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India @ 2047: The Research, Innovation, Employment and Economy

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Nation building is seen as a multifaceted and dynamic process. It is the consolidation of social, economic, political, civil and geographic factors and the synergy among all these are indispensable not only in building nation but also towards moving in the track of global leadership.

For a country like India, with vast population, diverse culture and burgeoning economy, the vision towards building a developed country by 2047 is not merely a strategic goal but a necessity. The visionary initiatives as rightly aimed, creates the blue print which extends beyond economic growth; encompassing social progress, technological innovation, environmental sustainability and good governance as the key factors.

There is no doubt that India is growing incrementally and the nectar of Amrit Kaal is unfolding and flowing. However, a concrete roadmap, more strategic initiatives are necessary towards bringing innovation, sustainability, empowerment and other factors as the wheel towards bringing the vision into reality.

Knowledge Economy and Education:

India's economy is experiencing a substantial growth with the emergence of technological innovation, quality education and inclusive policies. In the global innovation index, India records a trajectory growth from 81th rank in 2015 to 40th rank in 2023[1]. As per the World Intellectual Property Organisation (WIPO) report, 2022; India ranked at 7th in terms of Resident Patent Filing activity in the world and improves its ranking to 60th position in 2023 from 79th position in 2019 on the application of information and communication technology among the 134 economies around the world.[2] The statistics are clear cut indication of India's progress towards the global leadership in technology, innovation and knowledge-based economy.

The role and support of various policies towards the growth is immersive. The recent "The Anusandhan National Research Foundation Act, 2023 with a budget of Rs. 50,000 crores for five years (2023-28) towards fostering the culture of research and innovation by collaborating academics, research institute, ministry and industries is quite commanding. To foster R&D endeavours in the domains of emerging Science & Technology, the Promotion of University Research and Scientific Excellence (PURSE) grant to under supported region through the special drive announcement towards establishment of fundamental infrastructure and facilitating facilities is also a great initiative. Further, as a part of upgradation and recreation of infrastructure facility, the new scheme, "Support for Upgradation Preventive Repair & Maintenance of Equipment (SUPREME)" to facilitate for repair/ upgradation/ maintenance/ retrofitting or acquiring additional attachment to increase functional capabilities of existing DST supported analytical instrumentation facilities (AIFs) in various Institutions/laboratories/academic institutions is the need of the hour. All these initiatives with allocated corpus of 1 lakh crores towards promotion science and research based innovation and rebranding of Jai Jawan Jai Kishan Jai Vigyan to Jai Jawan Jai Kishan Jai Vigyan Jai Anusandhan clearly shows India's interest and vision towards innovation leadership by 2047.

However, to fully realise the impact, and reinvest and rebrand the landscape, it is important to understand the current state; output in terms of quantitative temporal and spatial data on already invested amount and a comparative analysis on the real time parameters with already developed economy, so that roadmap will be even more clear towards achieving the vision.

The most innovative economy index, 2023 shows that, Switzerland is the most innovative economy in 2023 followed by Sweden, the United States, the United Kingdom and Singapore[1]. The top Science and Technology innovation clusters in the world in 2023 are, Tokyo–Yokohama, followed by Shenzhen–Hong Kong–Guangzhou, Seoul, Beijing and Shanghai-Suzhou and when it comes to S& T cluster, compared to China's 24 and US's 21, India has only 4 S&T clusters

among the world's top 100. These are Chennai, Bengaluru, Mumbai and Delhi. Further, the research and development investment as a percentage of GDP standing at 0.64% in India, falls behind major developed and emerging economies such as China (2.4%), South Korea (4.8%), Germany (3.1%), and the United States (3.5%).[3]

Further, if we compare patent landscape, there is no doubt that, India is filling lakhs of patent every year. However, the patent granted in India is only 26,361 as compared to 5.3 lakh in China and 3.5 lakh in US and among them not more than 5% reach the market.[4] In the same way, India has a large population of science graduates, but there is a lack of skilled professionals with advance degree such as PhDs. According to a report by the Department of Science and Technology, only 2.1% of the Indian workforce has a Ph. D., which is much lower than the global average of 7.2% and how many of these existing PhDs is really getting the opportunity to contribute towards innovation as part of job or employment is again a question mark.

Along the existing schemes, the recent announcement in the Union budget 2024 towards creation of

4.1 crore jobs in the next five years and allocation of 1.48 Cr. for skilling is really a great initiative. Further, financial assistance as educational loans upto 10 lakhs for higher education in domestic institutes and the recent National Education Policy, are the great step towards attracting more talent for higher education. However, the technology-based innovation and the human resource creation for the same need's special attention and outlook.

