure the production of high yielding seeds of all crops.

- Under the National Food Security Mission-Tree Borne Oilseeds (NFSM-TBO), a total area of 404 hectares are under olive plantation.
- Various programmes have been undertaken in pursuance of the Union Government's aim of Doubling Farmer's Income by 2022, including the introduction of high yielding varieties of crops, intervention by Krishi Vigyan Kendras (KVKs), integrated farming system, horti-based farming, etc.

In Mizoram, cluster expansion of Dragon fruit cultivation has been carried out. The Bird's Eye Chilli from Mizoram has a Geographical Indication (GI) tag.

Socio-Economic Development Policy (SEDP):

- The Socio-Economic Development Policy (SEDP) is the flagship policy of the current Ministry in Mizoram.
- The SEDP is envisaged to bring about sustainable development with both short-term and long-term implications.
- The Policy has been divided into various components, including political, administrative, economic and social development.
- The core focus points of the economic policy include self-sufficiency in Agriculture-Horticulture, Bamboo Cultivation, Rubber Plantation, Infrastructure Development & Management, Creation of Trade & and Investment Environment, etc.

Mizoram – Strengths:

- Mizoram is the best State in India in terms of forest cover.
- It has the third-highest literacy rate in the country at 91.58%, behind only Kerala and Lakshadweep (2011 Census).
- It has a high sex ratio of 975 (2011 Census).
- A potential oil and natural gas reserve has been found in southern Mizoram, close to Arakan in Myanmar.
- Mizoram has a potential of 4500 MW if all the rivers were harnessed.
- The estimated solar potential of Mizoram, as calculated by the National Institute of Solar Energy (NIES), is approximately 9.09 GW.
- The state also contributes 14% of the country's bamboo stock.

Mizoram – Challenges

- Being a landlocked State, connectivity in all its dimensions remains a challenge for Mizoram.
- The State of Mizoram has only one airport, named Lengpui Airport. It has only one railhead at Bairabi, situated along the border with Assam.

- Mizoram has two National Highways (NH) – one connecting to Assam, and one NH running into Tripura.
- The NH connecting to Assam is the lifeline of the State.
- Mizoram is also unfortunately plagued by high incidences of cancer and HIV.

Mizoram – Potential

- Since agriculture is mainly for local consumption, a shift towards commercial farming is required.
    - An overwhelming majority of the farmers still practice the ecologically unsustainable shifting cultivation, also called 'Jhumming' or 'slash and burn' farming.
    - The agriculture sector is also plagued by problems such as the small size of average landholdings, aged and uneducated farmers, difficult topography, depleting soil health, less farm mechanisation, etc.
- Handloom and Handicrafts is another industry with potential in Mizoram.

Kaladan Multi-Modal Transit Transport Project:

- The Kaladan Multi-Modal Transit Transport Project (KMMTTP) is a massive connectivity project being undertaken by the Government of India to connect Haldia in West Bengal to Sittwe Port in Myanmar, which will then enter India through the southern part of Mizoram.
- The KMMTTP is expected to be a game-changer by providing a valuable alternative source of connectivity, while considerably reducing the long distance currently travelled via the Siliguri Corridor.
- While work on the Indian side is almost nearing completion, there are a few stumbling blocks on the Myanmar side.

Chapter 3: India's Asset, Threat and Growth Driver

There are innumerable pieces of evidence to show that our brothers and sisters from Northeast India were known and were assimilated in the immense body of Mother India from the 10^{th}-8^{th} century BCE when the Vedas were compiled.

Kiratas:

The word Kirata is a derivation from Kirati or Kiranti to name the group of people in Eastern Nepal and Northeast India. One school of thought says that it comes from the Sanskrit word Kirata found in the Yajurveda; they are described as the "handsome" mountain people and hunters in the forests.

- Yajurveda and Atharva Veda both mention Kiratas.
- Mahabharata describes Shiva and Uma disguising as a Kirata couple to test Arjuna's penance.
- Kirata Parva, part of the Vanaparva, state that they were having gold like skin.

