

Draft Detailed Project Report

New Technology Centre at
Patna
(General Engineering)
March 2019

Technology Centre Systems Program

Report No: 2018-Delhi-0126

Submitted

To

The Office of Development Commissioner - MSME
Ministry of MSME, Govt. of India
Maulana Azad Road, New Delhi -110008



Building a better
working world

The page has been intentionally left blank

07 March 2019

Director (Technology Centre Systems Program)

Office of Development Commissioner, MSME

Ministry of MSME

Nirman Bhawan, Maulana Azad Road,

New Delhi -110108

Dear Sir,

As part of our engagement to provide Consulting services for establishment of Program Management Unit (PMU) for designing the project, undertaking the pre-project activities and providing implementation support during the course of the Technology Centre Systems Program (TCSP), we hereby submit the Draft Detailed Project Report for setting up of Technology Centre at Patna, Bihar for your kind perusal. The deliverable has been prepared in accordance with our engagement agreement dated 07 November 2013, and our procedures were limited to those described in that agreement.

This Detailed Project Report is based on inquiries of and discussions with:

- ▶ O/o DC MSME
- ▶ PSC
- ▶ Industry experts
- ▶ World Bank Mission
- ▶ Industries and Ancillary units
- ▶ Government Institutes and Industry association
- ▶ Secondary Research

We have not sought to confirm the accuracy of the data or the information and explanations provided by the O/o DC MSME. Our work has been limited in scope and time and we stress that more detailed procedures may reveal other issues not captured here. The procedures summarized in our Draft Detailed Project Report do not constitute an audit, a review or other form of assurance in accordance with any generally accepted auditing, review or other assurance standards, and accordingly we do not express any form of assurance. This Draft Detailed Project Report is intended solely for the information and use of the Office of DC-MSME and is not intended to be and should not be used by anyone other than this specified party.

We appreciate the cooperation and assistance provided to us during the preparation of this report. If you have any questions, please contact the undersigned.

Very truly yours,

Amar Shankar, Partner – Advisory Services

Disclaimer

This Draft Detailed Project Report for development of Technology Centre at Patna as part of consulting services to establish a Program Management Unit (PMU) for designing the project, undertaking the pre-project activities and providing implementation support during the course of the Technology Centre Systems Program (TCSP) has been prepared by Ernst & Young LLP (hereinafter referred to as 'EY' or 'Ernst & Young' or 'Us') and delivered to the 'Office of Development Commissioner - Ministry of Micro, Small & Medium Enterprise (O/o of DC-MSME)' (hereinafter referred to as 'the Client').

The inferences and analyses made by EY in this report are based on information collated through primary research, secondary research, discussions with the client personnel and key stakeholders and our knowledge about the program and its objectives. EY has taken due care to validate the authenticity and correctness of the information from various sources, however, no representations or warranty, expressed or implied, is given by EY or any of its respective partners, officers, employees or agents as to the accuracy or completeness of the information, data or opinions provided to EY by third parties or secondary sources.

Nothing contained herein, to the contrary and in no event shall EY be liable for any loss of profit or revenues and any direct, incidental or consequential damages incurred by the Client or any other user of this report.

In case the report is to be made available or disclosed to any third party, this disclaimer along with all the limiting factors must be issued to the concerned party. The fact that EY assumes no liability whatsoever, if for the reason any party is led to incur any loss for acting upon this report, must be brought to the notice of the concerned party.

© EY, 2018

Acknowledgement

We would like to express our sincere gratitude to MoMSME and its officials for their involvement and valuable inputs during the preparation of this DPR. We extend a special thanks to **Shri Ram Mohan Mishra, IAS, (AS&DC-MSME)**, **Shri Sudhir Garg, (Joint Secretary-MSME)** and **Shri Sanjeev Chawla (Director-TCSP, MoMSME)** for their proactive support and guidance during the entire process.

We would like to thank MSME-DI, Patna officials and Tool Room and Technology Centre, Patna, (extension Centre IDTR Jamshedpur) for their co-ordination and support in organising stakeholder discussions.

We would also like to thank the GMs of existing MSME TCs for their guidance and valuable inputs during preparation of the DPR.

We would like to convey our sincere thanks to officials of Department of Industries, Government of Bihar, and Industries Associations in Bihar for their support during the on-site visit for the proposed Technology Centre at Patna.

Also, we must extend our sincere thanks to all the stakeholders like large enterprises, PSUs, industry associations, Government Institutes and Educational Institutes who gave us their valuable time and insights with respect to various dimensions of the tooling industry and its support requirements. Without their help, capturing of the industry requirements would not have been possible.

Abbreviations

AICTE	All India Council for Technical Education
AR	Augmented Reality
ATDC	Apparel Training and Design Centre
ATR	Academic, Technology support & Research
BCCI	Bihar Chamber of Commerce & Industries
BEA	Bihar Entrepreneurs Association
BIA	Bihar Industries Association
BIADA	Bihar Industrial Area Development Authority
BICICO	Bihar State Credit & Investment Corporation Ltd.
BIT	Birla Institute of Technology
BOD	Biological Oxygen Demand
BPL	Below Poverty Line
BRJP	Bihar Rajya Jal Parishad
BSPCB	Bihar State Pollution Control Board
BSSC	Bihar State Sugar Corporation
CAD	Computer-Aided Design
CAE	Computer-Aided Engineering
CAGR	Compounded Annual Growth Rate
CAM	Computer-Aided Manufacturing
CDGI	Centre for Development of Glass Industries
CFTI	Central Footwear Training Institute
CIHT	Central Institute of Hand Tools
CII	Confederation of Indian Industry
CIM	Computer Integrated Manufacturing
CIPET	Central Institute of Plastics Engineering and Technology
CITD	Central Institute of Tool Design
CMC	Construction Management Consultant
CMM	Co-ordinate Measuring Machine
CNC	Computerized Numerical Control
CSIR	Council Of Scientific And Industrial Research
CTR	Commercial Tool Rooms
CTTC	Central Tool Room & Training Centre
DART	Department of Agricultural/Rural and Traditional Enterprises
DC	Development Commissioner
DIC	District Industries Centres

DICCI	Dalit Indian Chamber of Commerce & Industry
DPR	Detailed Project Report
EDFC	Eastern Dedicated Freight Corridor
EDM	Electrical discharge machining
EMF	Environmental Management Framework
EPC	Environmental Protection and Compliance
EPIP	Export Promotion Industrial Park
ERP	Enterprise Resource Planning
ESDM	Electronics System Design And Manufacturing
ESTC	Electronics Service & Training Centre
EY	Ernst and Young LLP
FDDI	Footwear Design and Development Institute
FDI	foreign direct investment
FFDC	Fragrance & Flavour Development Centre
FMCG	Fast Moving Consumer Goods
FRP	Fibre Reinforced Plastic
FSSP	Full Social Screening Process
FY	Financial Year
GC	Governing Counsel
GDP	Gross Domestic Product
GE	General Electric
GESIP	Gender, Equity and Social Inclusion Plan
GIZ	Gesellschaft für Internationale Zusammenarbeit
GoB	Government of Bihar
Goi	Government of India
GSDP	Gross State Domestic Product
HPCL	Hindustan Petroleum Corporation Ltd
HSC	Higher Secondary School Certificate
HT	Heat Treatment
IA	Industrial Area
ICICI	Industrial Credit and Investment Corporation of India
IDBI	Industrial Development Bank of India
IDEMI	Institute For Design of Electrical Measuring Instruments
IDFC	Infrastructure Development Finance Company
IDTR	Indo Danish Tool Room
IE	Industrial Estate
IED	Institute of Entrepreneurship Development

IFCI	Industrial Finance Corporation of India
IGTR	Indo German Tool Room
IIBI	Industrial Investment Bank of India
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IOCL	Indian Oil Corporation Ltd
IoT	Internet of Things
IP	Intellectual Property
IPSSP	Indigenous People's Social Screening Process
IRR	Internal Rate of Return
ITI	Industrial Training Institute
ITSP	IT Service Provider
KPI	Key Performance Indicator
KVIC	Khadi and Village Industries Commission
LIE	Large Industrial Estate
LLP	Limited liability partnership
MACET	Maulana Azad College of Engineering and Technology
MIG	Metal inert gas
MIP	Mega Industrial Park
MoMSME	Ministry of Micro, Small & Medium Enterprises
MOU	Memorandum of Understanding
MSME-DI	Micro Small & Medium Enterprise - Development Institute
NABARD	National Bank For Agriculture And Rural Development
NBFC	Non-Banking Financial Company
NBPDCL	North Bihar Power Distribution Companies Limited
NCVT	National Council for Vocational Training
NGO	Non-Government Organisation
NIT	National Institute of Technology
NOC	No Objection Certificate
NSIC	National Small Industries Corporation
NSSP	No Social Screening Process
O/o of DC MSME	Office of Development Commissioner - Micro, Small & Medium Enterprise
OEM	Original Equipment Manufacturer
PDO	Program Development Objective
PHED	Public Health Engineering Department
PIA	Patliputra Industries Association

PJP	Patna Jal Parishad
PLC	Programmable Logic Control
PMC	Project Management Consultant
PMEGP	Prime Minister Employment Generation Programme
PMMY	Pradhan Mantri Mudra Yojana
PMU	Program Management Unit
PPDC	Process and Product Development Centre
QC	Quality Control
RFD	Result Framework Document
RFP	Resettlement Policy Framework
SBPDCL	South Bihar Power Distribution Companies Limited
SEZ	Special Economic Zone
SIDBI	Small Industries Development Bank of India
SME	Small and Medium Enterprises
SSC	Senior Secondary School Certificate
TAGMA	Tool & Gauge Manufacturers Association of India
TC	Technology Centre
TCM	Technology Cluster Manager
TCs	Technology Centres
TCSP	Technology Centre Systems Programme
TDC	Technology Development Centre
TIG	Tungsten Inert Gas
TR	Tool Room
TRTC	Tool Room & Training Centre
UNIDO	United Nations Industrial Development Organization
UTI	Unit Trust of India
VLSI	Very Large Scale Integration
VOC	Volatile Organic Compounds
VR	Virtual Reality

Revision History

Version	Revision Version	Amendment description	Prepared by	Reviewed by
1.1	First Draft DPR	Review of Draft DPR	Tashi Singh Samrendra Singh	Dr. Milind Mujumdar Dinesh Pradhan
1.2	Second Draft DPR	Incorporated changes as discussed with Dr. Milind, Dinesh Pradhan and Samrendra Singh	Tashi Singh Samrendra Singh	Dr. Milind Mujumdar Dinesh Pradhan
1.3	Third Draft DPR	Incorporated changes based on the meeting with Principal Secretary, Department of Industries and stakeholders discussion held on 2 April 2018	Tashi Singh Samrendra Singh	Dr. Milind Mujumdar O/O DC-MSME
1.4	Fourth Draft DPR	Incorporated changes based on inputs received from O/o DC-MSME	Tashi Singh	Dr. Milind Mujumdar Dinesh Pradhan
1.5	Fifth Draft	Incorporated changes based on the comments of the Client	Tashi Singh	Anil Bhandari Dr. Milind Mujumdar Dinesh Pradhan
1.6	Sixth Draft	Incorporated changes based on the comments of the Client	Tashi Singh	Anil Bhandari Dr. Milind Mujumdar