Strategic input:

There is no doubt that the country which is the highest producer of vaccine, the largest supplier of major food and textile material and the pioneer in the space energy in the world, has all the potential to be global leader by 2047 and even before. The only need is to rethink, reanalysed and reinvest in the real parameters towards achieving the long term goal.

When it comers to technology based innovation and potential sectors like electronics, information technology, biotechnology, manufacturing and others, India already has centre of excellence

which is emerging around major places like Hyderabad for Biotechnology, Bengaluru for IT, Pune and Noida for electronics, manufacturing and other services. Further, the venerated institutes like IITs, ISRO, CSIR institutes anchoring these centres of excellence create a more vibrate innovation ecosystem for research and innovation, just like the research triangle of North Carolina.

However, India's innovation ecosystem may not anchor to elite institutes and major cities as the landscape is quite unique compared to other developed nation. If we see the innovation landscape, by understanding the importance of technology and institutions in building nation like MIT in USA, IITs were built in India. However, to fit the universal education ecosystem of India, IITs were slowly diluted and positively, many recognised engineers, scientist in ISRO and others were born from regional engineering colleges and not always from major cities. It shows the importance and capability of Indian resources, which has to be gone beyond the elite institutes and places, towards providing quality education and opportunities and bring a vibrant innovation ecosystem all over India.

Further, though skilling with budget allocation and private partnership is given importance recently, the science and research-based skilling expertise towards innovation or industry ready needs special kind of attention than the existing ITIs system of training. More lucrative options of higher scholarship/fellowship with stringent selection and mandate towards product-based innovation, along with education loan to create quality resources and further invest them through jobs or special recruitment to do only research and innovation may be a good option to go ahead.

Innovative Economy & Entrepreneurship:

In recent years, India has emerged as global powerhouse with the wave of innovation and entrepreneurship. With a vibrant startup ecosystem, talent pool, government support and private participation, India has all the potential to reshape the global business and economy as a whole.

It is reported that, India is emerged as the third largest startup ecosystem in the world with 15X growth in funding, 9X increase in investors, 11X increase in

incubators and accelerators, 14 X growth in women entrepreneurs with overall year and year growth of 15 percent.[5] The unicorn landscape of India is flourishing with 111 unicorn with total valuation of 349.6 Billion Dollar till Oct, 2023.[5,6]

The government support in terms of Software Technology Park of India, BioNest of Biotechnology Industry Research Assistance Council (BIRAC), Dept of Science and Technology (DST) NIDHI Technology Business Incubators scheme and various grants and funds like Fund of Funds, SEED Fund, Credit Guarantee scheme, towards supporting innovative ideas and commercialization is immense. The recent announcement of abolition of angle taxes across all investors is much needed breather for Indian startups and an impetus towards flowing of fresh capital in the economy. The reduction in Long Term Capital Gain (LTGC) tax from 20 percent to 12 percent may also benefit startup staffers holding the employee stock option plans (ESoP). Further, the initiatives like tax exemption, patent facilitation, regulatory support are also great step towards attracting more talent in entrepreneurship and wealth creation.

However, the statistics tells that, the startup ecosystem of India is declining with only three unicorns' startups having a valuation of over USD 1 billion in 2023 against 24 in 2022 and 21 in 2021[5]. As the funding winter persists, more than 35,000 ventures were shut down in 2023. The deal volume also compressed by 45% and more than 20,000 employees were sacked from many leading startups.[7] It indicates that though the number of startups is increasing day by day and the Government support is ample in this direction, the sustainability needs more attention and investment than early stage funding and infrastructure.

Strategic input:

There is no doubt that the infrastructure support in terms of incubation centre, technology business incubator, startup cell, research park, Atal tinkering labs and others is immense for the startups. However, India’s infrastructure is not at par with global standard towards achieving the developed economy soon. Though the incubation support is evolving tremendously, there is a need for setting up more incubation linked acceleration centres too to support the MVP stage and

beyond.

