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S&T APPLICATIONS TO PEOPLES' PROBLEMS (STAPP)

Skill Development and Employment

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Project Information

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S &T APPLICATIONS TO PEOPLES' PROBLEMS (STAPP): AN OUTLINE

The Prime Minister of India had on several occasions emphasized the need for addressing problems faced by the people of India, through S&T applications. This assumes significance as it calls for a systematic identification and prioritization of peoples' problems that can be potentially solved through applications of existing S&T solutions, or with appropriate innovation and value addition. Thus the initiative for design of research and development for Applications of S&T to Peoples' Problems (STAPP) has been taken up at CSIR-NISTADS.

The conventional discipline-centric R&D can be said to be the cutting edge that drives our progress and guides our civilization. However, an additional, parallel effort is needed to systematically and effectively translate the results of scientific inquiry to solutions to peoples' problems and drive development. STAPP is aimed at enabling this task through systematic identification of S&T solutions.

The seemingly obvious and simple-looking task of STAPP, however, turns out to be a huge challenge as one begins to analyze the question in detail. In the first place, STAPP calls for a paradigm shift in our design of our R&D programmes; it necessitates identification and prioritization of problem to be addressed through socio-economic impact analysis and technology landscaping as the first step. Further, to keep pace with the evolution of the problem as well as the S&T solutions, the effort has to be supported by a sustained R&D effort and technology outlook,

The basic approach, and the departure from the conventional approach lies in STAPP is focus on the solution to an overall problem, rather than only on any specific cause of the problem. A major challenge in achieving this is technology integration in an effective R&D ecosystem,

STAPP needs a carefully identified R&D ecosystem to address a societal problem. A first requirement therefore is to examine the components and the connectivity of such an R&D ecosystem. It is in this sense that the STAPP approach tends to be problem-based, and not discipline or theme based.

The CSIR-NISTADS effort on S&T Applications for Peoples' Problems (STAPP) identifies such peoples' problems grouped into broad topics where S&T can provide effective solutions, contributing to rapid and disruptive socio-economic transformation. The identification is made objective as far as possible, using traceable parameters like the number of persons affected, geographical coverage, socio-economic strata and the severity; however, there is need for more extensive data and deeper analysis in the process of identification and prioritization.

STAPP also attempts to provide a global technology landscaping and technology outlook for addressing a problem. The technology landscaping and outlook, while not exhaustive, are expected to provide inputs for the design of a comprehensive R&D ecosystem leveraging new techniques and tools. Based on the analysis, a roadmap might be suggested for applying S&T to the peoples' problems in a cost-effective and implementable manner. It is expected that the challenges thrown by STAPP will open new and promising areas of innovation. STAPP is thus meant to supplement and complement, and strengthen our conventional science and technology research, not replace it.

This report discusses about need, status and efforts towards skill development in India; and outlines the programs and policies that have been initiated for this purpose.

Overview

The list contains topics initially selected as problems faced by people of India. For each of them, some S&T solutions are outlined based on available literature; similarly, a first-level technology outlook is provided for R&D planning.

The purpose of listing the topics is identification and prioritization of people-centric R&D. Naturally, the list is not exhaustive. Also, the ordering of the topics in the list doesn't reflect prioritization.

- **Adulteration:** Food, Milk, Drugs, Fuel and Material
- **Water:** Accessibility, Quality, Sustainability, Equity
- **Breathable Air:** Control of pollution, Management of Pollution
- **Energy:** Access, Dark and Brown Hours, Affordability
- **A House for Each:** Affordability, Liveability, Eco-compatibility
- **Dignified Old Age:** Adult Care S&T solutions
- **Healthy Mother, Healthy Baby:** Maternity and Birth
- **Nutrition:** Balance, Deficiency monitoring
- **Sanitation:** Affordability, affluence, Maintenance
- **Lifting of Poverty Line:** Minimum Income, Creating Employment
- **Disease and Healthcare:** Access, Diagnosis, Affordability, Prevention, Awareness
- **Mental Health:** Awareness, Diagnosis, Treatment, Prevention
- **Employment:** Skill empowerment, Skill up gradation, Self-employment, Placement
- **Waste-Free Environment:** Less-waste products, Degradable waste, waste processing
- **Climate Change:** Technology adaptation, Mitigation Technology, Resilience
- **Documentation and Record:** Digital records, Accessibility, Operability, Security
- **Social Equity and Inclusiveness:** Resource Policy, Employment Planning
- **Rural-Urban Divide:** Road Connectivity, e-connectivity, Cultural Connectivity
- **Mass Employment:** SME Empowerment, Resource and Material
- **Regional Equity:** Local skill, local employment, local resource mapping
- **Sustainable Development:** Acceptable Good Practices, Resource Planning, Products
- **Vulnerability to Disasters:** Warning, Preparedness, Resilience, Prevention
- **A Secure Society:** Social Unrest, Terrorism, Access to Law Enforcement
- **Cyber Safety:** Privacy, Fraud, Harassment
- **Digital Literacy:** Uniform literacy, access and dissemination

Macro Socio-Economic Analysis

Skills and knowledge are the chief driving force of socio-economic growth and development for India. The demographic transition of the country makes it imperative to ensure employment opportunities for more than 12 million youths entering working age annually. It is estimated that during 2005-12, there were 2.7 million net additional jobs created. To enable employment ready workforce, the youth need to be equipped with the necessary skills and education.

Education and vocational training are the important contributors to overall skill resource group of the country. Education provides a base in the form of capability in learning, proficiency and cognitive abilities, whereas vocational training prepares a person with precise skills. Vocational training is practical/manual in nature in contrast to education which is purely theoretical in nature. Thus linkages of both serve simultaneously the hand and the mind, the practical and the abstract aspects.

India faces a dual challenge of developing skills and utilizing them in a proper way. Skill development faces the specific competitions of integrating the large rural workforce with limited access to training infrastructure, improving the productivity of huge informal workforce and support its formalization and to realize the conclusions on skills for improved productivity, employment growth and development[1]. As per the National Skill Development Mission (NSDM) Document, India currently faces a severe shortage of well-trained, skilled workers. It is estimated that only 2.3% of the workforce in India has undergone formal skill training as compared to 68% in the UK, 75% in Germany, 52% in USA, 80% in Japan and 96% in South Korea. Moreover, large sections of the educated workforce in the country have little or no job skills[2].

The country presently faces a dual challenge of severe paucity of highly-trained, quality labour, as well as non-employability of large sections of the educated workforce that possess little or no job skills[3]. It is found that the primary 30% labour force in India is from non-literate category, whereas labour educated up to the level of primary and middle constitutes the 25% and 18%, respectively (Figure 1). India has very small proportion of skill with graduation level education profile which shows the severe paucity of highly-trained, quality labour in the country.