Table of Contents

Executive Summary	19
1 Introduction	21
1.1 Background and project rationale.....	21
1.1.1 Demographic overview and challenges	22
1.1.2 Recommendations of 12 th plan working group & Parliamentary Standing Committee.....	24
1.1.3 Technology Center System Program	25
1.1.4 Key TCSP stakeholders.....	26
1.1.5 RFD of TCSP.....	30
1.2 Existing MSME TCs and feedback on other TRs	31
1.3 Evaluation study of TCs and recommendations of the experts	35
2 DPR objective and approach	39
2.1 Objective.....	39
2.2 Approach	39
3 Framework for Selection of Industry/ Clusters/ Systems/ Location for New TCs	42
3.1 Location selection framework.....	42
3.2 Selection of Patna location for setting up of new TC.....	46
4 Location brief.....	48
4.1 Regional overview	48
4.2 Demographic profile of the district	51
4.3 Regional Stakeholders	52
4.3.1 Government Bodies	52
4.3.2 Industry Associations	56
4.3.3 Key Manufacturers and Suppliers.....	58
4.3.4 Financial Institutions	59
4.3.5 Technical and Research Institutes	60
5 Opportunity and need assessment.....	63
5.1 Overall Market size of Tooling Industry	63
5.1.1 Primary Research	66
5.1.2 Challenges faced by MSME TRs.....	69
5.2 Market opportunity.....	71
5.2.1 Overview of Welding Industry	71
5.2.2 Overview of Welding Industry in India.....	72
5.2.3 Casting and Foundry	73
5.2.4 Market in core sectors in the catchment	74

5.2.5	Market in other potential sectors in catchment area	82
5.2.6	Market outside catchment area	83
5.3	Opportunities associated with other proposed major projects in Bihar	85
6.	Social and Environmental Safeguards.	87
6.1	Socio-economic profile of district	87
6.2	Social and environmental screening	90
6.2.1	Social screening	90
6.2.2	Environmental screening.....	92
6.3	Gender equity and social inclusion strategy	96
6.4	Sample monitoring and reporting template	98
7.	Clearances required and respective authorities.....	100
8.	Manpower and Human Resource development	105
8.1	Proposed organization structure.....	105
8.2	Phase wise induction of human resources	109
8.3	Roles and responsibilities	114
8.4	Governance structure	124
8.4.1	Governance Model for the new TCs	124
8.4.2	Composition of the Governing Council	125
9.	Marketing plan of Patna TC.....	130
10.	Focus area for Patna TC	137
10.1	Training	137
10.2	Production	144
10.3	Additive Manufacturing Facility.....	145
10.4	Industry 4.0, AR, VR Labs	146
10.5	Incubation Centre.....	146
10.5.1	Incubation Centre at Patna TC.....	148
10.5.2	Proposals & Selection	149
10.5.3	Investments/ Sustainability of incubation centre	150
10.6	Consultancy.....	151
10.7	Centre of excellence for manufacturing skill development.....	156
10.8	Proposed support system to enable private TRs tap the market.....	157
10.9	Technology collaboration	158
10.10	Technology Information Centre.....	160
10.11	Department of Agricultural/Rural & Traditional Enterprises (DART) & Plug and Play	161
10.12	Entrepreneurship Development Cell	163

10.12.1 Entrepreneur Development Cell at Patna TC	164
11. Quality system	167
12. Infrastructure and facilities.....	170
13. Expenditure pattern.....	177
13.1 Capital expenditure	177
13.1.1 Plant and machinery.....	177
13.1.2 Building cost.....	178
13.2 Operating expenditure	178
13.2.1 Variable operating expenditure	178
13.2.2 Fixed Operating expenditure	179
14. Financial analysis.....	185
14.1 Key assumptions	185
14.1.1 Income assumptions.....	185
14.1.2 Project cost and financing.....	194
14.1.3 Other financial assumptions	194
14.2 Income & expenditure statement.....	199
14.3 Balance sheet	202
14.4 Profitability	203
14.5 Sensitivity analysis	204
15. Environment, health and safety.....	206
15.1. Environment.....	206
15.1.1. Air emissions.....	206
15.1.2. Wastewater and liquid wastes.....	207
15.1.3. Waste water management.....	209
15.1.4. Solid waste management	212
15.2. Occupational health and safety.....	213
15.2.1. Monitoring	214
15.2.2. Monitoring accidents and diseases monitoring.....	215
15.3. Addressing potential EHS issues	216
15.3.1. Construction phase	216
15.3.2. Operation and maintenance	221
15.3.3. Manufacturing	222
15.4. Provisioning of site services	225
15.4.1. Fire alarm and firefighting system	225
15.4.2. Rain water harvesting.....	228
15.4.3. Water treatment plant	228

15.4.4. Sewage treatment plant.....	229
15.4.5. Ventilation system	229
16. Key risks and mitigation	232
17. Conclusion	240
18. Annexure	243
18.1. Minute of stakeholders meetings at Patna.....	243
18.2. Minute of stakeholders meetings at Patna for DPR validation	248
18.3. Social Screening Certificate.....	252

List of Figures

Figure 1: TCSP eco-system	26
Figure 2: Location of existing TCs and New TCs.....	33
Figure 3: Weightage assignment	44
Figure 4: Location of Patna	48
Figure 5: Growth of Population in Patna District	51
Figure 6: Stakeholders of Patna TC	52
Figure 7: Size of the Tooling market in India	63
Figure 8: Structure of Tooling Market.....	64
Figure 9: Composition of captive segment	64
Figure 10: Composition of CTRs segment	65
Figure 11: Composition of imports segment.....	65
Figure 12: Absence of competitive advantage	69
Figure 13: Global welding consumables market	71
Figure 14: Target Market Structure of Patna TC	73
Figure 15: Core industrial District in the Catchment area.....	74
Figure 16: Mega Food Park, Bihar	83
Figure 17: Market outside Catchment Area.....	84
Figure 18: Growth of District GDP of Patna	87
Figure 19: Proposed organisation structure.....	109
Figure 20: Suggestive framework for marketing of TC	130
Figure 21: Positioning of marketing mix for proposed TC	131
Figure 22: Support for other training institutions	157
Figure 23: Key areas of incubation support.....	164
Figure 24: Net working capital requirement	196
Figure 25: Cash flow closing balance.....	196
Figure 26: Net free Cash flows and Cumulative Cash flows	203

List of Tables

Table 1: Result indicators of the RFD.....	31
Table 2: Existing TCs & TRs along with their specializations	32
Table 3: Patna District snapshot	49
Table 4: Bihar snapshot	49
Table 5: Status of Water, Electricity, Climate, Temperature in the Patna District.....	50
Table 6: Intake capacity at technical institutions in Bihar	60
Table 7: Composition of major manufacturing players in the Patna catchment.....	75
Table 8: Sector wise table spread of MSMEs in key catchment District	76
Table 9: Catchment Area Profile	77
Table 10: Educational Institutions in the District (2010 - 2011)	88
Table 11: Health Infrastructure in Patna District.....	89
Table 12: Checklist for environmental screening	94
Table 13: Sample monitoring and reporting template.....	98
Table 14: Clearances required and respective authorities	100
Table 15: Sanctioned strength of key resources	108
Table 16: Summary of phase wise induction of resources	111
Table 17: Department wise induction of fulltime resources	112
Table 18: Roles and responsibilities of proposed positions	114
Table 19: Comparison of Society Registration Act and Companies Act	124
Table 20: Governing Council of Patna TC	125
Table 21: Suggestive marketing activities, ownership and timeline	134
Table 22: Details of specialization, courses, duration and capacity intake	137
Table 23: Proposed list of machines for training.....	141
Table 24: Proposed list of machines for production/ manufacturing activities.....	144
Table 25: Areas of consulting and estimated revenue	153
Table 26: Proposed areas of consulting	155
Table 27: Estimated revenue from consulting	155
Table 28: Indicative certifications of quality systems	167
Table 29: Details of the proposed new TC and existing TRTC Campus infrastructure construction.....	171
Table 30: Details of proposed infrastructure for hostel and staff quarters	172
Table 31: Cost for development of campus infrastructures	173
Table 32: Details of other infrastructure.....	173
Table 33: Capital expenditure.....	177
Table 34: Plant & Machinery.....	177
Table 35: Building cost	178
Table 36: variable cost assumptions	179
Table 37: Fixed Operating Cost assumptions	180
Table 38: Manpower and salary assumptions	181
Table 39: Key assumptions	185
Table 40: Training revenue assumptions	185
Table 41: Production assumptions	190
Table 42: Consultancy revenue assumptions.....	192
Table 43: Project cost and financing	194
Table 44: Working capital schedule	197
Table 45: Cash flow statement	198

Table 46: Income and expenditure	199
Table 47: Balance sheet.....	202
Table 48: Profitability with investment plant & machinery	203
Table 49: Sensitivity of IRR	204
Table 50: Activities and anticipated EHS issues during construction phase	216
Table 51: Potential hazards during O & M phase	221
Table 52: Potential hazards during manufacturing phase	222
Table 53: Risks & mitigation	232

Executive Summary



Executive Summary

Objective of DPR: Evaluate the feasibility of the proposed Patna TC.

Key Components

Opportunity and need assessment

Social and Environmental assessment

Technology & Skillset requirement

Investment & Return

Opportunity and need assessment

Key clusters in Patna Catchment Area

- Industrial Area, Hajipur
- Industrial Area, Fatuha
- Industrial Area, Bihta, Patna
- Industrial Area, Patliputra, Patna

Potential Market Opportunity

- Training in advanced welding for GE Diesel Locomotive Factory at Marhaura, Saran
- Fitter and electrical job training for Alstom Electric Locomotive Factory at Madhepura
- Heat treatment facility

Stakeholder discussions



Key Stakeholders

- O/o DC-MSME
- Department of Industries, Govt. of Bihar
- MSME-DI, Patna
- TRTC Patna (IGTR Jamshedpur extension Centre)
- Industrial Association
- Government Institutes
- MSMEs

Key Training Requirement

- Multi-skilled workforce
- Skills in basic & advanced welding
- Quality Workforce

Key Technology Requirement

- Reverse engineering
- Heat treatment facility
- Job work for complex parts
- Maintenance of Machines
- Process Automation

Financials

Total Capital Expenditure: INR 145.06 Cr

Training, ARTD, EDP and Incubation Centre Machines: INR 35.42 Cr

Production Machines: INR 25.55 Cr

Building Infrastructure: INR 78.58 Cr

Other Equipment and Pre-Operative Expenses: INR 5.51 Cr



Location Overview



- Accessible by NH 19, NH 30 and NH 83
- Close proximity to Golden Quadrilateral Highway



- Connectivity with major cities like Delhi, Jamshedpur, Kolkata, etc.
- Connected to the Eastern Dedicated Freight Corridor (Punjab to Kolkata)



- Jay Prakash Narayan International Airport at Patna
- New airport proposed in the Industrial Area of Bihta (6 km from TC site location)

Industrial Goods Production in Patna Catchment Area

Small Machines & tools manufacturing, Food processing, Footwear and Textile/Ready-made garment industries

Sugar, Rice mills, cement, steel re-rolling, paper, plastics



3rd largest producer of vegetables
6th largest producer of fruits

GE Diesel Locomotive Facility, Marhaura
Alstom, Electric Locomotive Facility, Madhepura

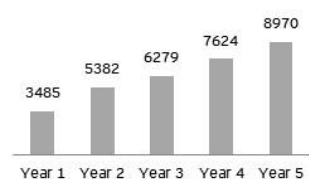
Focus area of the Technology Centre

1 Training

- CNC Mfg.
- Maintenance
- Tool and Die making courses
- Welding Courses
- Process automation

Over 80% of total revenue

Number of trained students



2 Production

- Mold, Die & Tool manufacturing
- Advance CNC Machines
- Heat Treatment facilities
- Reverse engineering
- Testing and Certification facilities

3 Consultancy

- Design Support
- Productivity improvement
- Support in training and up-skilling to ITI, Polytechnics, engineering colleges, Courses on Rural Artisan, Craftsman & Technician Training

4 Additional Key Areas

- Prototyping Facility
- Incubation Centre
- Emphasis on Renewable Energy
- Industry 4.0, IoT, AR, VR
- Technology Information Centre
- TCM support
- Agricultural/Rural & Traditional Enterprises Department (ARTD)

IRR: 7.8%

Positive income after depreciation is projected to be registered in 8th year

1 Introduction

1.1 Background and project rationale

India is one of the largest and dynamic emerging markets with vast economic potential. India's GDP in 2016 was USD 2,263,792 million ranking 7th amongst all countries¹. The objective of the Government of India's, 12th Five-Year Plan (2012-2017) is to return to GDP growth rates in excess of 8 percent, with strong emphasis on the manufacturing sector. Manufacturing has long been recognized as an essential driver of economic development for most countries, as it has an important economic and employment multiplier effect. The manufacturing sector will have to play an important role to take Indian economy to a high growth rate trajectory and achieve the planned objectives. MSMEs play an essential role in the overall industrial economy of the country and account for over 45% of India's manufacturing output².