- Bhima during his all-conquering tours of the east met Kiratas in Videha country.
- In Sabha Parva, Sunrise Mountain, Lohitya river and hills surrounding Pragjyotisha are mentioned.
- In Ramayana (Kishkindhakanda), Kiratas are mentioned.
- Vishnu Purana mentions Kiratas in the northeast part of India.
- Sammha tantra speaks of the Tantrika culture of Kiratas, Bhotas, Cinas, Mahacinas.
- Brahmakunda and Parshuramkunda are places of pilgrimage in Lohit and a Shivlinga site is discovered in Paya in the Lohit district.
- Greeks in the 1st century AD had heard about Kiratas.
- Trade to China was filtered through Kiratas, observed Kein, a Chinese general and explorer in 2nd century AD and then the assimilation of all the races was completed.

Buddhism:

- Buddhists occupy a significant part of Arunachal Pradesh.
- Monpa, Sherdukpen, in Tawang follow Mahayana Buddhism and Khampti, Sigpho in Dibang district follow Hinayana Buddhism.
- Even tribes adjacent to Buddhists also are influenced by them.

Driving India's Growth Engine:

- The potential of the northeast to be the energy capital of India with its rich possibilities in solar, water, wind energy generation is hardly tapped so far.
- 'Development through culture' and not development versus culture, is the need of the day.

Driving development through culture:

- The latest initiative is a North East Special Infrastructure Development Scheme (NESIDS) entirely funded by the central government for infrastructure projects like water supply, power and connectivity.
- Northeast has great tourism potential and so it is specially been promoted in recent times and is aided now by much-improved infrastructure.
- More attention is also given now to primary and secondary education and health.
- NESIDS is promoting a lot of industrialisation in the region, in the manufacturing and service sectors.
- The Northeastern Development Finance Corporation Opportunity Scheme for Small Enterprises (NoSSE) is specially formed to help first-generation entrepreneurs.

- The Act East Policy has emphasised the development of the infrastructure of the region by building roads and highways, expansion of air connectivity, an extension of railway networks, the opening of trade routes as well as the creation of infrastructural conditions for border trade.
- Nine cities from across the Northeast region are declared as 'Smart Cities'- Agartala, Guwahati, Imphal, Kohima, Namchi, Gangtok, Pasighat, Itanagar and Aizawal.
- There has been a clear emphasis on skill development initiatives amongst the youth in the region.

Development through culture is the mantra for the Northeast and that will surely make us winners in our Look East and Act East vision.

Chapter 4: Agriculture and Sustainable Development

The NER comprising of eight States has a total geographical area which is nearly 9.12% of the total area of the country.

- The net sown area is highest in Assam (34.12%), followed by Tripura (23.48%). Arunachal Pradesh has the lowest net sown area in the region.
- Cropping intensity is highest in Tripura (156.5%), followed by Manipur (152.1%), Mizoram (136.36%), and Assam (123.59%).
- About 1.6-million-hectares of area are under shifting cultivation in North East region.
- The region receives an annual rainfall of 2000 mm accounting for around 10% of the country's total precipitation.
- The soil of the region is acidic to strongly acidic in reaction. The soils are however rich in organic matter.

Agriculture in NER:

- Rural population in the region is around 80%. In the absence of major industries except in the state of Assam, the society is agrarian and depends on agriculture and allied sector for livelihood and other support.
- The agricultural production system is characterised by low cropping intensity (114%), subsistence level and mono-cropping.
- Mixed farming system is the order as most of the farmers want to produce their household food and nutritional need without having to depend on outside sources.
- The system, therefore, supports horticulture and animal husbandry partly due to a preference for non-vegetarian food.

Agriculture in the NER is characterised by:

1. Although the landholding in the region appears to be higher, the entire holding cannot be used for agricultural purposes due to topographical disadvantages.

1. Rice dominates agriculture, but the productivity is low and production risky.
2. Farming is predominantly rice-based with a little exception in the state of Sikkim where maize is a dominating crop.
3. The NER is extremely diverse: uneven land, high and variable rainfall pattern and ethnicity.
4. Further expansion of cultivable land is constrained by geophysical limitations.
5. Various combinations of crop-livestock-fish-silk are followed in the region but such diversification contributes negligibly.
6. The preponderance of small and marginal (S&M) farmers is an important feature of the region.
7. On account of complete dependence on agriculture, its vulnerability to natural calamities such as floods, submergence as well as droughts has deteriorated rural life and rural poverty has become rampant.

Deficit in food grains especially rice in the NER is increasing over the years. The approaches and strategies to increase rice production are given below:

1. Increasing seed replacement rate.
2. Enhancing varietal replacement rate.
3. Increasing cropping intensity through assured irrigation.
4. Expansion of effective irrigation facilities.
5. Adoption of more intensive cultivation practices.
6. Maintaining soil health and providing judicious soil nutrients.
7. Revisiting the extension mechanism.
8. Facilitation of credit, finance and crop insurance.
9. Marketing and creation of rural storage infrastructure, and
10. Farm mechanisation.