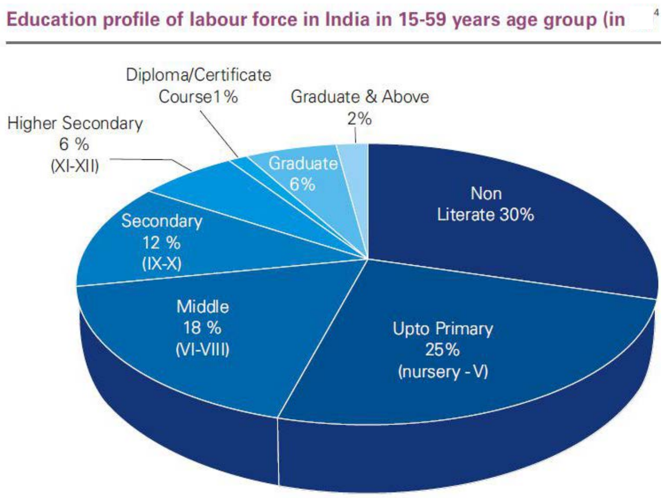

Figure1: Education profile of labour force in India
Source: Reference[4]

Demand-skill disparity: The skill development issue is pertinent both at the demand and supply level. To meet the demand challenge, consistent efforts are being made towards expansion of economic activities and creation of large employment opportunities. Favorable scenario would be with supply of labour transformed into skilled workforce ready to be engaged by the industrial-sectors. The Government along with its partner agencies has been trying to set-up more standardized skill based institutions or skill development centers across the country. There is a need for more emphasis in laggard/backward states to provide equal access to all sections and units of the society, to enable the whole society avail the benefits of the skill initiatives and strategies.

The number of ITIs have increased at CAGR 11.5% (2007-2012) with a seating capacity rise to 12.2% CAGR (in 2007-2012). The current available capacity in industrial training is 4.3 million, 201% less than the industrial requirement of 22 million skilled workforces annually.

There are a large number of drop outs in education at an average age of 15 years especially girl students along with poor literacy and much obsolete training provided which fails to provide jobs and industrial requirement[5]. In India, 90% of the jobs available are skill based but only 2% of the population (15-25 years) attains formal vocation training in comparison to 80% in USA and 60% in South Asian countries. The overall estimation is to provide vocational training to 128 lakhs workforce but currently capacity available is only 31 Lakhs whereas India aims to provide vocational training to 50 crores of workforce by 2022. It is required to offer vocational training to at least 300-350 million workforce by 2022 which is much lower than the target of 500 million workforce[5].

The establishments need to deliver eminent educational programme at all levels with targeting skills development programs, the instructional material or syllabus is required to be prepared conjointly by the industry and the educational planners. The same needs to be often restructured to include additional practical knowledge in addition to theoretical. In this way, people should absorb the crucial job skills as necessitated by the industrial zones.

A simple aspect of the projected youth population provides a reasonable resolution to believe that India has the strength to cater to this demand. However, the employability quotient is questionable and remains a major area of concern. Already huge gaps exist between the industry requirements and the level of skills of workers due to varied reasons, including inadequate training infrastructures, inappropriate mix of skills and education, outdated curricula, limited industry interfaces, limited standards.

Demographic dividend: A young population is India's demographic dividend. It gives the potential to become a global production hub as well as a large consumer of goods and services. Nearly two-thirds of country's population are under 35; half are under 25. By year 2020, India will be the youngest country in the world, with a median age of 29 years. India's large youth population could potentially make India the biggest consumer market and the biggest labour force in the world in the next decade.

Indian demographics in the global context

Developing demographics explicitly point out that India will remain a young nation and the largest contributor to the global workforce over the next few decades - an exceptional strength compared to the rapidly ageing population in the Western countries.

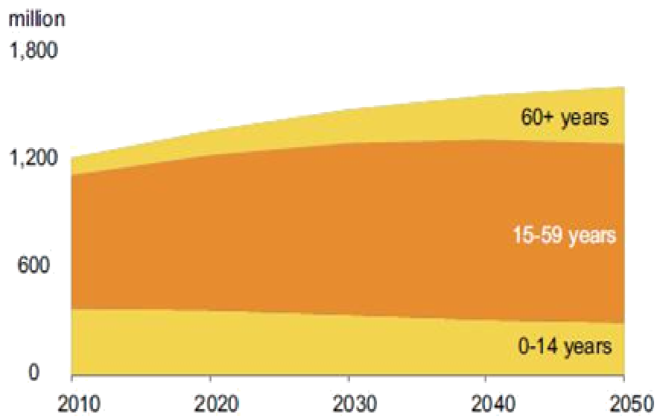

Figure 2: India's bulging working age population
Source: UN World Population Prospects, 2008[6]

The average age of India's population by 2020 is projected around 29 years compared to 37 years in China, 45 years in West Europe, and 48 years in Japan. While the global economy is expected to witness a shortage of young population of around 56 million by 2020, India will be the only country with a youth surplus of 47 million. Figure 2 shown the India's bulging working age population. The rise in working-age population, however, is necessary but not sufficient for India to sustain its economic growth. We need to create enough jobs and adequately prepare workers for the jobs to exploit the demographic dividend of the country.

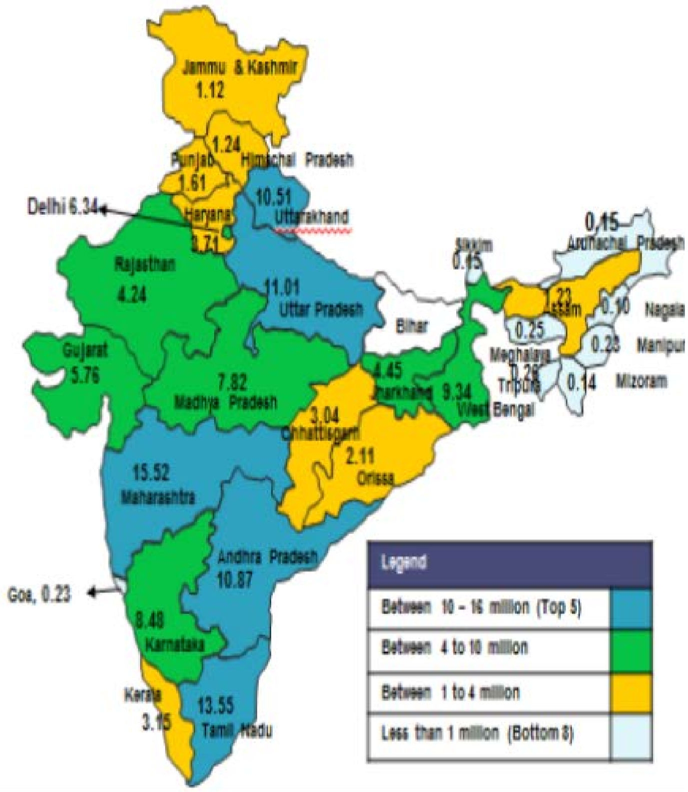

Figure 3: High growth State level district-wise studies commissioned, Source: NSDC

A study conducted by NSDC indicates that sector related to construction and retails have skill gap of 31% and 17% respectively. Top 10 sectors account for approximately 80% skill requirement[7]. State level studies indicate that Uttar Pradesh, Maharashtra, Tamilnadu, Andhra Pradesh and Uttarakhand are among top 5 states having skill gap between 10-16 million.