Despite strong potential, India's manufacturing performance has not been encouraging. The share of manufacturing in India's GDP has stagnated at around 16 percent³, compared to more than 30 percent (and growing) in some of the other Asian countries. Many new initiatives have been taken by the Government to promote investment in manufacturing in the country. Under the Make in India initiative, the Government of India aims to increase the share of the manufacturing sector to the gross domestic product (GDP) to 25 per cent by 2022, from 16 per cent, and to create 100 million new jobs by 2022.⁴ India's manufacturing sector has been facing challenges, such as low value addition, low productivity, and less-than-desirable up scaling. However, world-class production units that compete in the international market are observed in the automotive sector.

The major constraints in the growth and competitiveness of India's manufacturing sector are:

- ▶ Difficulties in accessing markets (including within India),
- ▶ Difficulties in accessing finance (especially for MSMEs),
- ▶ Infrastructure deficiencies and
- ▶ Difficulties for MSMEs to access technology and lack of skilled manpower.

These constraints impact the competitiveness of MSMEs operating in both upstream and downstream manufacturing industries.

Upstream industries, such as the tooling industry, which consists of developing and manufacturing of dies, moulds, castings, as well as testing and prototyping, serves as an interface between product

¹ <https://databank.worldbank.org/data/download/GDP.pdf>

² <http://www.dnb.co.in/Nashik2013/PDF/MSMEsInIndia.pdf>

³ The Manufacturing plan - Strategies for accelerating growth of manufacturing in India in the 12th Five Year Plan and beyond

⁴ IBEF - <https://www.ibef.org/industry/manufacturing-sector-india.aspx>

design and product manufacturing. The right tools help increase throughputs, reduce material waste, improve product quality, time to market and thus improve competitiveness. The importance of the tooling industry increases with accelerating technological developments, product sophistication/ innovation/ customization and reducing time to market. Tooling is a specialized but local industry (more than 60 percent of tools in the world are locally produced and consumed – including in India) dominated by MSMEs (more than 80% of firms in India, Europe, US and Japan). As in other countries, the private tooling industry in India has grown hand in hand with the manufacturing industry. It is estimated that the total tooling market in India will reach to INR 20,000 Cr by FY 2020 with CAGR of 11% from current market of INR 14,640 Cr (FY 2016-17) over the next three years (TAGMA Report 2016-17). The constraints to the growth and competitiveness of the Indian tooling industry mirror the ones affecting manufacturing as a whole, as articulated above. The scarcity of skilled workers and problems related to their retention, as well as the lack of access to a high-quality design and prototyping facility has hurt growth.

In downstream industries such as automotive, electronics, fragrance and flavours, glass, leather, toys etc., there is shortage of skilled labour and limited access to advanced technologies. These industries include large numbers of MSMEs, often working as part of supplier networks of larger enterprises and subject to increase international competition.

1.1.1 Demographic overview and challenges

While India stands to benefit from an immense demographic dividend (with more than 62% of its population in the working age group of 15-59 years⁵, it has an overall unemployment rate of 5 percent (under usual principal status approach) and an overall labour force participation rate of 50.3 percent⁶. For the country to gain from this demographic dividend, skilling and up-skilling its youth are key priorities for the Government of India (GoI).

India has a labour force of about 470 million, of which less than 10 percent has received skills training, either through formal or informal means⁷. About 26 million young people enter the labour force annually. Despite the huge expansion of skills training provision during the 11th Five-year plan, the country's skills development system requires massive up scaling. In its 11th and 12th Five-year plans, India recognized that skill development is critical to achieve faster, sustainable and inclusive growth on one hand, and to provide decent employment opportunities to the growing young population, on the other hand. According to the National Skill Development Policy 2015, there is an

⁵ National Policy for Skill Development and Entrepreneurship 2015

⁶ Report on the Fifth-Annual employment & unemployment survey (2015 - 2016) of the Ministry of Labor, Government of India.

⁷ 11th and 12th Five Year Plan

additional net incremental requirement of 109.73 million skilled manpower by 2022. This will add another 104.62 million persons to be skilled to meet the target.⁸

Global experience shows that a workforce with higher education and skill levels leads to higher productivity and personal income. A 2011 study showed that students who attended three-year vocational training courses at ITIs earned 25 percent more than two-year course students, who earned 14 percent more than did one-year course students⁹. These results were also observed in a 2007 study showing that the returns on vocational training in India have been found to be 8 percent, almost equivalent to the 8.4 percent related to an additional year of education. The same study showed that increased educational attainment by one year is associated with 5.8 percent higher firm-level productivity in India¹⁰.

Development of Indian manufacturing sector calls for deepening and recalibrating of economic reforms that would strengthen the sector and make it grow faster and become an engine of inclusive growth. To realize the potential of the manufacturing sector, Government of India had announced National Manufacturing Policy in 2011 with the objective of enhancing the share of manufacturing in GDP to 25% within a decade and creating 100 million jobs. It also seeks to empower rural youth by imparting necessary skill sets to make them employable. Sustainable development is integral to the spirit of the policy and technological value addition in manufacturing has received special focus.

The National Manufacturing Policy has six objectives:

- ▶ Improve manufacturing sector growth rate to 12-14% over the medium term to make it the engine of growth for the economy. The 2 to 4 % differential over the medium term growth rate of the overall economy will enable manufacturing to contribute at least 25% of the National GDP by 2022.
- ▶ Increase the rate of job creation in manufacturing to create 100 million additional jobs by 2022.
- ▶ Creation of appropriate skill sets among the rural migrant and urban poor to make growth inclusive.
- ▶ Increase domestic value addition and technological depth in manufacturing.
- ▶ Enhance global competitiveness of Indian manufacturing through appropriate policy support.
- ▶ Ensure sustainability of growth, particularly with regard to the environment including energy efficiency, optimal utilization of natural resources and restoration of damaged/ degraded eco-systems.

⁸ <http://www.skilldevelopment.gov.in/assets/images/Skill%20India/policy%20booklet-%20Final.pdf>

⁹ Vocational Training in the Private Sector (Goyal 2011)

¹⁰ The Knowledge Economy and Education and Training in South Asia (World Bank 2007)

1.1.2 Recommendations of 12th plan working group & Parliamentary Standing Committee

At present, the Office of Development Commissioner [O/o DC (MSME)], Ministry of Micro, Small and Medium Enterprises, operates 10 TRs and 8 TDCs (both hereinafter called as TCs) spread across the country. The TCs have been providing technical and vocational training programmes to more than 1, 00,000 trainees annually including AICTE and NCVT approved certification. They also provide design and manufacturing support to entrepreneurs alongside technical consultancies. The TCs' primary focus is to improve access to advanced technologies, provide technical advisory support to entrepreneurs and workers, and offer opportunities for technical skill development to the youth at varying levels. The variance in levels of training itself is demonstrative of a wide spectrum of technical sophistication in training inputs.

Considering the performance of existing TCs, the Department related Parliamentary Standing Committee on Industry, in its 235th report submitted to Rajya Sabha on 04th May 2012 have recommended as follows:

- i) “The committee is impressed with the performance of the TRs established by the MSME Ministry. These enable the youth to improve their skills and get employment opportunities. The success of such TRs inspires confidence that establishment of more such institutions will equip the young people with necessary ability useful in the expanding market and manufacturing sector”.
- ii) “The Committee strongly recommends that more funds must be allocated for establishment of TRs across the country. It is understood that MSME Ministry is also approaching the concerned organizations within Government to get loan from International Financial Institutions. If Planning Commission and Finance Ministry cannot allocate more funds for this purpose, the necessary permission to MSME Ministry to get access to borrowings from international banks may be given without delay. However, it is strongly recommended that we must use our own resources for this cause, which is good for the youth of our country and MSME sector”.

The evaluation of existing ten TRs was undertaken under GIZ-MSME Umbrella Programme during 2011. The experts have appreciated the performance of the existing TCs and have recommended expansion of skill development activities and introduction of newer technologies in the TCs.

Hon'ble Finance Minister on 28th Feb 2013, in his budget speech 2013-14 has made following announcement:

Para 75: “TRs and TDCs set up by the Ministry of MSME have done well in extending technology and design support to small businesses. I propose to provide with World Bank assistance, a sum of Rs.2200 crores during the 12th Five Year Plan period to set up 15 additional Centres”.

In pursuance of (i) the Finance Minister’s announcement through his Budget speech (2013-14), (ii) the recommendations of the Department Related Parliamentary Standing Committee on Industry in its 235th Report submitted to Parliament (Rajya Sabha) on 4th May 2012, and (iii) the recommendations of the experts after evaluating the performance of existing TCs, it was proposed to implement “Technology Centre Systems Programme (TCSP)” at an estimated project cost of Rs.2,200 crores including World Bank assistance of USD 200 million by setting up 15 new TCs and to modernize / upgrade existing TCs by introducing latest machinery / technologies.

1.1.3 Technology Center System Program

The Technology Center System Program, a national program, seeks to develop the technological and skill base of MSMEs in selected manufacturing industries, via upgraded and new TCs (currently called TRs and TDCs) has been envisaged. The TCs’ mission would be to improve the competitiveness of MSMEs across India - with a strong emphasis on low income states.

This will be achieved by providing an integrated suite of services to MSMEs on a fee basis, ranging from providing them access to technology, access to skills and access to business advisory services. TCSP will reinforce the technical capability of the TCs as well as their performance, by further increasing the participation of the private sector in key decisions at both the national and local levels.

The TCs shall support industry clusters across manufacturing value chains, both upstream (tooling industry) and downstream (key industries exposed to global competition close to the technology frontier, such as the automotive and electronics sectors, as well as industries evolving through indigenous innovations, such as fragrance and flavour, glass, leather, toys etc.).

The PDO has been defined to enhance the competitiveness of MSMEs by improving their access to technology and business advisory services as well as skilled workers through systems of financially sustainable TCs. The program seeks to establish 15 new TCs and upgrade technological capabilities of the existing TCs and develop linkages between MSMEs, Indian and international research institutes and leading manufacturers. The program will connect leading practices that will contribute to advance technology, knowledge, skilling and innovation that can be transferred to MSMEs served by each TC.

The competitiveness of MSMEs is impacted by various factors such as entrepreneurial drive of the leader, market and customer dynamics, their access to technology, finance & business advisory and availability of skill manpower. The TCs will shape the outcomes of the program by providing MSMEs access to technology, business advisory and skilled manpower. So it would be possible to measure

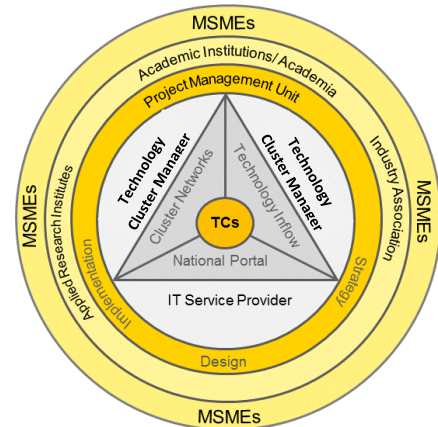
the success of this program by measuring the off-take of these paid services of the TCs by MSMEs. Therefore, the key indicators that will be measured are;

- ▶ Number of enterprises paying for the services of the TCs.
- ▶ Number of long term trainees employed by industry, including MSMEs, within six months after being trained at TCs.
- ▶ Profit of TCs before depreciation and land.

In addition, intermediate result indicators are designed to monitor critical progress towards achievement of the PDO with primary emphasis on market-tested outputs of the TCs supported by TCM. Examples of such indicators include capacity utilization of machines; trainees trained access to services by MSMEs, number of technology strategies / roadmaps developed by TCM and endorsed by industry associations and value of TCs' businesses generated with support of TCM.