Livestock Sector in NER:

- Assam which has the largest cattle production in the region has slow growth in milk production which may be because it has a maximum of indigenous breeds in the total cattle population.
- Manipur and Mizoram witnessed decline in per capita availability of milk while it has increased in other states.
- Productivity of milk in case of buffaloes shows that the buffaloes in the region are very low yielding compared to other parts of India.

Policy Perspectives:

Synergy is needed among the inter-disciplinary research community, policy planners and implementers, along with civil society to deal with the multifaceted situation. It is felt that the region needs appropriate policy and investment to boost the development process.

1. The flood escaping production system is required, in flood-prone areas, where Boro rice is a promising crop enterprise.
2. Numerous aromatic and medicinal plants can be practised with low-cost and resource conserving practices (Zero-tillage, System of Rice Intensification, etc.) to meet the growing domestic as well as international demand. Agriculture plus is required. That is, crop production should coexist with livestock, plantation, floriculture, medicinal crops and sericulture systems.
3. The hilly terrains suit crop diversification with high value horticulture crops accompanied by livestock and sericulture. The shifting cultivation requires an innovative strategy for improving productivity of rice and other crops, flowers like orchids and livestock.
4. Continuous R&D support systems for generating small and marginal farmers' friendly new agricultural technology should be given. Therefore, there is a need for boosting R&D investment in agriculture, which already is a low key area in the region.
5. Database is a serious constraint to effective policy analysis in the agricultural economy in the region. Basic tool of e-governance is necessary in this regard.

Any attempt to reduce poverty as well as to place the region in developmental paradigm shall have to base on system-wise eco-regional planning of agriculture development. In order to capture the advantages of the untapped potential, the states need to reorient their development strategy within the overall macro-economic framework.

Chapter 5: Long-term Peace & Development

In the past decade, there has been long term peace all over the Northeast region leading to new ideas flourishing and investments flowing in. The emerging challenge is to invent new ways of ensuring the participation of States in the formulation of national policies and motivating them for effective implementation in key development areas.

Social and Infrastructure Development Fund

- SIDF was created with a sum of Rs. 586.20 cr. to upscale the infrastructure in NER.
- The fund is provided to benefit Arunachal Pradesh & other border areas facing special problems.
- A total of 37 projects have been sanctioned under the SIDF scheme.

- Young, educated and confident entrepreneurs are coming up slowly changing the landscape of Assam.
- The emerging challenge is to invent new ways of ensuring the participation of states in the formulation of national policies and motivating them for effective implementation in key development areas.
- In a departure from the past practice, the Prime Minister has stressed the need to leverage cooperative and competitive federalism to achieve all-round growth.

- The basic idea behind the turn of cooperative federalism is the sharing of powers and responsibilities between the three levels of government which involves participative policymaking.
- This further involves empowering the interested council created under Article 263 and mandated to deal with coordination between states and initialising the structural changes in the same light.
- With the implementation of the recommendations of the 14th Finance Commission, states are now entitled to a 10 per cent increase in the overall devolution of funds – an enhanced fiscal autonomy.
- States are now entrusted with the responsibility of designing and implementing development schemes as per their priorities and needs. To be socially and economically sustainable, India's growth has to be inclusive.
- The region is also a vantage entry point to southeastern Asian markets.
- Moreover no less than five major bridges over Brahmaputra, along with the world's longest bridge at Dhubri-Phulbari are in the various stages of construction which are going to unlock North East India completely.

Concerns:

- The absence of efficient cold storage chains exposes cultivators to market fluctuations.
- Tourism, too, has not made much headway due to poor infrastructure development.
- There are uncoordinated and fragmented efforts by individual states.
- Each Ministry of the Union Government is required to spend at least 10 per cent of its budget in the North-East.
- To harness the full potential of these sectors, significant investments will be required in upgrading the region's infrastructure, education and skill development.
- The newly introduced initiatives of the ministry for the development of the north-eastern region could energise the process. Much depends on the proactive role of the states.