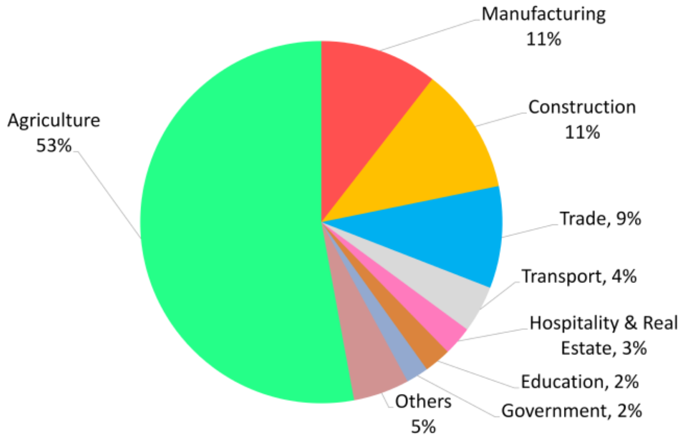

Figure 4: Employment by Sector 2009-2010, Source: Reference[8]

Illustration made by NSDC for 2022 indicate that this gap will further increase across the sectors ranging from 3% to 35%. For the economy to grow at 8% to 9%, with the targeted growth rate of 10% for secondary, 11% for tertiary and 4% for agriculture sectors, a multi-faceted and highly efficient skill development system is vital[5]. Employment in different sectors in India from 2009-10 is shown in Figure 4 and the Human Resource requirements across select sectors till 2022 is depicted by Figure 5.

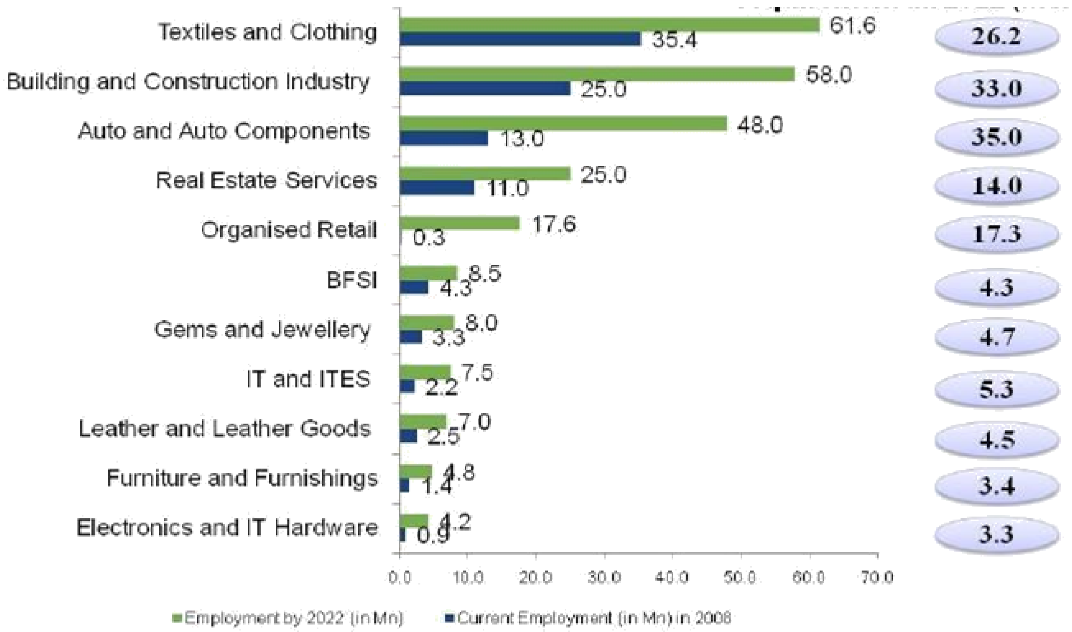

Figure 5: Human Resource requirements across select sectors till 2022(in million)
Source: NSDC

Formal Education and vocational Training: In general skill development refers to the larger objective of 'equipping an individual with marketable skills', however, in recent times skill development has been largely used in the context of technical/vocational training for the manufacturing/industrial or services sector.

India has attained progress in primary education with 1.5 million schools and 250 million enrollment. There is however a shortage in higher education with 20.7 million with only 24.3% of total enrollment. Statistics related to higher education indicate almost 10% increase in the number of University, college, Standalone Universities during 2008-16 as per the NSDC report.

Figure 6 presents an overview of the structural framework of the Educational and Skill Development Sector.

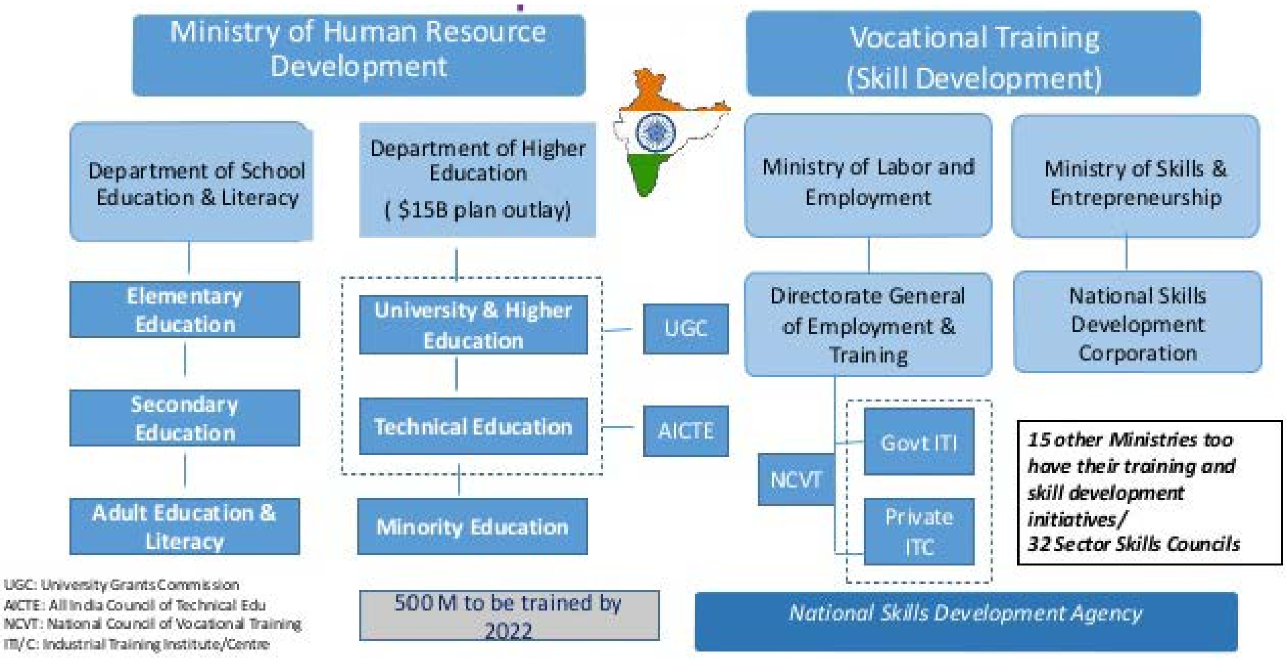

Figure 6: Structural framework of Education and Skill Development Sector in India
Source: FICCI document

With respect to industrial/vocational training, the Director General of Employment & Training (DGET) is the apex organisation for development and coordination at the national level for the programmes relating to vocational training with curriculum being set and implemented by the National Council for Vocation Training (NCVT). There are also several initiatives being undertaken by various other ministries and agencies of the Central and State Governments. In 2014-15, all the departments, including NSDC trained about 7.5 million people against a target of 10.5 million, as per official data. In the next two years 2015-16 and 2016-17, 11.7 million people have been trained. The government has constantly been focusing on refining the quality of skill training. The organisations have been safeguarding on private skill training providers working on a license model and establishment of the Industrial Training Institutes (ITIs) to source efficient workers to the industry[9]. The total capacity of ITIs and ITCs in 2015 is shown in Table 2.