This program will help MSMEs in key industries to become more competitive by acquiring improved technology and employing better skilled workers. This will be done directly through the services provided to them by the TCs, as well as indirectly through their linkages with larger firms (e.g. as part of the supplier network of an OEM), which will have access to the services of the TCs under the condition that it benefits their suppliers. The TCs will contribute by providing inputs to MSMEs on manufacturing technology & business advisory and by improving the skills of workers/ skill seekers who can gain better employment opportunities. The program will therefore benefit the Indian MSMEs, students and workers and help establish systems of TCs in the country where each centre will gain from the specialization and experience of the other and improve the competitiveness of MSMEs.

Figure 1: TCSP eco-system



1.1.4 Key TCSP stakeholders

TCSP has multiple stakeholders who will need to work together to achieve the objective to enhance the competitiveness of MSMEs by improving their access to technology and business advisory services as well as skilled workers through systems of financially sustainable TCs. The key players who will participate in the program include:

▶ Beneficiaries

MSME units will be the prime beneficiaries of the program and the overall objective of the program centers around providing them with access to modern technology, business advisory services and skilled workforce. Workers, job and skill seekers will also gain from this program with access to short

term and long term training/ skill development courses which will help them in improving their career prospects and finding livelihood.

► **Office of Development Commissioner, Ministry of MSME (DC-MoMSME)**

The program would be designed and implemented under the aegis of the O/o Development Commissioner MSME, Government of India.

► **Technology Centres**

The TCs will act as the medium through which the services of the MSMEs - integrated suite of services on a fee basis, ranging from providing them access to technology, access to skills and access to business advisory services. The program will focus on up-gradation of select existing TCs and 15 new TCs that support or will support industry clusters across manufacturing value chains, both upstream (tooling industry) and downstream (key industries exposed to global competition close to technology frontier, such as automotive electronics, as well as industries evolving through indigenous innovations, such as fragrances and flavours, footwear, glassware, toys etc.).

► **Industry associations, academia, applied research institutes and others**

Strategic collaborations between TCs and various other organizations will be critical to foster research and development, idea incubation and strengthen the TCs with regard to manufacturing services, business advisory and training capabilities. These include:

- Regional / sectorial industry associations representing MSMEs.
- Regional / national level engineering/ academic / vocational training institutions.
- Applied research institutes.
- Local regional colleges.
- Autonomous institutes such as IISc, CSIR.
- Academia.

Leading practices from around the world for similar program suggest and underscore the importance of establishing such linkages. In the Indian context, there are many research oriented projects and concepts that can provide competitive advantage to Indian industry once the early state research emanating from applied research institutes and academia can be validated and implemented at the TC through such collaborations. The TCs will provide a unique environment of bringing the country's leading academics, engineering and industry professionals together to develop and demonstrate new

technologies on an industrial scale. This will allow the clients of TCs to develop new manufacturing processes in a safe, neutral setting, reducing the associated financial risks.

► **Program management unit (PMU)**

The PMU will assist the O/o DC MSME in designing and implementing this program. This will include developing framework for identifying sites/sectors for the new TCs, developing Detailed Project Report (DPR), support in procurement of services and Environmental Protection and Compliance (EPC) contracts; developing and implementing environment and social safeguards, monitoring and evaluation, manage the roll out of the IT Portal and ERP Implementation Partner, deployment of subject matter expertise and overall program management for TCSP over 6 years. EY LLP has been appointed as the PMU for the TCSP by the O/o DC MSME.

► **Technology Cluster Manager (TCM)**

Technology Cluster Manager (TCM) will help build capacity of the TCs to enhance economic development cooperation amongst key stakeholders to improve the competitiveness of the cluster. This will include strengthening market linkages of the TCs with the MSMEs in the cluster it serves, trade and industry associations, academia, educational institutions, applied research institutions, service providers, other government support institutions, workers and skill seekers.

TCM will enhance the competitiveness of the cluster business environment by establishing a network of service providers which will address the needs of the MSMEs not served by the TC e.g. access to a network of financial services. TCM will also facilitate closer cooperation between the TC and MSMEs with key innovation stakeholders such as applied research institutes, autonomous institutions such as IITs, IISc, CSIR, academia, skill seekers, and students etc. to enhance product and process innovation.

TCM will also help enhance the supply side of the TC by augmenting the technologies at the TCs, assist in their capacity building with respect to the identified technologies and clusters and provide greater support to the services being offered to the MSMEs by the TCs. These services include being exposed to the potential impact of new and relevant technologies, learning how to use new technologies/equipment, providing access to cutting-edge equipment, developing and testing new products, consultancy, training and deploying efficient techniques and practices that improve the competitiveness of the MSMEs being served.

► **IT Portal and ERP Implementation Partner**

TCSP will support an Online Portal for MSMEs and a common ERP for the TCs with the vision of “creating an interactive technology platform for the needs of Ministry of MSME, Technology Centres and MSMEs for collaboration and information dissemination”. The portal will act as a common platform for information dissemination, services and support across many aspects of business that will be required by an MSME from the start of their business, to successful operations and growth e.g. access to Ministry’s MSME schemes, TCs’ services, MSME-relevant tenders published by Government departments and PSUs, central MSME databank etc. Through this portal, users will also be able to access (virtually) most of the technical information and training services provided by the TCs. A robust Monitoring & Evaluation mechanism will also be an integral part of the platform to help track the outputs and outcomes of the programs being run at level of TCs and under the ambit of TCSP.

Under the project, a fully integrated, robust & internationally recognized ERP solution is planned to be implemented for all the TCs encompassing functionalities such as Accounting and Finance, Purchase & Contract Management, Stores & Inventory Management, and HR and recruitment. The ERP would assist TCs carry out the essential functions in a standardized and efficient way. This ERP solution is also envisaged to help TCs collaborate among them on various business/non-business activities and thereby add greater value to the MSME value chain. Becoming centers of excellence on this product is also one of the long term objectives for some of the TCs, enabling them add additional source of revenue via imparting industry-accepted professional training courses & certifications on the ERP package to the MSME sector.

► **Construction Management Consultant (CMC)**

The Construction Management Consultant shall be responsible for design, supervision of work and final closure of construction works for the TCs. CMC will prepare concept plans and subproject appraisal reports, carry out contract planning and detailed engineering designs, prepare schedules of quantities and specifications. It will support the PMU in preparation of procurement packages, bid documents, invitation, receipt and evaluation of bids etc. CMC will supervise the construction, manage the contract, monitor construction activities and will certify contractor’s progress claims, carry out quality control, testing, and prepare progress and monitoring reports, and certify bills. M/s Tata Consulting Engineers Ltd. has been selected as the CMC for the TCSP by the O/o DC MSME via competitive bidding as per World Bank guidelines.

1.1.5 RFD of TCSP

- ▶ TCSP's objective is to enhance the competitiveness of MSMEs by improving their access to technology, business advisory services as well as skilled workers through systems of financially sustainable TCs. For monitoring the program outcomes, RFD has been defined; which contains the results indicators at the PDO level and intermediate outcome level together with the baselines and targets over the life of the program. Intermediate results indicators are designed to monitor critical progress toward achievement of the PDO with primary emphasis on market-tested outputs of the TCs and other stakeholders of the TCSP (viz. TCM, IT Portal and ERP Implementation Partner).

Active participation of General Manager of TCs will be essential for steering the operationalization of TCSP in line with the envisioned mandate. The key success parameters of the General Manager include:

- ▶ Revenue earned by respective TC from,
 - Production
 - Training
 - Consultancy and other services
 - Business given to private tool rooms
 - Production/training/consultancy with the help of TCM (territory/sectors to be identified Jointly by TCM in advance)
- ▶ Recovery ratio--Revenue/ recurring expenditure (cash) in percentage
- ▶ Profit before depreciation
- ▶ Profit after depreciation
- ▶ No. of trainees trained in Long term & Short term training programme
- ▶ No. of courses identified which are suitable for women employment & courses designed and started (TCM to assist the identification and designing of courses)
- ▶ No. of units assisted , out of which how many are MSMEs
- ▶ Present technical papers showing successes delivered and how it has aided industry
- ▶ Technical incubation centre to be started and the long term trainees to be encouraged to register for starting enterprises

The table below depicts the snapshot of result indicators which form a part of the RFD.

Table 1: Result indicators of the RFD

Program development objective indicators		 Number of enterprises paying for the services of TCs
		 Number of long term trainees employed by industry, including MSMEs, six months after graduating from the TCs
		 TCs' gross profit before depreciation (not including land)
Intermediary Results		
Component 1- Technical assistance to the existing and new TCs	Access to technology	 Revenue of TCs from access to technology activities (production support and consultancy)
		 Capacity utilization of machines in TCs
		 No. of technology strategies/roadmaps developed by TCM and endorsed by industry associations and IC
	Access to skilled workforce	 Number of trainees trained (direct program beneficiary)
		 Number of skills development contents (e.g. curricula, standards, certifications) developed and adopted by industry associations, and/or certifying agencies
	Access to business advisory	 Number of needs assessment and business plans developed by TCM and endorsed by Industry Assocs.
		 Value of TCs' businesses generated with support of Technology Cluster Managers
		 Number of users of IT Platform
		 Number of new TCs built
Component 2-Investments to upgrade existing and develop new TCs		

1.2 Existing MSME TCs and feedback on other TRs

Out of the currently operational eighteen TCs & TRs, ten are for the tooling industry and eight are for other industries such as ESDM (electronics system design and manufacturing), glass, footwear, and fragrance and flavour industries etc. Half of these eighteen TCs are located in low income states (Uttar Pradesh, Madhya Pradesh, Odisha, Jharkhand and Assam). The TCs are self-sufficient institutions that provide training, manufacturing and consulting services to MSMEs and OEMs. They have created a niche in the market in various fields such as hand tools, plastics, automotive, lean production etc.

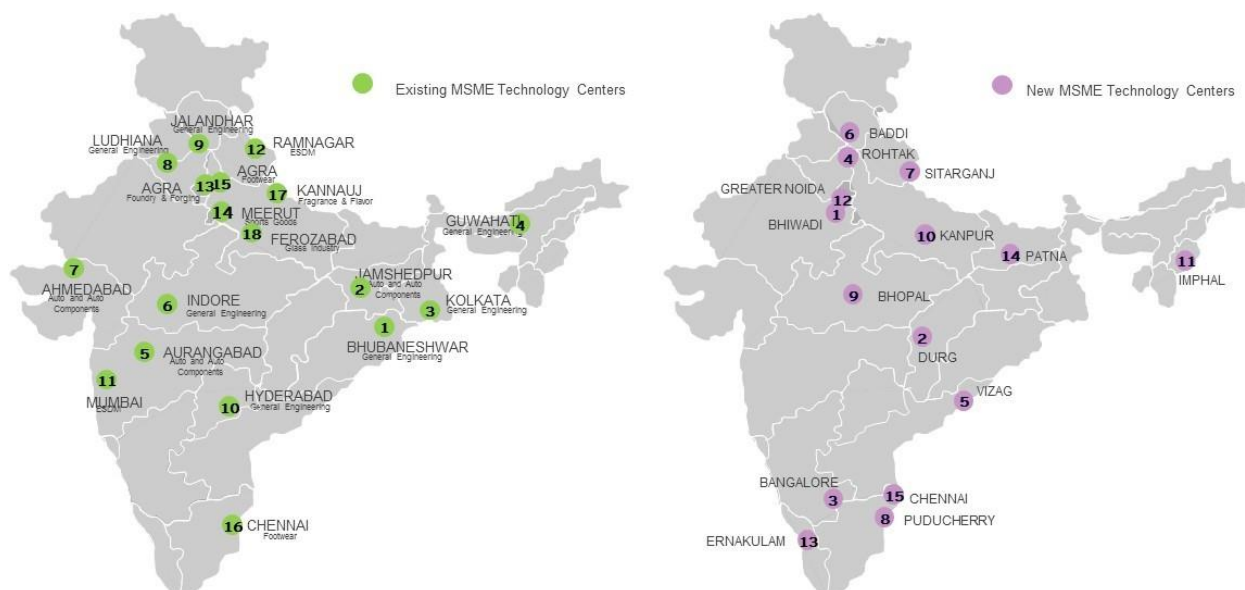
The list of the existing TCs & TRs along with their specializations is given below:

Table 2: Existing TCs & TRs along with their specializations

S. No.	Name	Specialization
1	Central Tool Room & Training Centre (CTTC), Bhubaneswar (Odisha)	Tooling, precision manufacturing and training
2	Indo Danish Tool Room (IDTR), Jamshedpur (Jharkhand)	Tooling (specialization in automotive) & training
3	Central Tool Room & Training Centre (CTTC), Kolkata (West Bengal)	Tooling & training
4	Tool Room & Training Centre (TRTC), Guwahati (Assam)	Tooling & training
5	Indo German Tool Room (IGTR), Aurangabad (Maharashtra)	Tooling (specialization in automotive) & training
6	Indo German Tool Room (IGTR), Indore (Madhya Pradesh)	Tooling (specialization in automotive and plastics, contributing to medical) & training
7	Indo German Tool Room (IGTR), Ahmedabad (Gujarat)	Tooling (specialization in plastics, contributing to automotive) & Training
8	Central Tool Room (CTR), Ludhiana (Punjab)	Tooling & training
9	Central Institute of Hand Tools (CIHT), Jalandhar (Punjab)	Tooling (specialization in hand tools)
10	Central Institute of Tool Design (CITD), Hyderabad, (Andhra Pradesh)	Tooling & training
11	Institute for Design of Electrical Measuring Instruments (IDEMI), Mumbai, (Maharashtra)	ESDM, tooling and training
12	Electronics Service & Training Centre (ESTC), Jamnagar (Uttarakhand)	ESDM and training
13	Process and Product Development Centre (PPDC), Agra (Uttar Pradesh)	Foundry & forging and training
14	Process cum Product Development Centre (PPDC), Meerut (Uttar Pradesh)	Sports goods and training
15	Central Footwear Training Institute (CFTI), Agra (Uttar Pradesh)	Leather footwear & training
16	Central Footwear Training Institute (CFTI), Chennai (Tamil Nadu)	Leather footwear & training

S. No.	Name	Specialization
17	Fragrance & Flavour Development Centre (FFDC), Kanauji (Uttar Pradesh)	Fragrance & flavours and training
18	Centre for Development of Glass Industries (CDGI), Firozabad (Uttar Pradesh)	Glass and training

Figure 2: Location of existing TCs and New TCs



Several of these were set up through support from German and Danish Governments and under bilateral agreements with the UNIDO. These TCs are largely self-sustaining entities that have been providing technical and vocational training programs to more than 1, 00,000 trainees annually. Some of these include certificate training programs certified by the AICTE and NCVT. They also provide design and manufacturing support to entrepreneurs alongside technical consultancies.

The existing TC's, were set up between 1967 and 1999, with primarily focus on improving access to technologies and providing technical advisory support for entrepreneurs in the given industry cluster they serve. These TCs also serve workers and youth by offering opportunities for hands-on technical training and skill development in varied trades with a view to improve employability and livelihood opportunities.

The key services offered by the TCs mainly include:

a) Design & manufacturing

- ▶ Design & Manufacturing of Tools, dies, moulds and precision tools,
- ▶ Process Development,
- ▶ Product Development.

b) Skill development

- ▶ Long & short term training programs,
- ▶ Areas include Tool and die making, Computer Aided Design (CAD), Computer Aided Machining (CAM), CNC (**Computer Numerical Control.**) ,Robotics and machine shop automation, Rapid Prototyping (RPT), mechatronics, welding etc.,
- ▶ International, modular and customized programs,
- ▶ Varies from school drop outs, SSC / HSC / pass outs, ITI pass outs, diploma holders and graduate engineers.

c) Consultancy

- ▶ Inspection & calibration facilities,
- ▶ Turn-key assignments,
- ▶ Course curriculum developments for ITIs and other institutions

Over the last few years, financial performance of the TCs has markedly improved. Most of them have experienced strong revenue growth (mostly due to training activities) and have achieved financial sustainability (before depreciation and land costs).

Some of the preliminary findings from the analysis show:

- a) High profitability in recent years:** There has been an improvement in recovery ratio of these TCs, thus allowing them to progress towards their self-sustainability mandate. Each of these 8 MSME TRs has become profitable in the last two years. From our discussions, we understand that IGTR Indore and CTR Ludhiana were not profitable in recent years; however, these centres have also corrected their recovery rates in 2012-13. In addition to these institutes, some of the other institutes are yet to reach the recovery ratio of 100%.
- b) Skewed / Tilted towards training:** Training and skill developed services have been a key revenue source for the TCs. The scope of manufacturing needs to be up-scaled to achieve a balance in operations and revenues from each TC. Ideally, revenues should be balanced between the two main sources of income for the TCs. Only IGTR Aurangabad is found to be closely balanced. CITD Hyderabad and CTTC Kolkata, although profitable, need to perhaps enhance their production activities.
- c) Focus of production activities is more towards job work or component production:** It was found that the utilisation of machines in the production area was focused on component production and facilities for designing, die casting or tooling were not being fully utilized. CTTC Bhubaneswar and IDTR Jamshedpur focus on component production while CTR Ludhiana on job work and IGTR Indore and CTTC Kolkata on jigs and fixtures. Only IGTR

Aurangabad and CITD Hyderabad were found to focus on specialization in production, including designing, such as die casting and sheet metal or press tooling.

- d) **Training capacity is well utilized:** As reflected in the sources of revenue generation, the scale of training activities has been growing. All TCs initially reviewed, demonstrated an increase in production numbers from 2016 to 2017, however training forms the majority share of the earnings. The staff at these TCs needs to further focus on production to maintain a balance between these two activities, while also up scaling other activities like consultancy and product testing. The centres should also seek avenues for taking advantage of government sponsored schemes and subsequently train more technicians in welding, machining and in automation.

1.3 Evaluation study of TCs and recommendations of the experts

A study of selected MSME TRs in India on '*Strategic Assessment and Recommendations*' has been submitted under the '*Micro, Small and Medium Enterprises Umbrella Programme*'. The purpose of the study was to make comparison of the TRs with international TR programmes. An integrated set of ten recommendations have been made to increase the impact of the TR programme - reducing constraints to manufacturing MSME growth which are as follows:

- ▶ **Scale up training to meet market demand** - TCs should contribute trainees in greater numbers. The gap in the supply of advanced manufacturing skills will systematically reduce.
- ▶ **Support private tooling sector to mature to excellence** - Besides 10 government TRs, hundreds of private TRs contribute to increased manufacturing MSME competitiveness by providing more complex tools at lower prices.
- ▶ **Speed up absorption of advanced manufacturing technology** - Increased numbers of MSMEs will be able to access advanced technologies which enables them to secure larger contracts at better margins.
- ▶ **Engage in strategic partnerships** - Partnerships with large manufacturers can help realise large scale opportunities for manufacturing MSME. TCs can benefit from large scale and long lasting demand for services and increased revenue.
- ▶ **Systematically build and leverage networks of capacities** - The TCs should build a network of collaborating stakeholders to support the TCs to unlock more opportunities. Sub-contractors can enable TRs to expand the scale and scope of their services.
- ▶ **Re-organise "business model" of government TRs**- the TCs should function as autonomous business units with increased powers and accountability, increase job enrichment and control over own wellbeing. These teams are likely to become more motivated, innovative, leaner and more responsive to customers.

- ▶ **Map out the TRs role in the local innovation system** - TCs can benefit from integration with the local innovation system. Increased opportunity will result from increased stakeholder awareness and support.
- ▶ **Move away from hierarchy to network governance** - TCs will benefit from more autonomy which enables them to respond better to opportunities.
- ▶ **Establish a strategic framework** - TCs should utilise a coherent strategic framework which clearly articulates programme goals, sound economic development principles and good practices. Revised KPIs should promote sound strategy that result in greater, sustained development impact.
- ▶ **Establish a strategic facilitation capacity** - TCs should learn faster to achieve greater development impact. TCs should be at an international level of competitiveness.

During our discussion with TCs, it was conveyed that several studies have been undertaken by O/o DC MSME to analyse the technology capabilities and governance framework established at the existing TCs. The key findings from these studies are summarized as follows;

A study was undertaken to analyse the technology, organization and training at select MSME TRs, including CTTC Bhubaneswar in November 2012. The key findings of the analysis for CTTC Bhubaneswar are as follows:

▶ **Technology**

- The average milling machine age is a higher compared to the reference groups,
- Multiple machine work is not accomplished limiting the potentials in productivity,
- The number of unproductive machines is significantly lower compared to other MSME TRs,
- The share of set-up times is conspicuously low and is therefore subject to review,
- The technology relevance distribution is different to other TCs, as the turning technology is an important technology for the component production,
- The grinding technology shows potential for higher performance particularly with regard of high precision machining for aeronautical components,
- The technology analysis shows machinery characterized by a high machine performance

▶ **Organization**

- Towards the customer this is compensated by a large portion of products being delivered early, - 4 out of 5 orders will reach the customer on time,
- Late orders occur infrequently and are in line with the international competitive standard,
- The experience, process quality, and customer focus is also represented by high customer satisfaction,
- High manpower in the quality management department ensures the high quality of the products,

- Quality assurance is also exercised by the departments individually to operate with process orientation,
- The customer group can be considered focused by the standard of the other MSME TCs,
- A short average job tenure is an indicator for future sustainability and a stable process structure,
- CTTC Bhubaneswar successfully exploits the benefits of customer focus and product portfolio - The next step has to be undertaken by adding an electronic planning and control system

► **Training**

- The development of further courses on automation and systems should be continued,
- Even though an advanced process understanding is existent in manufacturing it is not sufficiently transferred to training,
- The analysed courses comprehensively attend to the necessary key know-how of machine operators, programmers, and designers in the mid-term format.

The key recommendations made in the report were as follows:

► **Technology**

- Holding the high machinery performance level with the help of machine investments - large size milling machines and grinding machines,
- Rationalization and standardization of all manufacturing processes,
- Reduction of in-machine set-up times using zero-point clamping systems and pallets,
- Efficiency improvements by reduction of electrode milling and sink-EDM machining time by shifting to graphite electrodes.

► **Organization**

- Definition of requirements to improve planning and control of the order fulfilment process by developing an electronic planning and control system.

► **Training**

- Development of a link between manufacturing competencies and course offerings by setting-up of course offerings addressing organizational capabilities and component manufacturing,
- Establishment of modular course structure for advanced training of industry professionals.

All of the above recommendations are valuable not only for the improvement of the existing TCs but also it serves as an important input for conceptualizing and planning for the new TCs.

2 DPR objective and approach

2.1 Objective

Technology Centre in Patna has been proposed with the underlying fact and review of the catchment area which has multiple industrial areas and also has some of the leading units of plastics, food processing, leather, general engineering like cycle manufacturing units, agriculture implements etc. Further two major foreign direct investment (FDI) projects are coming up in Bihar. US based firm GE and leading French Transport Company Alstom are set to install their first diesel locomotive and electric locomotive factory respectively near Patna. The TC can provide training to up-skill the manpower and at the same time facilitate and support the MSME units which would come up across this region. The TC at Patna will play an important role in enhancing the competitiveness of the MSME units in the area. TC will focus on providing skill up-gradation, improving access to technology, and offering advocacy support to the MSMEs with high growth potential. The long term vision is to ensure competitiveness of the MSMEs in the eco-system by strengthening their linkages to the mainstream manufacturing sector in the region.

The objective of this DPR is to evaluate feasibility of proposed MoMSME TC at Patna. This include the assessment of the market needs in the region, technology and skillset requirement, amount of investment required, construction needed, its layout subsequent requirements for implementation of the greenfield TC at Patna. This DPR is prepared in consultation with relevant stakeholders including O/o DC MSME, Department of Industries, Government of Bihar, Bihar Chamber of Commerce & Industries, World Bank, Industry Associations, Government Institutes and some small manufacturing units in the region. This DPR would facilitate the implementation plan of proposed TC at Patna. Also, a stakeholder discussion at Patna was organised on 23 February 2018, which was chaired by Joint Director, Directorate of Industries, Government of Bihar and in the discussion representatives from various industry associations, industries, MSMEs participated. Their suggestions and views were also taken into consideration during the preparation of DPR.