Strengths:

- Several tourist attractions such as Blue Mountain (Phawngpui-Mizoram), Palak Lake (Mizoram), Kangla Fort (Manipur), Majuli (river island in Assam).
- Presence of an ethnic, tribal culture each with unique customs and traditions.
- The north-eastern region has a very well-performing gender development index.
- Rich bamboo reserves.
- The abundance of natural resources like limestone as well as water for hydropower potential.
- Safe and clean, pollution-free environment.

Weakness:

- Lack of proper connectivity.
- Limited tourism infrastructure facilities.
- Scarcity of skilled and unskilled labour.
- Floods and landslides in the monsoons make places inaccessible.
- Landlocked states.

Opportunities

- Development of the handicraft industry.
- Flood management system to improve accessibility.
- Linkages to existing tourism circuits.
- Trade can drastically be improved by improving infrastructural facilities and accessibility.

Threats

- Overuse and commercialization of eco-sensitive zones could lead to depletion of resources and weakening of attraction.
- Regional connectivity concerns.
- Land banks and land availability not addressed.
- Migration of local people to urban areas for employment prospects.

Note:

Under the "Special Accelerated Road Development Programme in North-East (SARDP-NE), the Trans-Arunachal highway is being developed. Under the initiative, a sub-regional Motor Vehicle Agreement allows buses and later private vehicles with a Bhutan, Bangladesh, India and Nepal (BBIN) permit to travel unobstructed through borders between Bangladesh, Bhutan, India and Nepal. Similarly, bus services with Bangladesh have improved.

Chapter 6: Educational Policy Interventions for the Region

Education policies worldwide are increasingly being realigned to the economic prosperity, vertical mobility and social citizenship of the people. Human capital theorists have long underlined the need for investment in building productive human capital in any organisation or a society.

Prof Srikant Datar, the globally acclaimed Indian-American economist argues for a shift from 'knowing' to 'doing' and 'being' in education. Extending his argument for the education policymakers of the North East, the education systems need a similar rethinking whereby our governments, institutions, administrators and faculty should focus on restructuring our courses and programmes to incorporate three major elements – globalisation, leadership and integration.

- Our educational policies developed at the national level are often driven by some overarching goals.
- Such a top-down approach in implementing those policies on the ground, especially in a specific region like North East India, needs a bottom-up restructuring.
- There is an urgent need to re-examine our education policies at the regional level to provide an environment where individuals can utilise their education and training to gain employment, improve their living standards, and contribute to the social development of the area.

The World Development Report 2019 makes three major recommendations that will feed into our 'globalisation' strategy for education.

- First, there is a need to focus on new skills in demand, invest in rural areas and disadvantaged communities, and include a high-order cognitive and socio-behavioural component in our programmes.
    - Our academic programmes traditionally concentrate on the 'knowledge' contents, text and theories to build a sound foundation in a subject.
    - Indian education systems are known globally for that strong 'foundation' built by our institutions over the years.
    - However, a re-orientation is necessary to include 'leadership skills' whereby our graduates are trained to develop a problem-solving approach, inter-cultural understanding to work with a diverse set of peers and a sense of responsibility for their actions and influence on others.
- Universities and colleges need to launch 'Leadership Development' as a core component of all courses.
- The third major redefining feature of our education policies in the region should include 'integration' skills in our education system.
    - The educational institutions in this region can cultivate the civilizational connections between North East India and Southeast Asian nations and incorporate relevant educational components based on the shared cultural histories and trade routes.

Also read: **National Education Policy, 2020**

Chapter 7: NECTAR – Strengthening S&T in the NE Region

NECTAR – North East Centre for Technology Application and Reach, an autonomous organisation, set up under the Department of Science & Technology, Government of India is the 'one-stop shop' for technological support to the North East people. NECTAR is providing technological applications and scientific support to the farmers, entrepreneurs, or any organisation associated with rural corporation, construction, or any other industry in North East, where technology intervention and technical support are needed.