Table1: Higher education statistics

	Institutes	2011-12	2012-13	2013-14	2014-15	2015-16
1	Number of Universities	642	667	723	760	799
2	Number of Colleges	34,852	35,525	36,634	38,498	39,071
3	Number of Stand Alone Institutions	11,157	11,565	11,664	12,276	11,923

Source: National Skill Development Corporation (NSDC)

Table 2: Capacity of ITIs and ITCs

State	No of Govt. ITI	Seating Capacity	No of Private ITI	Seating Capacity	Total No of ITI and ITC*	Total Seating Capacity
Northern Region	818	134530	4311	545695	5129	680225
Southern Region	438	101100	3084	354486	3522	455586
Eastern Region	211	61066	1726	275257	1937	336323
Western Region	826	208922	1691	184564	2517	393486
Grand total	2293	505618	10812	1360002	13105	1865620

*ITC=Industrial Training Centre ITI= Industrial Training Institute
Source: Reference[10]

Growth of ITIs has been 59 to 13359 during 1956-2016[11]. With the progress, the participation of the women in ITI education also improved significantly from 329 enrolments in 1980 to 130113 in 2016-17.

Number of recognized primary, upper primary, secondary and senior secondary are depicted Figure 8. In 2014-2015, major dominancy is of colleges as compared to other recognized institutions.

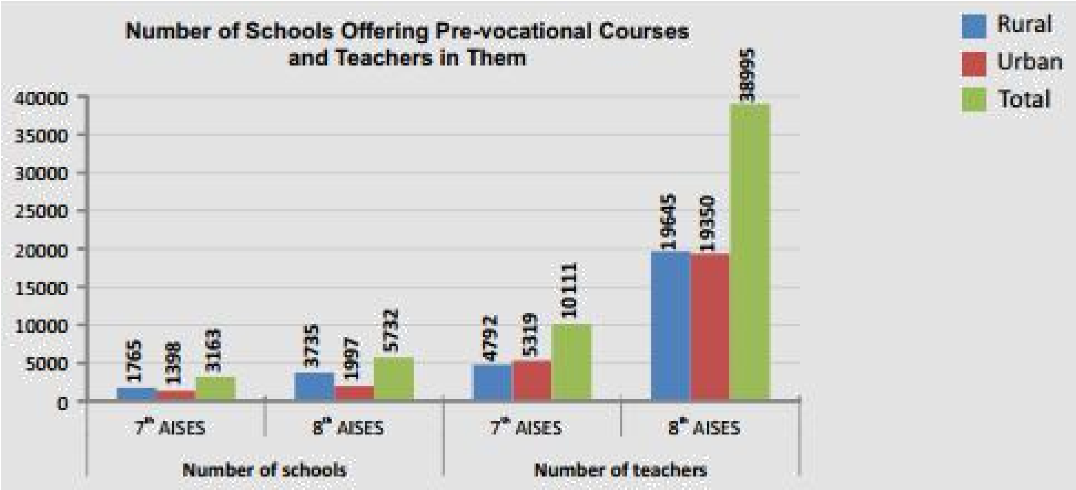

Figure 7: Number of Schools Offering Pre- Vocational Courses and availability of teacher
Source: Reference[12]

Number of Institutions by Type 2014-15

	Type		Number
School Education*	Primary		847118
	Upper Primary		425094
	Secondary		135335
	Senior Secondary		109318
	Total		**1516865**
Higher Education	University	Central University	43
		State Public University	316
		Deemed University	122
		State Private University	181
		Central Open University	1
		State Open University	13
		Institution of National Importance	75
		State Private Open University	1
		Institutions under State Legislature Act	5
		Others	3
		Total	**760**
	College		**38498**
	Stand Alone Institution	Diploma Level Technical	3845
		PGDM	431
		Diploma Level Nursing	3114
		Diploma Level Teacher Training	4730
		Institute under Ministries	156
		Total	**12276**

Figure 8: Number of Institutes of different type
Source: Reference[10 11 13]

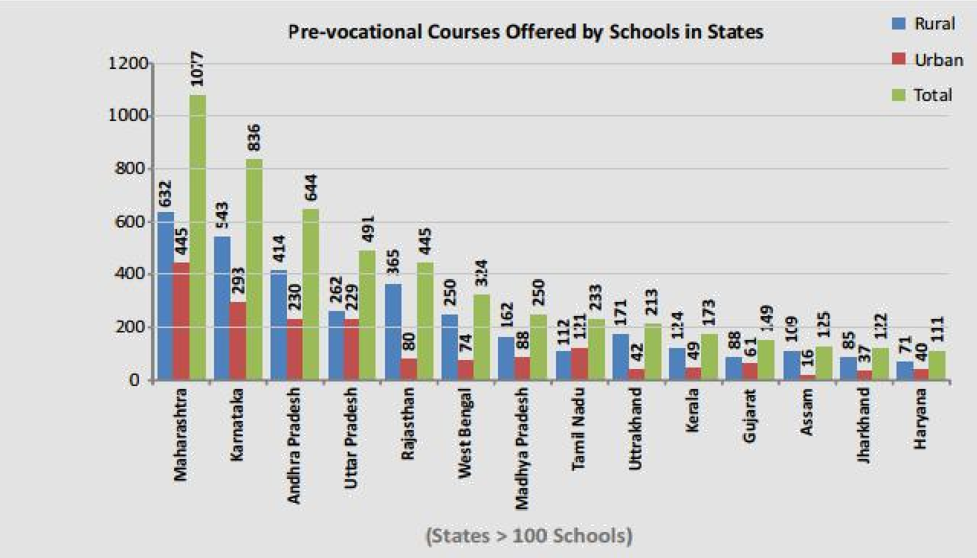

Figure 9: Pre-vocational Courses offered by schools in states
Source: Reference[14]

Qualified faculty: The major impediments inhibiting early childhood education in some countries are overcrowding, lack of qualified teachers, and inadequate educational funding serve. This is not the case in countries wherein educational opportunities are easily accessible to all, virtually all of the population is literate, and there are as few as between 6 and 10 primary school pupils for every teacher. Having more qualified teachers means that teachers are less strained to give each and every one of young scholars the consideration they require and deserve in order to fully expose their academic abilities and nurture success in education and life thereafter. Table 3 depicts the availability of teachers in higher education, whereas Figure 10 depicts the trend of availability of teacher in higher education.

Table 3: Availability of teachers in higher education.