The setting up of incubation centres to even tier I and II cities is welcoming, still the negative roads or connectivity, unreliable electricity and poor broad band width is still a challenge for startups to choose these centres for incubation. Further, though instrument support for early-stage research is ample, the pilot scale facility and manufacturing facility as part of scaling is still very limited. There is no doubt that, the Production Linked Incentive (PLI) scheme is able to attract domestic and foreign investment of Rs 1.23 lakhs crore by March, 2024 as part of manufacturing facility, and or the recent announcement of biomanufacturing and bio foundry by BIRAC is an excellent move towards scaling up which is always a hurdle for biopreneurs, still there is need to rework and re-strategies on the overall infrastructures starting from roads, electricity, internet to efficient instrument facilityof various production level towards supporting startups to overcome the valley of death and ease scaling towards commercialization.

Further, though the regulatory compliance and legal support as part of self-certification of various environmental and labour laws, easy registration of companies, fast track patent applications are great initiatives but still it is reported that, compliance cost often accounting for 10-20% of operational budget of Indian startups. Further, many investors deterred due to noncompliance of startups and many lead to legal penalties and loss brand image due to noncompliance. The challenge is even tough for biotech based startups as compliance and regulatory approval towards launching products demands more time, investment and resource.

Though there are many private firms towards providing legal and IP support to startups, a dedicated legal cell in the incubation centre itself with a minimal rate can help to reduce lots of burden on startups, both money and time wise. Further, a dedicated, compliance and regulatory support cell especially towards assisting in getting various certificates or licences and even to link startups, especially life sciences one, to various regulatory firm can also help to fasten the scaling and commercialization. Though funding support in enormous, a dedicated funds with a stringent selection towards

achieving various regulatory/ clinical approval is also a much need towards bringing and supporting more innovation and products.

Sustainability and Green Economy:

A Viksit Bharat should have a clean and green environment and the vision encompasses it rightly as one of the critical factors towards attaining a resilient economy by 2047. India's commitment towards balancing economic growth with sustainability is evident as, in spite of one of the growing economy, the annual per capita carbon emission is only one third of global average.

The ongoing initiatives like national green hydrogen mission towards production and supply of green hydrogen as clean energy source, GOBARdhan scheme towards production of compressed biogas, bioresource centres towards helping farmers for natural farming, free electricity through solar power are the critical steps towards attaining sustainability and net zero carbon emission by 2070. The recent union budget (2024-25) announcement, with allocation of 1.52 lakhs crore for the climate resilient agriculture, introduction to 10 million farmers the natural farming and digital public infrastructure towards getting precise information by farmers on weather forecast and others are signalling[8] towards India's vision on climate resilience and sustainability.

Further, India's proposed initiatives on interest free loan for research in green energy, green farming and green mobility is appreciating. The ambitious goal of attaining 30% electric vehicle sales penetration by 2030, Faster Adoption and Manufacturing of (Hybrid) Electric Vehicle (FAME), financial incentives towards adoption of Electric vehicles are encouraging.[9]

However, as climate change is real and as sustainability and green practices are one of the facets of Viksit Bharat, there is a need to prepare more ambitious and transformative agenda for the same. There is no doubt that, India's green economy represents a powerful source for both economy and environment which needs more support in terms of innovation, financing and awareness.

Strategic input:

It is estimated that, climate shocks have a significant risk to Indian economy and

financial burden towards adopting and mitigating these changes requiring an estimated of 2.5% of GDP annually until 2030.[10] To tackle these challenges climate financing towards allocation of resources for projects on Green house gas emission, renewable energy is the need of the hour. Though the recent budget has given hint towards development of taxonomy for climate finance, just like developing economies like China, Malaysia, Sri Lanka, a clear cut guideline on green taxonomy is one of the agenda to act soon.

Further, India's energy demand by renewables and decarbonisation needs attention in research and innovation. It is reported that, the cleantech startups in India surpassed 1 billion dollar in 2023, which is 50% of the last year. It shows the potential towards attracting foreign investment, creation of green skilling jobs which is estimated to grow 30% annually. Further, attention on decarbonisation by increasing ethanol production, better waste management, reduction of plastics, alternative food and use of green chemicals for various industries are the key steps towards attaining ambitious development goals.

Along with the climate threat, the recent emphasis on reporting of sustainable business practices as one of the criteria for various nation also shows the importance and opportunity towards innovation, green economy and responsible business.

There is no doubt that, Indians with the traditional rich lifestyle is among the lowest per capita energy user and carbon emitter, the only need to create more awareness towards sustainable living, more policy and incentives towards promotion of sustainable based innovation and entrepreneurship, more tracking and regulations on business practices of Industry and organisations towards embracing a cooler and sustainable planet along with the overarching vision of Viksit Bharat by 2047.

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