2.2 Approach

To start with, a comprehensive secondary research was carried out to understand the tooling and technological requirements of the General Engineering Sector and in particular of the Patna region. To validate the facts, the team conducted a detailed primary research that included meetings with various key stakeholders including O/o DC-MSME, Industrial Associations and General Engineering units in the catchment and others as explained below.

Discussions with various stakeholders were carried out to develop better understanding of the requirements and expectations from the proposed TC. Leading players were met in this region to discuss and understand the various insights with respect to the tooling, General Engineering & other technological requirements during the preparation of the DPR. Telephonic discussions with some of

the General Engineering component manufacturers and suppliers across various regions were carried out. The objective of this primary research was to understand their business requirements, issues, challenges, and future requirements to develop a deeper understanding of the requirements that can be served by the TCSP in future.

Based on the outcomes and the results of the discussions, market opportunity assessment was undertaken to understand the tooling & technology demand in General engineering sector across various stages of manufacturing.

Way forward: Post completion of the DPR for the proposed TC at Patna under TCSP, the on-boarding of 2 main partners would be very critical to achieve the envisaged outcome in the defined time frame.

- ▶ **Construction Management Consultant** - For the development of the new facility, CMC will be selected for execution of the construction work under the TCSP.
- ▶ **Technology Cluster Manager** - Hiring of the TCM is under process for the TCSP project. The key purpose of TCM will be to assist in procurement of machines by providing inputs on technical specifications, adoption of new technologies available, designing technological roadmap etc. Also, TCM will assist TCs in marketing activities, provide linkages, cluster development etc.

[illegible]

3 Framework for Selection of Industry/ Clusters/ Systems/ Location for New TCs

3.1 Location selection framework

With the objective of establishing 15 new TC's to support industry clusters, there was a need to prioritize and identify high potential growth industries based upon certain selected parameters. Hence, one of the most challenging and critical aspect of the TCSP was selection of the Industry/Clusters/Systems/Locations. This required careful consideration of parameters and consultation with the stakeholders. Preliminary meetings with the O/o DC-MSME were held to discuss the concept and approach. Subsequently three distinct approaches were finalised to identify the locations:

a) **Manufacturing Competitiveness approach:** Key idea for this approach was to identify location for TC at a place where it can create the most impact on improving the manufacturing competitiveness. The steps involved were:

- ▶ Listing major manufacturing industries creating value across country
- ▶ Identifying the clusters which can be catalyst to the manufacturing competitiveness for respective industry

One key limitation of this approach is that it will select the clusters which are already established and are among the most competitive across the country. A TC at such location will further improve the competitiveness of this location.

b) **Inclusive Growth approach:** Approach is based on the assumption that the state which has higher Net State Domestic Product has significant growth and hence the states with lower per capita state domestic product should be supported. A TC in such states would become a catalyst to improve the manufacturing growth in the state. Following steps were followed:

- ▶ Identification of bottom 15 Low Income states on the basis of per capita Net State Domestic Product¹¹
- ▶ Identification of major manufacturing Industries in the selected states
- ▶ Identification of the major clusters for the identified major industries in the state

One of the key drawbacks of this approach is that clusters identified will not be the most competitive for the industry in the country. It is possible that by investing in a TC at such a location might improve the competitiveness of that cluster but this may not lead a world class centre TC.

¹¹ 2011-12 Current prices

c) **Alignment of Major Economic Projects:** Since a TC will create value for many years¹² and there are some mega projects in progress which will be completed in the next 10-15 years. This approach aims to incorporate the possible future growth areas on the basis of these mega projects. Considering that such economic growth is based on future development, these areas may not get covered in the above two approaches. The steps included are:

- ▶ Identification of major Economic projects & timelines (which have been ratified by the Government)
- ▶ Listing the States & Industries that are getting impacted
- ▶ Identifying the emerging clusters for the top industries

Above three approaches resulted in the first list of locations. It was important to create a common framework to choose the most appropriate location. In this context “systems approach” was applied. Systems approach takes in to account the presence of entire ecosystem for a TC in the catchment area¹³ and a **Location Attractiveness (LA) Index** was created.

A Technology Centre will perform better in achieving its objectives if it is established at a location with better LA Index.

Construct of LA Index:

$$\text{LA Index Score} = \text{Catchment Score} * \text{Presence of TC Score}$$

Catchment Score = f_x (MSME Unit Score * ITI/PT Score * Presence of Major Firms Score* Presence of Leading Technical Institute Score)

Presence of TC Score= Presence of state/private technology center in the catchment area

Following data prints were captured and analysed:

- ▶ Number of MSMEs, Number of ITIs /Polytechnics, Number of Major Firms, Leading Technology Institutes for R&D
- ▶ Existence of TCs in the Catchment area (inclusive of DC-MSME, State Government , and Private Tool Rooms)

MSME Units: This reflects the concentration of MSME and it is envisaged that larger the number of units more opportunity for TC to impact the competitiveness.

¹² Existing Technology Centers are more than 25 year old.

¹³Catchment Area = District of the location and all neighbouring districts (transcending state boundaries) it is assumed that maximum value creation will be in the immediate surroundings of the Technology Center.

Number of ITIs/Polytechnics: This reflects the availability of population seeking skill development courses. It has also been observed that students from ITI and polytechnic form a large group of students seeking vocational training at TCs due to lack of such facilities at their respective institutes.

Number of Major Firms: It has been observed that often larger firms take the initiatives to go for technology upgrades and performance improvements. This leads to cascading effect and firm's suppliers, competitors follow up these initiatives in order to stay competitive. If a TC has larger number of such major firms in the vicinity it will have more opportunity to do technology collaborations and thus impact the entire ecosystem.

Leading Technology Institutes: Each TC can play a vital role to establish an Industry- Academia partnership. It has been found that while there are researched ideas available at the academia but they have difficulty in commercializing same. On the other hand the industries are looking for the fresh ideas to improve upon their competitiveness in the market. Unfortunately this linkage does not happen as industry has the need for ideas where the proof of concept is ready but unfortunately academia does not go beyond research. TC can play a role of bridging this gap and create the platform to link industry and academia.

State/Private TC: TC can play a vital role in mentoring and improving the performance of the state government or private sector TCs (tool rooms). If there are such opportunities in the vicinity of the MoMSME TC it can further increase the reach of TC to improve the competitiveness of MSMEs.

The weightages assigned to each parameter were as below:

Figure 3: Weightage assignment

100				30				20		20		10		20	
				Catchment Area Parameters				Major Firms		Tech Inst.		Presence of state/pvt TR			
State	Industry	Location	Net Score	Units	Unit Score	ITI/PT	ITI/PT Score	Number	Score	Number	Score	TC of State Govt/ Pvt Tool Room	TC-State Govt/ Pvt Score		

In order to further refine the list of locations arrived using the above approach, following additional criteria for shortlisting the industries were incorporated:

- ▶ **Prior experience:** These are the sectors where O/o DC-MSME has experience of operating TCs, such as General Engineering, Automotive, Electronics/ESDM, Leather & Footwear, Glassware, Sports Goods, and Fragrance & Flavours
- ▶ **Concentration of MSME's:** These are sectors where O/o DC-MSME has limited prior experience of operating TCs, however there exist a large number of MSMEs in these industries. Such as Food processing, Textiles (including Handlooms & Handicrafts), Pharmaceuticals, Wood/Paper/Pulp, and Rubber & Plastics.
- ▶ **Emerging Sectors:** These are upcoming sectors that may be at the forming stage, but will become major sectors in the near future, such as Bio-technology, Nano -technology, etc.

The sector in which DC-MSME has prior experience has been taken on priority. These sectors are: auto components, ESDM, general engineering, fragrance & flavour, leather & footwear, glass. Later the scope can be expanded to include other sectors pertaining to ministries other than MoMSME, if needed. Such sectors include food processing, pharmaceutical, packaging etc. where presence of MSMEs is considerable.

The list of locations arrived by the above was further refined and finalised with respect to the following additional considerations;

- ▶ **State Classification:** The states were classified into two categories as unserved states and served states. All states of the country were distributed between Un-served states where O/o DC-MSME did not have an operating TC and served states where an operating MoMSME TC existed.
- ▶ At first unserved states were considered for the new TC in order to spread the coverage of MoMSME TC which would help in supporting more MSMEs across the country. With the approval of locations for the unserved states, served states would also be considered for the technologies for which existing TC cannot support.
- ▶ On the basis of MSMEs concentration in prior experience sectors, leading clusters were identified in each unserved state. This resulted in identifying the industry wise potential locations in each of these states.
- ▶ Some of the unserved states took proactive approach and have allocated or identified land for the purpose of TC. These locations were mapped to the locations identified in the step above. Accordingly technology focus was selected for these locations.

3.2 Selection of Patna location for setting up of new TC

In the 16th PSC meeting, it was decided to consider two new sites for development of new TC in lieu of the earlier identified sites at Pasighat and Sambha. The Bihar state government has allocated 15 acres of land for setting up a TC at Bihta, Patna. With the land availability, Office of DC – MSME advised EY to prepare a detailed project report for Patna TC. Patna region has been found suitable from multiple perspectives:

- ▶ Patna is the capital of Bihar which is one of the fastest growing states of India. The Gross State Domestic Product (GSDP) of Bihar grew at a CAGR of 12.14% between 2011-12 and 2016-17. A strategically beneficial location of Patna connects it to the eastern and northern parts of India.
- ▶ Patna has good connectivity with other key districts in Bihar being in the centre of the state and also with major cities like Jamshedpur and Kolkata. There are 3 National Highways accessible to Patna. The existing Air base at Bihta is proposed for a new airport which would be used for majority of the domestic and international flight travel after the revamp.
- ▶ The Eastern Dedicated Freight Corridor which involves the construction of a 1,839 km-long dedicated freight line will be one of the world's biggest cargo handling operations. It is planned to start at Ludhiana in Punjab and terminating at Dankui in West Bengal, while passing through the states of Uttar Pradesh, Bihar and Jharkhand.
- ▶ Patna consists of four Industrial Areas at Patliputra, Fatuha, Bihta and MIP Bihta and is in close proximity to the Hajipur Industrial Area.
- ▶ Industrial city of Hajipur has some of the leading plastic and packaging companies, food processing units etc. and is just 10 km away from Patna. A TC in Patna will help improve manufacturing competitiveness of the region.
- ▶ Indian Railways has signed contracts worth Rs.40,000 crore with General Electric Co. (GE) and Alstom to set up diesel and electric locomotive factories respectively. The projects will require locally trained skilled manpower for fabrication, painting, testing etc. jobs. The TC will play an integral role in training the manpower according to the requirement.

4 Location brief

4.1 Regional overview

Bihar is located in the eastern part of India. The state is surrounded by Nepal in the north, West Bengal in the east, Uttar Pradesh in the west and Jharkhand in the south. The topography of Bihar primarily comprises of the fertile alluvial plain occupying the north, the Gangetic Valley. The northern plain extends from the foothills of the Himalayas in the north to a few miles south of the river Ganges as it flows through the State from the west to the east.

The capital of Bihar, Patna is the largest city in the state. It is located on the banks of the Ganges River at 25.0961° N, 85.3131° E. The state enjoys a unique location specific advantage because of its proximity to the vast markets of eastern and northern India, access to ports such as Kolkata and Haldia and to raw material sources and mineral reserves from the neighbouring states. Patna is 580 km from Kolkata, 670 km from Haldia.

Patna is well connected by railway and road. It is accessible by NH 19, NH 30 and NH 83. The Golden Quadrilateral Highway passes through Bihar in the districts of Kaimur, Sasaram, Aurangabad, Gaya, and Patna. It is also connected to the Eastern Dedicated Freight Corridor which is 1,839km-long planned freight railway line extending from Ludhiana in the Indian state of Punjab to Kolkata. The nearest airport is Jay Prakash Narayan international Airport situated in Patna city which connects to important cities like Delhi, Mumbai Kolkata directly. To improve the infrastructure and meet the growing traffic demand, a new domestic airport is proposed at Bihta, which is 35 km from the Patna city. The Government, at the same time is working on a project to connect this proposed international airport on the outskirts of Patna, with a 40-km expressway and four-lane link roads.