- NECTAR was formed in the year 2012, with the merger of erstwhile National Mission on Bamboo Applications (NMBA) and Mission on Geospatial Application (MGA).
- It is headquartered in Shillong, Meghalaya.
- NECTAR has the mandate of equitable and inclusive social and economic development of the NER.
- The areas in which NECTAR has played flagship roles include agro and food processing, renewable energy source bamboo applications like construction and structural applications, composites and wood substitutes, bamboo for energy, bamboo in industrial products, bamboo-planting material, skill development, and employment generation.
- NECTAR's unique and distinct work is to act as a solution designer and a partnership institution that helps in focusing or providing technology applications and support for problems of the NE in consultation with State Governments and other related bodies.
- NECTAR is also working for the applications to internal security, watershed analysis, development of fixed wing micro unmanned aerial vehicles, mapping of tsunami vulnerable areas, and Brahmaputra river embankment mapping and erosion study.
- With NECTAR's intervention and development of new technologies, value addition in the bamboo sector has increased from 10% to as high as 70%.
    - In the agro and Food Processing sector, the Centre has supported the setting up of bamboo shoot and pineapple processing units and king chilli pickle making units.
    - Expansion of beekeeping activities in NER and spice processing facilities are other areas of support that the Centre provides.
- NECTAR has created linkages between the farmers and markets of metro cities.

Bamboo-based technologies with green material approach:

- NECTAR is working on bamboo-based construction and structural applications with a green material approach.
- Under this effort, support is being provided to the projects related to structural engineering and in development of bamboo composites by utilising the natural higher tensile strength and a weight-to-strength ratio of the material.
- In the areas of the development of technologies related to wood substitutes and composites, various relief and rehabilitation projects using bamboo composite material and prefabricated housing units have been initiated.
- Gasifiers based on bamboo have been developed to produce clean and renewable electricity, and a range of valuable by-products such as high-grade charcoal has also been developed.
- Huge industrial applications of bamboo have been identified.

Schemes of technology solutions for employment generation:

The Centre is offering two major schemes to NER: TOSS – Technology Outreach and Service Scheme and BAANS – Bamboo Applications and Support Scheme.

- The schemes are targeted for building and expanding partnerships with people, communities, local bodies, NGOs, SHGs and research and technology institutions.
- TOSS is an umbrella scheme of NECTAR to establish linkages with individuals and institutions to deliver technology solutions to the NER which have clear potential to generate social or economic growth in the region.
- BAANS is a scheme to undertake support measures under public-private partnership mode (PPP) in various areas of bamboo applications to generate employment, create sustainable livelihoods and incomes, especially among the poor and disadvantaged groups, including women.
- Supports and promotes community groups, SHGs and decentralised associations of people to economic activities in bamboo products and value-added processing, and in adopting measures for expansion and consolidation of bamboo technologies.

Conclusion:

NECTAR is playing an important role in the development of NER. It is very important to connect the technologies with common people, various organisations, entrepreneurs, and farmers so that the mandate of that technology can be proved. People from the NER should take advantage of the technologies developed and supported by NECTAR. Successful case studies of NECTAR must be shared at the Krishi Vigyan Kendras of NER, NGOs, various community centres, innovation centres, entrepreneurial organisations, colleges and universities so that every section of the NER can be benefited with the technological applications.

Chapter 8: Waste and Climate Change

Climate change is one of the biggest challenges being faced by the present world. A number of factors including clean energy, forest protection, adaptive habitat and natural resources are attributed to climate change mitigation and adaptation. With the high pace of urbanisation, solid waste is a ferociously growing concern especially for developing countries like India. Amount and complexity of wastes are growing rapidly but the equivalent technology and resources are still inadequate. Wastes and climate change are closely interrelated and are severely impacting each other but, less recognised in the domains of climate change mitigation, adaptation and disaster risk reduction.

- Beyond the industrial revolution, the rate by which global surface temperature is rising has almost been doubled.
- In the last 40 years, it is increasing by 0.18^{o} Celsius per decade, Greenhouse gas (GHG) emissions (carbon dioxide, methane, and nitrous oxide) majorly emitted by anthropogenic activities are accumulating in the atmosphere and absorbing solar radiations and, thereby, changing atmosphere's chemical composition. This is further leading to the rise in extreme

weather events all around the globe, e.g., severe droughts, devastating floods, scorching heat waves, heavier and persistent rainfall, ferocious forest fires, etc. The resulting loss in snow-cover, rise in sea level and increasing temperature are endangering human settlements, animal lives and forest cover.