	Faculty/Teacher	2011-12	2012-13	2013-14	2014-15	2015-16
1	Professor & Equivalent	1,02,738	1,20,156	1,25,338	1,36,966	1,46,021
2	Reader & Associate Professor	101100	3084	354486	3522	455586
3	Lecturer/ Assistant Professor	852894	877556	912178	9,85,085	1009196
4	Demonstrator/ Tutor	49,164	54608	58546	71,657	76933
5	Temporary Teacher	68392	79849	88792	1,01,948	1,12,006

Source: National Skill Development Corporation

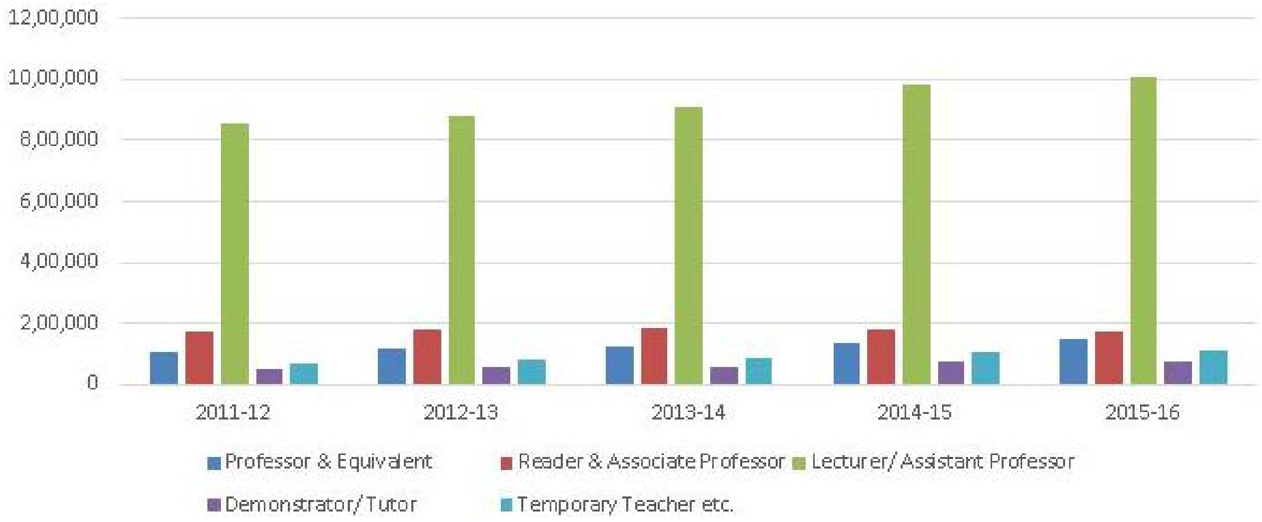

Figure10: Trend of availability of teacher in higher education Source: Reference[15]

Rural-Urban Employment Divide: Worker population ratio (WPR) is defined as the number of persons employed per thousand persons. The WPR is estimated to be 49.9% at All India level under the UPS approach; about 50% of the persons aged 15 years & above are employed. In rural areas, the WPR is estimated to be 52.1% under the UPS approach as compared to 44.6% in the urban areas[18].

- Labour Force Participation Rate (LFPR) is estimated to be 52.5% under the UPS (Usual Principal Status) approach at All India level or in other words 52.5% of the persons aged 15 years and above was either working or seeking work.
- In the rural sector, the LFPR is estimated to be 54.7% whereas in the urban sector the LFPR is 47.2% under the UPS approach.
- Female LFPR is significantly lower as compared to that of males. At All India level, female LFPR is estimated to be 25.8% as compared to 74.4% for males.
- LFPR for different categories based on UPS approach is as below:
- The female WPR is estimated to be 23.8% at All India level under the UPS approach as compared to the male WPR of 71.4%.

Unemployment: According to the *Resolution concerning statistics of work, employment and labour underutilization* adopted in 2013 by the 19th International Conference of Labour Statisticians (ICLS), the standard definition of unemployment refers to all those persons of working age who are without work, seeking work (carried out activities to seek employment during a recent past period), and currently available for work.

Table 4: Labour force and worker population ratio (%)

Sector	Male	Female	Person
Urban	74.7	29.1	54.7
Rural	73.8	18.5	47.2
Urban+Rural	74.4	25.8	52.5

- Unemployment Rate decreased to 3.46% in 2016 from 2015 level. The unemployment Rate averaged 4.08% from 1983 until 2016, reaching an all-time high of 8.3% in 1983 and a record low of 3.46% in 2016[16]
- In rural areas, unemployment rate is 4.79% whereas in urban areas, the unemployment rate is 5.79% under the UPS approach[17].
- The unemployment rate is significantly higher among females as compared to that among males. At all India level, the female unemployment rate is estimated to be 7.7%, whereas for males this rate is 4.1% (under the UPS approach).
- In urban areas, the female unemployment rate is estimated to be 12.4% at All India level under the UPS approach.

The unemployment rate for different categories based on UPS approach is given in Figure 11.

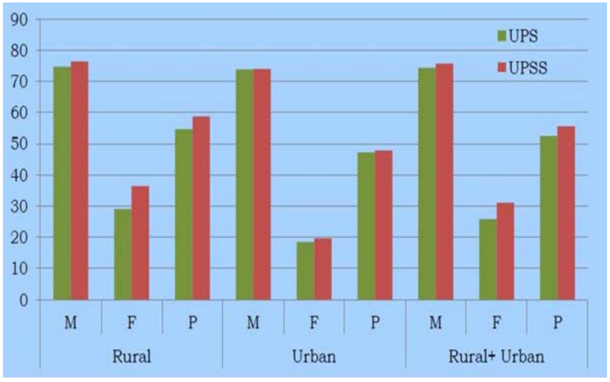

Figure 11: Labour Force Participation Rate
Source: Reference[18]
UPSS= Usual Principal Subsidiary Status

Head	15-17 Years			18-29 Years			30 Years & above		
	R	U	R+U	R	U	R+U	R	U	R+U
Self Employed	44.3	36.2	43	44.5	34.4	41.9	55.9	42.6	52.3
Wage/ Salaried employee	5.3	16.9	7.0	12.9	35.6	18.6	9.3	34	15.9
Contract Worker	2.2	5.1	2.6	3.8	6.6	4.5	2.0	4.0	2.5
Casual Worker	48.3	41.8	47.3	38.8	23.4	34.9	32.9	19.3	29.2

R-Rural; U-Urban

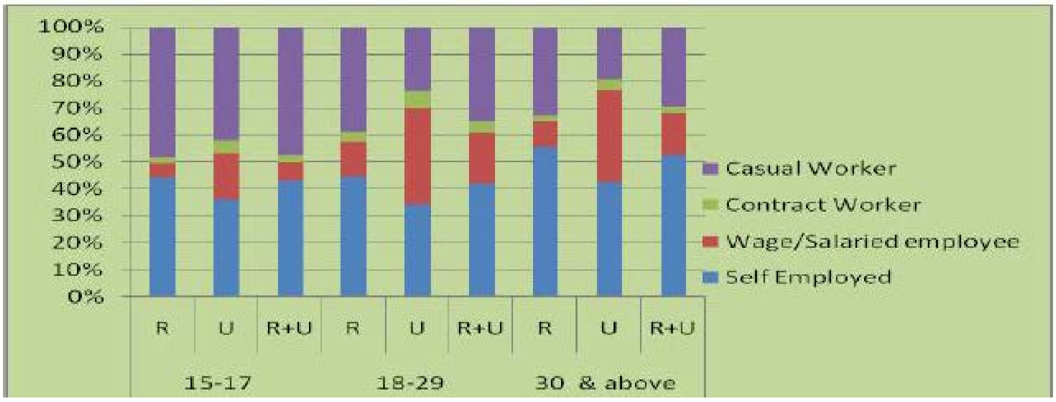

Figure 12: Activity based Worker distribution by different age group (in %)
Source: Reference[19]

Around 30% of the total country population is composed of female workforce in 2010 against 39% in 2000 which is much lower than China 82% and 72% in Brazil. A large section of female workforce is largely engaged in low paying unorganized works due to which women workers fail to get skilled jobs. A large section of women in India are not only unskilled but lack in attainment of both basic primary education and vocational training. Around 30% of females in urban areas fail to attain primary education against 65% of rural women who lack primary education[20].