The State Government of Bihar has introduced the Bihar Industrial Investment Promotion Policy 2016 in order to improve the investment climate in the state and envisages achieving the industrial development growth rate of 15% per annum. Bihar single window clearance system has also been initiated to provide rapid clearances, issue of licenses & certificates thus providing an overall investor-friendly environment in the state.



Figure 4: Location of Patna

Table 3: Patna District snapshot¹⁴

Section	Quantity/Value
Area (geographical)	3,202 sq. kms.
Administration	
Blocks	23
Panchayats	330
Villages	1157
Population	
Total	5,838,465
Male	3,078,512
Female	2,759,953
Literacy Rate	
Total	72.47%
Male	80.28%
Female	63.72%
Sex Ratio	892
Infant Mortality Rate	38 per 1,000 live births less than one year

Table 4: Bihar snapshot¹⁵

Section	Quantity/Value
Area (geographical)	94,163.00 sq. km
Administration	
Districts	38
CD Blocks	534
Villages	45,103
Population (Approx.)	
Total	10,40,99,452
Male	5,42,78,157
Female	4,98,21,295
Literacy Rate	
Total	61.80%
Male	71.20%
Female	51.50%

¹⁴ <http://gov.bih.nic.in/Profile/default.htm>, District Census Handbook 2011, Patna;

<http://health.bih.nic.in/Docs/Annual-Report-2011-12.pdf>

¹⁵ Bihar State Profile 2015-16, Ministry of MSME; National Family Health Survey - 4(2015-16), Bihar

Sex Ratio	918
Infant Mortality Rate	48 per 1,000 live births less than one year

Table 5: Status of Water, Electricity, Climate, Temperature in the Patna District

Aspect	Status	Significance for TC
Water Availability	▶ Execution, operation and maintenance of water supply in Patna is looked after by Bihar Rajya Jal Parishad, (BRJP), Patna Jal Parishad (PJP) under Patna Municipal Corporation, and Public Health Engineering Department (PHED). ▶ The water supply for Patna is drawn from ground water sources i.e. tube wells	▶ The water is drawn from surface sources so have to contact the PHED and Patna Municipal Corporation. ▶ Rain water harvesting system can help double the capacity of consumption.
Electricity Availability	▶ Electricity is distributed and supplied by North and South Bihar Power Distribution Companies Limited (NBPDC and SBPDCL)¹⁶	▶ Power Backup to be designed keeping emergency and essential services/equipment in mind
Climate	▶ The average annual rainfall measured in the region is about 1250 mm ▶ By and large sub-tropical climate	▶ Good amount of rainfall signifies that there is a high capacity of rain water harvesting in the TC campus
Temperature	▶ Patna witnesses extreme warm summers but pleasant winters. ▶ The temperature varies from 9 degree Celsius in winters to around 40 degree Celsius in summer season.	▶ Due to high temperatures in summers, there is a high estimation of capacity of AC to be installed for adequate cooling, designing of building.

¹⁶ Bihar Economic Survey 2017, Page 219

4.2 Demographic profile of the district

- ▶ The population Growth: The total population of Patna district is 58.38 Lakhs (census 2011). The growth of population in Patna district was 23.73% during the last decade (year 2001-11). Out of total population, 52.72% are men and 47.27% are women. Density of population is 1823 persons per sq. km.

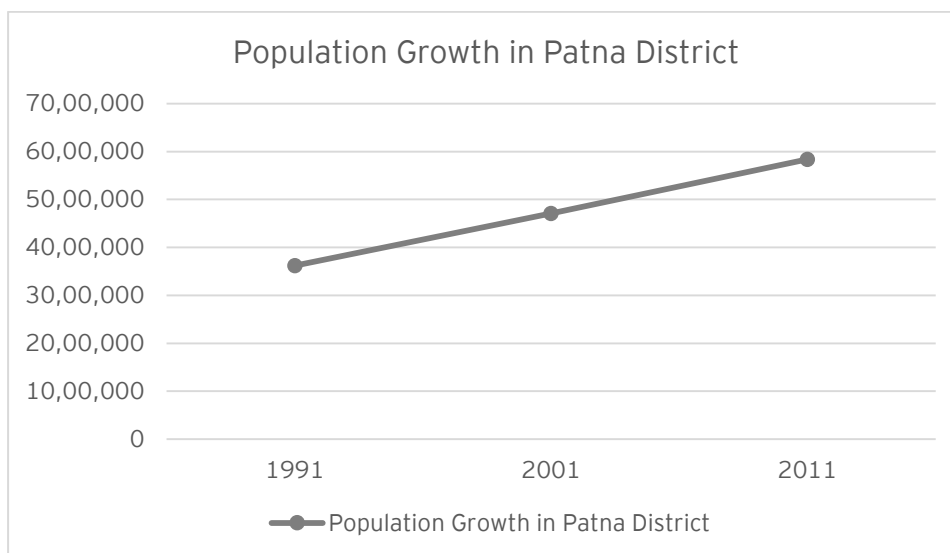


Figure 5: Growth of Population in Patna District¹⁷

- ▶ Patna district has an urban population of 43.06% and a rural population of 56.93% as per census 2011. In urban area, males constitute 53% of the population and women constitute for 47% of the population. In rural area, men constitute around 52.5% of the population and women constitute 47.5% of the population.
- ▶ The Literacy rate of Patna district is around 70.68%. Among male it is 78.48% and for females it is 61.96%.
- ▶ The sex Ratio at the district level is 897 females per 1000 males (year 2011).
- ▶ There are many popular spoken languages in Patna, but Hindi is the most commonly used and official language. English is widely understood though spoken by a few. The primary dialects spoken include Maithili, Magahi (Magadhi), Bhojpuri and Angika. People bordering Bengal speak Bengali as well.

¹⁷ http://www.censusindia.gov.in/2011census/dchb/1028_PART_B_DCHB_PATNA.pdf ; <http://gov.bih.nic.in/Profile/CensusStats-01.htm>

4.3 Regional Stakeholders

Regional industry associations, leading manufacturers, training institutes, applied research institutes, academia, thought leaders and above all MSMEs would play an important role in providing the guidance on key aspects including (but not limited) designing capabilities, technological requirements, skillset requirement and cluster development.

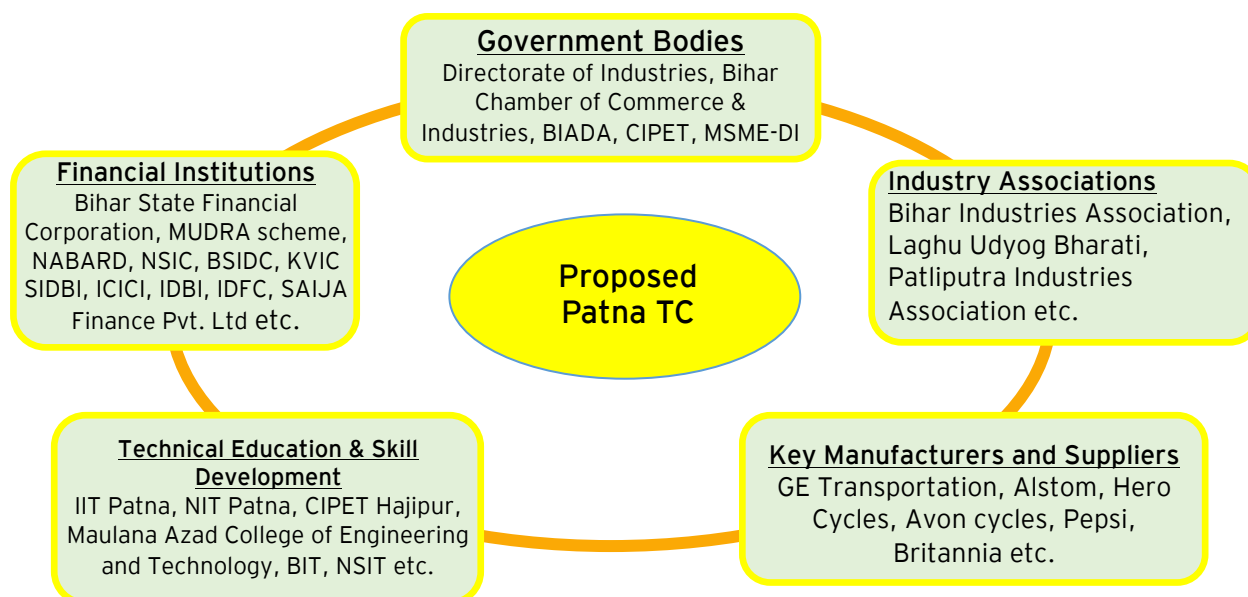


Figure 6: Stakeholders of Patna TC

4.3.1 Government Bodies

► Department of Industries, Government of Bihar

The Department of Industries is responsible for the growth of Industries in the state of Bihar and their sustainable development. Within the Department of Industries, there are important institutions which are meant for promoting Industrialisation in Bihar – Udyog Mitra, District Industries Centre (DIC) and Bihar Industrial Area Development Authority (BIADA). The main activities of the department include:

- Formulation of Industrial Policy and their implementation
- Creation of cohesive environment for Industrial Growth in the State of Bihar.
- Grant Registration to Small Scale Industries.
- Provide institutional and infrastructural support to industries.
- Provide extension and entrepreneurial training to employ youth/women.
- Allotment of Industrial Land and shed and creation of new industrial Estate/Food Park/Growth Centre etc.
- Create self-employment opportunities for unemployed Youth through Entrepreneurship training.

Udyog Mitra:

Established under the Societies Act 21, 1860, Udyog Mitra was formed in 2004 by dissolving and merging two societies - Industrial Data Bank & Single Window System. It is the Centre for Industrial Documentation and Information for Industrial Development and Promotional activities. The main purpose of Udyog Mitra is to disseminate relevant information to the investor pertaining to investment profiles for different industries and the various clearances required at the business entry stage. Being the promotional agency of the state, it conducts investor presentations, seminars, meets, conferences etc. for showcasing Bihar as a potential investment location. It also assists the investors and entrepreneurs by providing technical guidance and policy information for setting up of all kinds of industries. Udyog Mitra consists of an “Entrepreneur Assistance Cell.

District Industries Centre (DIC):

District Industries Centres (DIC) are responsible for promoting enterprises, particularly medium, small and micro enterprises at the district level. It was set up with the objective to accelerate industrialisation and attain economic equality across all districts. It provides assistance, required during the establishment of units. It is involved in implementation of Prime Minister Employment Generation Programme (PMEGP) in the districts. To facilitate the development of small enterprise, DICs have been entrusted with most of the administrative and financial powers. For purpose of land allotment, work sheds, raw materials etc., DICs functions under the ‘Department of Industries’. The key activities include:

- Economic investigation
- Plant and machinery
- Research, education and training
- Raw materials
- Credit facilities
- Marketing assistance
- Cottage industries

► Bihar Industrial Area Development Authority (BIADA):

BIADA was constituted under the statutory provision of the Bihar Industrial Area Development Act 1974 with a mission to promote and assist industrialisation and create awareness about the Industrial Policy of state as well as creating environment for consistent growth of Industries in the state. The objectives include¹⁸:

- To promote and develop infrastructure for industries in the industrial area such as road, drainage, water, power.

¹⁸ BIADA Website

- To help, support entrepreneurs to setup industries and provide assistance and incentives under the industrial policy of the State.
- Dissemination of Information about the Industrial Policy and create an investor friendly atmosphere in the state.