- The solid waste generated by various human activities is another major contributor to climate change, and simultaneously getting affected by it as well.
- There is a wide variety of wastes being generated, viz. municipal solid waste, commercial and industrial waste, construction and demolition (C&D) waste, agricultural waste, biomedical waste, electronic waste and hazardous waste. All these wastes generate GHGs during various stages of their life cycle.
- During waste collection and waste incineration (energy consumption in transportation and furnace), carbon dioxide (CO_2) gas is emitted.
- Anaerobic decomposition of organic waste in landfills is responsible for the emission of methane (CH_4) with a 20-year Global Warming Potential (GWP) of 72.
- GWP is the amount of heat that is absorbed by a GHG, expressed in relation to that absorbed by a same mass of CO_2.
- Composting and biological treatment of waste emit nitrous oxide (N_2O) gas which has a long lifetime of 114 years with a GWP of 289.
- An extremely short-lived component called Black Carbon (BC) with a very high GWP (3200) is emitted from uncontrolled and open waste burning. On the other hand, approximately 70% waste globally ends up in open dumps and landfills which render huge land surfaces useless, decreasing the green cover and, hence, reducing the natural carbon sinks.
- Also, the highly poisonous leachate (wastewater sludge) seeps down, polluting groundwater and soil.
- The toxicity of hazardous waste and the landslides incidences of waste dumps also pose life threats especially to poor and underprivileged people having no options other than to live around such sites.

India with a global population share of 18.05% contributes 11.95% of the global waste generation. Globally, solid waste is composed significantly of food and green waste followed by plastic and cardboard waste. Low-income countries such as the countries in sub-Saharan Africa are disposing of more than 70% of their waste in uncontrolled open dumpsites whereas for high-income countries this share is as low as 2%. Quantity, quality and composition of waste may vary from region to region pertaining to factors such as climate, population size, urbanisation, the standard of living, economical condition and level of education and awareness.

Effect of Climate Change on Solid Waste Management

- A series of extreme weather events are affecting the waste management processes to a significant level.

Changes in Precipitation Patterns

- Climate change has led to significant alterations in the precipitation patterns.
- These events cause severe damage to property, infrastructure and human lives.

Changes in Temperature Patterns

- In the last 40 years, huge fluctuations in daily minimum, average and maximum temperatures have been recorded.
- Frequent occurrences of very high atmospheric temperatures and heat waves are taking place.
- This is fastening the rate of degradation and decomposition of the waste.
- High temperatures can cause drying up of the compostable wastes and hinder the composition process as microbes fail to sustain.

Increase in Sea Level and Storm Surges

- With the increase in global mean temperature, the snow covers are melting and, thereby, increasing the mean sea-levels.
- This is leading to high risks of inundation, flooding, bund erosion and seawater intrusion of the dumpsites and waste management sites in coastal areas leading to coastal water pollution.

Effect of Solid Waste on Climate Change

- Municipal solid waste can be broadly classified into organic (biodegradable) and inorganic (non-biodegradable) waste.
- When organic waste is decomposed anaerobically it produces landfill gas (LFG), which is a mixture of 45-60% methane (CH_4), 40-60% carbon dioxide (CO_2) and 2-9% other gases.
- GHGs can be emitted from municipal solid waste management either directly or indirectly.
    - Direct emissions take place when anaerobic decomposition of organic waste takes place or when the biological treatment of wastes (incineration/composting) is carried out.
    - Indirect emissions are caused due to the fuel consumption in vehicles used for waste collection and transportation.

Climate Change and Effluent Treatment Plants (ETP)

Changing precipitation patterns have increased the evaporation (surface heating) and so is the water vapour load of the atmosphere. The higher moisture content of the atmosphere is liable to stronger rainfall.

Table: Fugitive gases emitted through various ETP processes and their reasons for emissions

Gas emitted from ETP	Reason
Methane (CH_4)	-anaerobic decomposition of the organic matter present in sewers
Nitrous Oxide (N_2O)	-Biological Nutrient Removal (BNR) process – Nitrification Denitrification (NDN) process
Carbon Dioxide (CO_2)	-during treatment processes -due to electricity consumption
Hydrogen Sulphide (H_2S)	-anaerobic decomposition of organic matter -from the reduction of mineral sulphites and sulphates -highly corrosive to mechanical and electrical equipment and sewer pipelines
Volatile Organic Compounds (VOCs)	-Occurs during turbulent flow and air exchange between ambient atmosphere and wastewater -significant amounts are found in refinery and petrochemical wastewaters

Mitigation Strategy

- It is very important to understand the waste composition in different regions to chalk out an effective mitigation strategy for its environment-friendly treatment and disposal.
- Integrated Solid Waste Management (ISWM) encompassing waste management hierarchy is the dire need of the time to be inculcated in various international and national plans dealing with waste management.