For population under 18-29 years of age group, it is seen that 41.9% are self-employed followed by 34.9% as casual workers, 18.6% under wage/ salaried employee category and remaining 4.5% under the contract worker classification at all India level (Rural+ Urban).

It may be seen that in urban sector wage/salaried employees are maximum with 35.6% followed by 34.4% under the self-employed classification, 23.4% under the casual worker category and remaining 6.6% under the contract worker category at all India level for the age group of 18-29 years.

Approach	15-17 Years			18-29 Years			30 Years & above		
	M	F	P	M	F	P	M	F	P
UPS	16.4	21.3	17.5	11.3	18.2	12.9	0.9	3.1	1.4
UPSS	10.2	10.1	10.2	8.4	12.4	9.4	0.5	1.6	0.8

Figure 13: Unemployment Rate (UR) for different age groups by different approaches (in %)
Source: Reference [21]

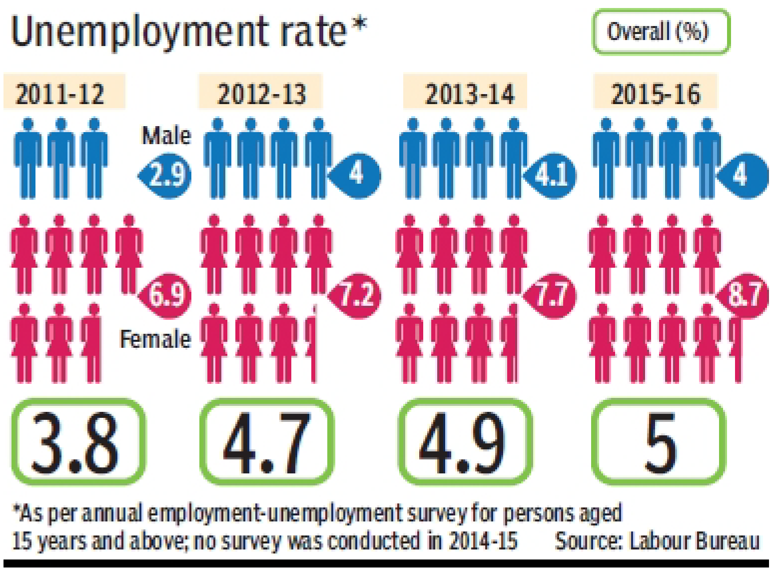

Figure 14: Unemployed rate
Source: Reference[22]

Skill Development Ecosystem

The skill development ecosystem includes the broad policies and structural agenda governing the skill development activities in the country. The system consists of providing varied levels of skills across an exceptionally diverse population. Skill development can be broadly segmented into Education and Vocational Training; figure 15 presents the broad framework of Skill Development in the country.

In order to improve employment or self-employment, the National Skill Development Corporation, has initiated Skill-training in different trades[23]

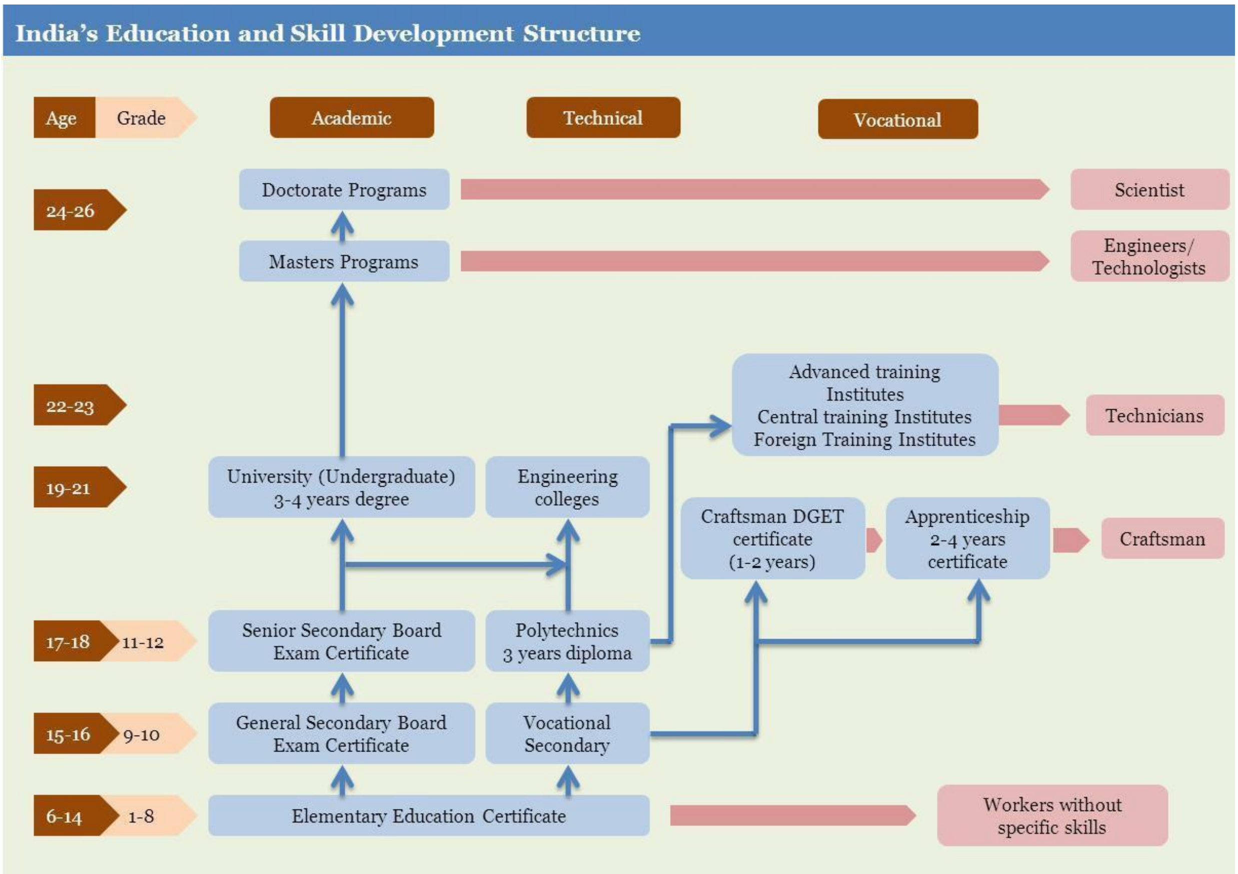

Figure 15: India's Education and Skill Development Structure. Source: Reference[24]

Skill development is affected by lack of awareness on the type of courses as well as information on the ensuing career prospects.