Waste Management Hierarchy

- Conventional waste management did not consider reducing, recycling or reuse of the waste as part of its system.
- Thus, a paradigm shift is required from conventional practices to ISWM.
- ISWM is a comprehensive approach for reducing the quantity of waste reaching the landfill sites. It introduces a four R's principle viz, Refuse, Reduce, Reuse and Recycle.

Role of Policy

- In 2008, India came up with a comprehensive National Action Plan for Climate Change (NAPCC).

- Out of the eight exclusive missions encompassing and addressing various issues related to climate change, the National Mission on Sustainable Habitat was made accountable for the management of Municipal Solid Waste of the country. This part of the mission is focused on enhancing resource recovery and recycling, reducing waste to be disposed of in landfills or dumpsites and maximising reuse/recycling of sewage, as much.
- In 2015, four additional missions were added to NAPCC, out of which one entire mission was dedicated to the theme of Waste-to-Energy conversion. The focus of this recent mission is to harness energy from the maximum possible waste to minimise the dependence on non-renewable resources for power generation.
- Swachh Bharat Abhiyan (Clean India Mission) was launched in 2014 by the Prime Minister of India with the primary aims of making the country open-defecation free and improving the status of solid waste management. There is an urgent need for a robust policy formulation that is inclusive of all major factors associated with climate change and solid waste management.

Chapter 9: Rooting for Resilient Bamboo

One of the quickest growing plants in the world, Bamboo can survive and thrive in a range of climate conditions. Used in the agricultural and the industrial sectors, bamboo's adaptability, resilience, cost-effectiveness and easy handling makes it an ideal material for resource-efficient livelihoods. It is known as 'poor man's timber.'

- Bamboo's versatility and vitality make it a precious agroforestry resource. Modern technologies allow the use of bamboo as a durable and high-quality wood substitute.
- In India, bamboo is an important plant in terms of forest coverage and diversity, majorly in Madhya Pradesh and the North Eastern states.
- Northeast region alone comprises 60 per cent of India's bamboo reserve. India is reportedly home to about 125 indigenous and 11 exotic species of bamboo, making the country a significant player in international bamboo export.
- Over the past several years, more bamboo products have been imported into India rather than exported; according to estimates, the share of bamboo cultivation in India is only 6 per cent.
- The Government of India has launched the restructured 'National Bamboo Mission', under the Ministry of Agriculture.
- The aim is to foster growth in the sector, create jobs and help increase farmers' income, promote rural welfare, reduce agrarian distress and bring parity between the income of farmers and those working in non-agricultural professions.

Demand drivers under the Bamboo industry in India:

- Population and income growth, increasing exports and favourable demographics.

- Hybrid and genetically modified seeds, favourable climate for agriculture and wide variety of crops, mechanization, irrigational facilities and Green Revolution in Eastern India.
- A strong demographic dividend and extensive labour force available in India.
- Growing institutional credit, increasing MSP, introduction of new schemes like Paramparagat Krishi Vikas Yojana, Pradhan Mantri Krishi Sinchai Yojana and Sansad Adarsh Gram Yojana.
- Initiatives like Kisan Rath (mobile app for farmers, FPOs and traders), 200+ Kisan Rails and Krishi Udaan Scheme for produce transportation and Perishable Cargo Centres, cold storage facilities at Airports and Inland Container Depot as well as cargo terminals and warehouses.

Way Forward:

- The development of the bamboo sector in India involves collective multi-stakeholder efforts.
- At the national level, the Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Agriculture (MoA), Ministry of Development of North East Region (MoDoNER) and Ministry of Science and Technology (MoST) drive strategic initiatives to this end.

Note:

- In September 2020, the Ministry of Agriculture and Farmers' Welfare inaugurated 22 bamboo clusters in nine States-namely Gujarat, Madhya Pradesh, Maharashtra, Odisha, Assam, Nagaland, Tripura, Uttarakhand and Karnataka.
- The Cane and Bamboo Technology Centre (CBTC) has designed a project for the sustainable development of the bamboo industries to create a livelihood for people in North Eastern India.
- NITI Aayog in July 2020 urged the state governments to carry bamboo and sandalwood tree plantation drives in a first-of-its-kind initiative of Khadi and Village Industries Commission (KVIC) towards monetization of available vacant land resources and financial sustainability for farmers.
- The Government of India is committed to enhancing rural livelihoods and infrastructure development opportunities through the bamboo sector, using a holistic approach.