More importantly, there is limited acceptance of skill development courses as a viable alternative to formal education. Skilling is often viewed as the last resort meant for those who have not been able to progress in the formal academic system. This is partly to do with the lack of integration between the two options and also due to rising aspirations for white collar jobs which necessitate higher qualifications. Moreover, skill development is often associated with blue collar jobs, which is largely perceived to be of low dignity and provides low wages/salaries. The perceived 'stigma' associated with skill development has resulted in low enrolments in vocational education courses.

Skill development initiatives continue to be largely dependent upon the government funds or public-private ventures. Owing to high capital requirements and low return on investments, skill development is often considered as a non-scalable model and rests underinvested.

Moreover, a fee-based model also gets challenges as potential students are often reluctant or incapable to pay high fees for training. Even the bank's willingness to lend for skill development activities is low as educational loans are perceived as high risk products due to uncertainty with respect to future employment.

Educational qualification is generally preferred over vocational training as former is associated with better employment opportunities, in terms of wages as well as superiority of work. Furthermore, there is partial mobility between formal education and vocational training in India because of lack of equivalent credit for the latter; a student enrolled in vocational training often cannot migrate to institutes of higher education due to eligibility constraints. Under the National Skills Qualification Framework (NSQF), efforts are being made to address the mobility issue by appreciation of prior learning and establishing a credit system for skills, knowledge and experience gained by an individual either formally or informally. NSQF is likely to enable multiple-entry and exit between vocational education, skills training, general education, technical education and job markets.

Skills are acquired through both formal and informal channels. Formal vocational training is imparted in both public and private sector. Some of the major channels of formal vocation training include the government-run Industrial Training Institutes (ITIs), privately operated Industrial Training Centres (ITCs), vocational schools, specialized institutes for technical training, and apprenticeship training by the industry. The private sector involvement has been on rise lately, but the sector continues to be ruled by the public sector. Informal training on the other hand refers to experiential skills acquired on the job.

At the central level, the nodal institution for vocational training is the DGET under the Ministry of Labour and Employment. The DGET is responsible for formulating policies, establishing standards, permitting affiliation, trade testing and certification, and matters connected to vocational training and providing employment services. The National Skill Development Council (NSDC) - now a part of the newly created Ministry of Skill Development and Entrepreneurship - was initially set up under the Ministry of Finance to provide viability gap funding and promote private skill initiatives. The skill development of the working population is the main priority for the government; as is apparent by the remarkable progress India has witnessed under the National Policy on Skills (2009) over the years. The objective of the policy has been to grow on outreach, equity and access of education and training, which it has aimed to achieve by establishing several industrial training institutes (ITIs), vocational schools, technical schools, polytechnics and professional colleges to facilitate adult leaning, apprenticeships, sector-specific skill development, e-learning, training for self-employment and other forms of training[25].

The policy-makers must pay attention to provide the required infrastructure and equipment, computers, software, tools, machines and competent instructors to offer high-quality skills vital for industrial sectors and relevant practical exposure. Also, appraisal of institutes against standard norms and guidelines need to be conducted regularly and ratings should be based on outcomes assigned to every institution

Skill development is also critical from socio-economic and demographic point of view. For the economy to grow with the targeted growth rate for secondary, tertiary and agriculture sectors, a multi-faceted and highly efficient skill development system is imperative. Further, India is destined to be a contributor to the global workforce pool on account of demographic bonus, with the growth rate of higher working age population as compared to its total population and home to the second largest population (with a headcount of around 1.4 billion by 2025) with distinct advantage of having the youngest population with an average age of 29 years as against the average age of 37 years in China and the US and 45 years in Western Europe (FICCI, 2014[26]).[5]

Few challenges faced by Skill Development[20] Initiatives in India are enumerated below:

Institutional Set-up: The prevailing arrangement for skill development comprises complex and over lapping priorities. It has been revealed through the government's data that skill development initiatives are spread across about 20 different ministries, and 35 state governments and union territories. Under this structure, National Skill Development Agency (NSDA) was formed to consolidate efforts in Skill Development.

Inadequate Infrastructure: There is a need to boost up the training infrastructure and institutional set-up for providing skill training in technical and vocational skills. The infrastructure available for skill development currently is mainly government-funded; as the private sector investment has not been capitalized. Around 3.5 million labour force are trained in various professional skills by various publicly funded organizations, while about 12.8 million new add-ons occur in the labour force annually. The emphasis on vocational training has to enhance to match with the requirement of the unorganized workers. The sector constitutes 90% of the work force, resulting in a shortage of skilled workers at the national level.

Demand and Supply: Only small segment of work force essentially receives vocational and technical training for skill enhancement. The number of formally trained persons annually in various educational level is only 1,100,000; by Ministry of Labour and Employment and around 3,200,000 persons are trained by other ministries of Government of India. There appears to be a wide gap between the formal education and training to acquire skills by workforce as demanded by the industry[5].

Geographical Issues: The economically developed states have more jobs creation with lower rate of available workforce whereas; the states with low economic growth have more job seekers with a growing population. Thus states with higher economic growth have to rely on workers migrated from other parts of the country to disentangle this matter. Mostly Institutional set-up for vocational and technical training are provided in urban parts of the country. Hence, the youth from rural areas lag behind in getting the formal training in skill enhancement[5].

MAKE IN INDIA

Skill Development has an imperative role to play in the mission of Make in India scheme successful, youth of the nation should be empowered with formal education, technical and vocational training to meet the industrial requirement as per global standard. Make in India focus on creating 100 million new employment opportunities in manufacturing industry lowering down the growing problems of unemployment. In India only about 14% labour force is employed in Formal jobs[27]. A study[20] states how Make in India can generate job opportunities with new Industrial skill requirement, and analyses the overall status of Skill capacity available, skill requirement, skill gap and initiatives taken by the Government for the project.

Indian work force is immensely talented and adaptable. Continuous investment in up gradation of their skills, knowledge and competencies is essential for an organization if it wants a guaranteed survival in the immensely competitive environment[28]. In 2010, the first of its kind Manufacturing Policy was launched with prime focus on skill development as a strategy to enhance skill requirement India's manufacturing sector. In fact, it focused on skill enhancement of less educated unskilled labour in the unorganized sector and proposed a Modular Employable Skills (MES) scheme under DGE&T[20].

To match the pace of manufacturing revolution in the wake of Make in India, country needs to attain a share of at least 25% contribution to India's GDP. To realise this, there is need of skilled, educated and healthy workforce[20].

Other than initiatives like Smart City development, Skill India, Digital India, Startup India, FDI enhancement, National Investment and Manufacturing zone, creation of Industrial Corridor will not only make India a global manufacturing pivot but it will also create a vast number of employment opportunities with increasing Industrial demand[29].

Unorganized and unskilled labour like construction workers from village and slam areas with little or no education require special attention from government providing them basic skill enhancing their employability[30].

Youth of the nation should be empowered with formal education, technical and vocational training to meet the Industrial requirement as per global standard, and to attain success in Make in India mission.