Chapter 10: TID-BITS

Music and Dance

The unique styles of folk, classical, rock and contemporary music of the Northeast make it a significant entity in the country's musical ecosystem.

- The three ethnic communities in Sikkim, Lepcha, Bhutia, and Nepalis constitute the folk dances and songs which are an ingrained part of Sikkimese.
- This music and folk dances relate to the beauty of the natural surroundings, depicting the harvest season and are performed for good luck and prosperity.

- Nepali folk dance "Maruni" – is one of the oldest and popular group dance forms of the Nepali community, usually performed by three male dancers and three female dancers.
    - The dancers are usually accompanied by a clown called "Dhatu waray".
    - Sometimes Maruni dances are performed to the accompaniment of the nine instrument orchestra known as "Nau-mati Baja".
- Nepali folk dance "Tamang Selo" is a group dance of Tamang community performed to the rhythmic sound of "Dhamphu" – a musical instrument and hence are also called "Dhamphu" dance.
- Bhutia folk dance "Tashi Sabdo" – This age-old group dance beautifully and gracefully shows the custom of offering khadas on auspicious occasion. The dancers dance to the melodious tunes duly supported by musical instruments such as Yarkha, Drum, Flute, and Yangjey.

Textiles and Designs

- "Eri silk" is woven in Assam. It also has medical properties.
- This silk is extracted without killing the worms so has been coined "Ahimsa silk" and is used for weaving the shawl worn by monks.
- The textiles and crafts of the Northeast are made with a deep understanding of the earth and are sustainably produced.
- Apart from the Muga, Eri and Matka silks and cotton from the Northeast, there are also many other developments brewing like the bamboo, banana and nettle fibre, and many kinds of subtle mixed weaves between silks and wools and other blends.

Energy Efficiency Measures

The Ministry of Power is implementing measures to save energy with an objective to reduce CO_2 emission levels in the environment from industries, establishments, and by using equipment/appliances. In this regard, **Perform Achieved and Trade (PAT) Scheme** is a key programme for large industries and establishments.

- This scheme aims to enhance the cost-effectiveness of energy savings by upgrading technologies or by taking in-house actions to minimise energy consumption.
- The scheme provides mandatory targets for the identified Large Units and the excess energy saved by them is issued as Energy Saving Certificate (tradable instruments).
- The different industries and establishments are assigned separate energy efficiency targets based on their levels of energy consumption and the potential for energy savings.

By the year 2020, the scheme coverage has been extended to the 13 most energy-intensive sectors in the country including Cement, Iron and Steel, Fertilizer, Thermal Power Plants, Refineries, Petrochemicals, Railways and others.

- Rising demand can be optimised, if the consumers prefer high-efficiency appliances.
- To enable market transformation of efficient products, **Standards and Labelling (S&L) Program** was introduced by the Bureau of Energy Efficiency (BEE).
- The objective of S&L is to provide the consumers with an informed choice about the energy savings potential and thereby the cost-saving due to the products available in the market.
- The scheme includes display of energy performance labels on key energy-consuming equipment & appliances, with stipulations for minimum energy performance standards.
- This initiative has been effective in reducing CO_2 emissions of approx. 46 million tonnes every year.

The blend of regulatory as well as market-based policies in various sectors would offer promising outcomes, if all the energy efficiency measures are adopted by the potential consumers of the economy. This would further endorse the Government's significant efforts in enabling mitigation of CO_2 emissions towards maintaining environmental integrity and meeting our climate commitments.

Global Warming:

- Carbon dioxide (CO_2) is a well-known greenhouse gas on our planet.
- The rapid increase in its concentration in the atmosphere is a major cause of global temperature rise which in turn leads to many environmental and healthcare problems.
- The 'greenhouse effect' works in case of CO_2 when solar radiation hits the surface of the earth, part of the heat escapes the atmosphere while balance heat gets trapped which raises the earth's temperature.
- This is a phenomenon popularly known as global warming.
- This primarily results in a severe impact on climate change, which has a ripple effect over all the natural ecosystems and by extension, all industries and people around the globe.

About BEE

- The Government of India set up the Bureau of Energy Efficiency (BEE) in 2002 under the provision of the Energy Conservation Act.
- BEE's span of Energy Conservation and Efficiency efforts covers areas such as Appliances, Buildings, Transport, key Demand Side Management programs in Agriculture and Municipalities and the industry and other establishments.

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