CSIR Initiatives

CSIR-IICT

As a part of CSIR-Integrated Skill initiative, job oriented Installation, Operation & Maintenance of Reverse osmosis and Nano filtration based Water Purification Systems of varying capacities is being offered under SKILL DEVELOPMENT program for X/XII/ITI passed candidates with Industrial experience[31].

CSIR-CDRI

CDRI offers certificate course on skill development in following[32]:-

- Certificate course - Advanced Spectroscopic (NMR, MASS, UV/IR) technique
- Certificate course in Microscopy (Electron Microscopy, Confocal and Intra vital Microscopy) and Flow Cytometry
- Certificate course in Regulatory safety studies and Animal experimentation
- Certificate course in Computational Approaches to Drug Design and Development

CSIR-NPL

NPL has got excellent infrastructure for standards and measurements, is at par with international level in precision measurements. It implements a quality system as per ISO/IEC 17025 Standard and undergoes international peer review for technical expertise and Calibration and Measurement Capabilities (CMCs), regularly. NPL is uniquely positioned to cater the emerging needs of training in these areas because of the availability of relevant expertise.

Young certificate holders trained in NPL in the field of metrology have ample opportunities to become professional in precision measurements and quality controls to serve Industries, accredited testing and calibration laboratories, MSMEs, strategic sectors at their various key positions. Courses offered includes[33]:-

- Basic Metrology
- Quality Control and Management
- Mass, Force and Related Parameters
- Pressure, Vacuum and Fluid Flow
- Optical Radiation
- Length and Dimension
- Temperature, Humidity, Acoustics and Ultrasonics
- AC and DC Standards
- AC Power, Energy, High voltage, High Current, Time and Frequency
- Quality Manual Writing (project)
- Writing Calibration Procedure and Preparing Uncertainty Budget (project)
- Protocol for Inter-Comparison or Proficiency Testing (project)
- Industrial Training

CSIR-NEIST

NEIST offers to organize Basic Training on Welding, Fitting, Plumbing, Weaving and Glass Blowing[34].

CSIR-IHBT

IHBT is a leading lab in the area of Floriculture under Biological Sciences and globally known for scientific contribution in agro-technologies of cut flower crops, development of improved varieties and rural development which directly impacts societal sector. CSIR-IHBT conducts training for[35]:-

- Floriculturist-Protected Cultivation
- Gardener
- Hands-on Laboratory Experiment and Analytical Exposure
- Diploma in Laboratory Practices in Animal House

GOVERNMENT INITIATIVES

Skill Landscape in India[1]

Skill development is one of the key objectives to achieve the Make in India mission. Skilled manpower for manufacturing and technology intensive industries is an important objective the government wishes to achieve. 'Skill India' program envisages expansion of skill councils in partnership and opening new higher education institutions. The idea of Skill India mission is to raise confidence, improve productivity and provide path through proper skill development. This is vital to channelize youth for appropriate job prospects. There is a need for stable growth in all the sectors and every occupation need to be given equivalent significance. Skill development needs to reach the rural and remote areas as well. Corporate educational institutions, non-government organizations, Government, academic institutions, and society need to support in the process to achieve better results.

Skill India is a campaign launched by the Prime Minister, aiming to train over 40 crore (400 million) people in country by 2022. It includes various initiatives of the government as:

- National Skill Development Mission
- National Policy for Skill Development and Entrepreneurship, 2015
- Pradhan Mantri Kaushal Vikas Yojana (PMKVY)
- Skill Loan scheme
- Rural India Skill

India has among the lowest proportion of trained youth in the world. The quantitative dimension of India's skill development challenge is that 80% of new entrants to the workforce have no opportunity for skill training. Against 12.8 million per annum new entrants to the workforce, the existing training capacity is only 3.1 million per annum[36]. The Prime Minister's National Council on Skill Development has endorsed a Vision to create 500 million skilled people by 2022, whereas, at present, only about 2% of the workforce has skill training[36].

India has slowly progressed as a knowledge-based economy by the wealth of capable, flexible and qualified human capital. With the continually increasing impact of globalization, the country has immense opportunities to establish its distinctive position in the world. Though, there is a prerequisite to develop and empower the human capital to ensure the nation's global competiveness.

Skill development through vocational training in India is offered by the Directorate General of Employment and Training (DGET) under the Ministry of Labor and Employment. The training is instructed through many schemes as follows:

- Craftsmen Training Scheme (CTS) – ITI/ITC training
- Apprenticeship Training Scheme
- Craftsmen Instructor Training Scheme
- Advance Vocational Training Scheme
- Women Training
- Research and Staff Training
- Instructional Material Development
- Hi-Tech Training
- North Eastern States
- Modular Employable Skills (MES)
- Centre of Excellence and World Bank Assistance
- Up gradation of ITIs through Public Private Partnership (PPP)

National Skill Development Mission: NSDM was approved by the Union Cabinet in 2015, and officially launched on World Youth Skills Day. The Mission aims to create convergence across sectors and States in terms of skill training activities. Further, to achieve the vision of 'Skilled India', the NSDM would combine and coordinate skilling efforts, and accelerate

[1] Information has been compiled from various Government of India websites.

decision making across sectors to achieve with speed and standards for skilling process. There exists a streamlined institutional mechanism under the Ministry of Skill Development and Entrepreneurship (MSDE). Key institutional mechanism has three layers; a Governing Council for policy guidance at apex level, a Steering Committee and a Mission Directorate (along with an Executive Committee) as the executive arm of the Mission.

Mission Directorate has been supported by three institutions: National Skill Development Agency (NSDA), National Skill Development Corporation (NSDC), and Directorate General of Training (DGT) – all with horizontal linkages with Mission Directorate to facilitate smooth functioning of the national institutional mechanism. Seven sub-missions have been proposed initially to act as building blocks for achieving overall objectives of the Mission as:

- Institutional Training
- Infrastructure
- Convergence
- Trainers
- Overseas Employment
- Sustainable Livelihoods
- Leveraging Public Infrastructure[37]

National Skill Development Corporation: NSDC is a Public Private Partnership Company with the main directive of catalysing the skills landscape in India with main objectives as:

- Upgrade skills to international standards and develop necessary frameworks for standards, curriculum and quality assurance
- Enhance, support and coordinate private sector initiatives for skill development through appropriate Public-Private Partnership (PPP) models; strive for significant operational and financial involvement from the private sector
- Play the role of a "market-maker" by bringing financing, particularly in sectors where market mechanisms are ineffective or missing
- Prioritize initiatives that can have a multiplier or catalytic effect as opposed to one-off impact[38].

NSDC is a unique model created with a well thought through underlying philosophy based on the following pillars:

- Create:Proactively catalyse creation of large, quality vocational training institutions.
- Fund: Reduce risk by providing patient capital. Including grants and equity.
- Enable: the creation and sustainability of support systems required for skill development. This includes the Industry led Sector Skill Councils.

Pradhan Mantri Kaushal Vikas Yojana: PMKVY is the flagship scheme of the MSDE; the objective is to enable a large number of Indian youth to take up industry-relevant skill training, help them acquiring improved living[39]. Under this Scheme, Training and Assessment fees are completely paid by the Government Individuals with skill learning experience will also be assessed and certified under Recognition of Prior Learning (RPL).

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