► **Bihar Chamber of Commerce & Industries**

The Chamber of Commerce & Industries is registered under Indian Companies Act. The Chamber strives to support and popularize Government's policies and assist in their implementation. It acts like a catalyst for the overall economic development of the State. In its bid to promote economic activities, the Chamber helped in the establishment of the Magadh Stock Exchange at Patna. The objective of the organisation is to extend assistance to the Government with respect to the policy formulation for the promotion of trade and industry in Bihar. Through such a supplementary role, it has built a bridge between the government and the business community which ensures the availability of variety of skills and experience to the private sector are channelized in the right direction. It primarily works to promote the aspiration of the people, and assists to the causes for rapid development of Industry and Trade. The Chamber maintains a non-political outlook. It also assists in building partnerships with the academic world to foster development of the economy. The Mission of the organisation is:

- To lead the economy of Bihar on the path of all round growth and development.
- To extend assistance to the Government to formulate well-researched policy positions that, reflect and promote the interests of trade and industry in Bihar.
- To influence the Government policies in a positive, visible, consistent and representative manner.
- To facilitate the members of the Chamber by holding consultations, conferences, seminars, open-house workshops and by providing them access to relevant and necessary information.
- To encourage national and overseas business delegations to visit Bihar to promote development of trade and industry as well as to bring new technologies to the State.

► **MSME-Development Institute (MSME-DI), Patna**

Micro, Small & Medium Enterprises Development Institute (formerly known as Small Industries Service Institute), Patna widely known as MSME- DI was established in 1957 for the purpose of promotion and development of Micro, small and medium Enterprises in the state of Bihar through implementation of policy guideline of the Ministry of MSME, GoI. It also facilitates promotion of entrepreneurship and skill development through its various training programs. The main aim of the Institute is economic up-gradation and employment generation through Industrial development. The primary activities and services performed include:

- Services and Schemes pertaining to MSME sector of Govt. of India

- Providing techno-economic and managerial consultancy, common facilities and extension services to MSMEs.
- Providing facilities for technology up-gradation, modernisation, quality improvement and infrastructure.
- Developing Human Resources through training and skill up-gradation.
- Advising the Government in policy formulation for the promotion and development of MSMEs.
- Providing economic information services.
- Maintaining a close liaison with the Central Ministries, State Governments, Financial Institutions and other Organisations concerned with development of MSMEs.
- Evolving and coordinating Policies and Programmes for development of MSMEs as ancillaries to large industries.

► **Institute of Entrepreneurship Development, Bihar (IED)**

The Institute of Entrepreneurship Development, Bihar was established in 1987 under the Societies Registration Act XXI of 1860. It was jointly set up by Government of Bihar in association with Central Financial Institutions Like IDBI, IFCI & ICICI, Allahabad Bank, Bank of India, and BSFC & BICICO. It acts as the nodal agency to promote entrepreneurship and self-employment in the state. It aims at:

- Creating a multiplier effect on opportunities for self-employment.
- Augmenting the supply of competent entrepreneurs through training.
- Augmenting the supply of entrepreneur trainer-motivators.
- Inculcating the spirit of 'Entrepreneurship' in youth.

► **Central Institute of Plastics Engineering & Technology (CIPET)**

CIPET is a premier institution devoted to Academic, Technology support & Research (ATR) activities for the growth of polymer & allied industries in the country. It has 16 centres across India which have state of art infrastructural facilities in the areas of design, CAD/CAM/CAE, tooling & mould manufacturing, plastics processing, testing and quality control to cater to the needs of polymer & allied industries.

- In the region, CIPET has one centre in Hajipur Industrial Area, 10 km from the Patna city, with full- fledged design wing, tool room, processing division and plastics testing centre to cater to the industry through managerial and supervisory manpower, training, testing, consultancy, advisory and development services.

The proposed TC at Patna can collaborate with CIPET for plastic die and mould manufacturing with the objective to strengthen its expertise in the field of plastic moulding, research and development etc.

4.3.2 Industry Associations

► **Bihar Industries Association (BIA), Patna**

The Bihar Industries Association, popularly known as BIA was established in 1943. It is the apex representative body of industry & service sector in Bihar. The Association is registered under Indian Companies Act, 1956, Section-25 as a non-profit organisation. The membership comprises of large, medium and small-scale industries spread throughout the State.

- The main objective of this Association is to promote industrial development of the State by focusing attention of the State and Central Government and other authorities towards the impediments in the way of Industrialization and to promote and safeguard the interest of industries of Bihar in particular.
- The Association acts as a representative body with the sole object of advancing and promoting the common cause of industry.
- It has experience of more than 74 years with National & International exposure in the field of Industrial sectors
- Membership is open for any association, individual, financial institutions, organisation engaged in any branch of industry, mining or any profession including law, taxation, consultancy, etc.
- Active participation and facilitation of skill up-gradation, entrepreneurship development and women empowerment

► **Confederation of Indian Industries (CII) , Patna**

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes. CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has over 8000 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 200,000 enterprises from around 240 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

The CII theme for 2016-17, Building National Competitiveness, emphasizes Industry's role in partnering Government to accelerate competitiveness across sectors, with sustained global competitiveness as the goal. The focus is on six key enablers: Human Development; Corporate

Integrity and Good Citizenship; Ease of Doing Business; Innovation and Technical Capability; Sustainability; and Integration with the World.

With 66 offices, including 9 Centres of Excellence, in India, and 9 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Singapore, UK, and USA, as well as institutional partnerships with 320 counterpart organizations in 106 countries, CII serves as a reference point for Indian industry and the international business community.

► **Dalit Indian Chamber of Commerce and Industry (DICCI), Patna**

Dalit Indian Chamber of Commerce & Industry (DICCI) was established on 14th April 2005 with the purpose to instill the spirit of entrepreneurship among Dalit youth to develop business leadership, thus empowering them. It facilitates Dalit youth to enter the business & industry sector and actively participate in the economic growth of the country.

The Chamber operates with a three-fold mandate:

- Bring together all Dalit entrepreneurs under one umbrella
- Become a one-stop Resource Center for existing and aspiring Dalit entrepreneurs
- Promote entrepreneurship among Dalits as a solution to their socio-economic problems

DICCI members participate in diversified activities ranging from manufacturing (sectors such as chemicals, agri-products, frozen foods, plastics, textiles, pest control, metals and metallurgy, marine engineering, solar energy, sugar refining), construction and services (health care, hospitality industries, education and international trade). The aim of the organisation includes:

- Business Trade Fairs.
- Seminars & Workshops.
- Interaction with Industry and Government.
- Share the Information on latest trends & opportunities

► **Bihar Entrepreneurs Association (BEA)**

Bihar Entrepreneurs Association (BEA) is a Not for Profit Organization founded by young Entrepreneurs from the state in 2011. Its purpose is to provide a platform for new enterprise, start-ups and potential entrepreneurs from the state to establish a successful business. It forms a regional coalition of entrepreneurs, business and community leaders, organizations to provide them access to nationwide tools and resources which will lead to scale-up and growth of the whole ecosystem and create jobs. BEA works under guidance and in collaboration with the Department of Industries, Govt. of Bihar, MSME Department, and various National and International Organizations

- BEA offers a platform for the future entrepreneurs, where one can get a single window service, from advisory services to fund raising support.

- It conducts regular events for solving issues, sharing best practices, exchanging ideas, identification of opportunities and collaboration opportunities
- Provides relevant linkages for entrepreneurs, association with skill development activities, thereby creating job space and opportunities

4.3.3 Key Manufacturers and Suppliers

► GE Transportation

GE is an American Fortune 500 company ranked at 30th position in 2017. It is a conglomerate headquartered in Boston, Massachusetts. The business diversified into aviation, healthcare, lighting, renewable energy, transportation, power, etc. GE Transportation is a division which provides rail and railroad related products. It is the largest producer of diesel locomotives for both freight and passenger applications in North America.

The Indian Railways has signed a \$200 million contract with GE Transportation. The deal is proposed for production of diesel locomotives at Marhaura (Saran District), 75km northwest of Patna facility to be set up by GE.

- GE will have 70 % localisation by value for the locomotive production.
- The hiring of skilled manpower is to be done mainly from Bihar, Jharkhand and local areas.
- In its effort of skill building, GE has established a welding school at the Tool-Room Training Centre, Patna of the Ministry of Small and Medium Enterprises.
- The operations to be carried out in the facility will include fabrication works, assembly, painting and testing job
- The 227 acre facility is under construction and the first locomotive is scheduled to be rolled out in October 2018
- The diesel factory would be set up at the cost of INR 2,000 crore and, Indian Railways would buy 1,000 diesel locomotives from it over a period of 10 years.

► Alstom

Alstom is a French conglomerate fully focussed on transport solutions. It is a world leader in integrated transport systems. The company recorded sales of €7.3 billion and booked €10.0 billion of orders in the 2016/17 fiscal year. Headquartered in France, Alstom is present in over 60 countries and employs 32,800 people.¹⁹

Alstom Transport India Limited provides a complete range of systems, equipment and services in the railway sector. It has 1800 employees in India and manufacturing units at Bengaluru, Sri City (Andhra Pradesh) and Coimbatore (Tamil Nadu).

¹⁹ <http://www.alstom.com/about-us/>

The Indian Railways has partnered with the French mobility giant for an electric locomotive facility project worth Rs 20,000 crore with foreign direct investment component of around about Rs 1,200 crore. The locomotive factory spread over 250 acres of land at Madhepura, 284 km northeast of state capital Patna, is a joint venture between Alstom (74%) and Indian Railways (26%). Alstom has already commenced the production of 1st Electric Engine at the new facility.

- The Indian Railways is looking to manufacture 800 electric train engines in the next 11 years to meet the requirement. 5 locomotives are scheduled to be shipped “as assembled” by 2019 and subsequently production will be increased by 25 % annually to meet the target of 800
- 85-90 per cent of the components will be sourced locally
- The facility promotes local recruitment of young people to support socio-economic development in Madhepura

► **MSME Units**

Patna district houses approximately 43,914 MSME units in total of which, around 13,717 MSME units cater to the manufacturing sector²⁰. An overview of the spread of MSMEs in this region has been provided in the need assessment section.

Some of the other key manufactures and companies in the catchment areas are:

- IOCL, Barauni Refinery
- Britannia Industries Ltd.
- Lumbini Beverage Pvt. Ltd. (Pepsi Plant)
- Anmol Industries Limited
- Godrej Agrovat
- Genial Polymers Pvt. Ltd.
- Riga Sugar Co. Ltd.
- Balaji Mini Steels & Re-rolling Pvt. Ltd.
- National Plastic Industries Ltd.
- Hero Cycles etc.

4.3.4 Financial Institutions

► **Pradhan Mantri Mudra Yojana (PMMY)**

Under the Micro Units Development and Refinance Agency (MUDRA) Bank, comes a new institution which was set up by Government of India for development and refinancing activities relating to micro units. It was announced by the Finance Minister while presenting the Union Budget for FY 2016. The purpose of MUDRA is to provide funding to the non-corporate small business sector. Loans worth

²⁰ Udyog Aadhar

about Rs 1 lakh crore have been sanctioned to small entrepreneurs under the Pradhan Mantri MUDRA Yojana

► **Patna** is the capital city of Bihar, so it is infused with many private, public and cooperative banks. Some of the important financial institutes are:

- Small Industries Development Bank of India (SIDBI)
- Bihar State Financial Corporation (BSFC)
- Industrial Credit and Investment Corporation of India (ICICI)
- Industrial Credit and Investment Corporation of India Ventures (ICICI Ventures)
- Industrial Development Bank of India (IDBI)
- Industrial Finance Corporation of India (IFCI)
- Industrial Investment Bank of India (IIBI)
- Infrastructure Development Finance Company (IDFC)
- National Small Industries Corporation (NSIC)
- Non-Banking Financial Company (NBFC)
- SAIJA Finance Pvt. Ltd etc
- Unit Trust of India (UTI)

4.3.5 Technical and Research Institutes

Patna being the capital of the state of Bihar is the educational hub with maximum number of technical and research institutes. These include institutes of national importance in the field of engineering, agriculture and dairy, fashion medical sciences etc.

The details of technical and vocational training institutes supplying skilled man-power in the catchment have been given as follows:

Table 6: Intake capacity at technical institutions in Bihar²¹

► Technical Education:

The state of Bihar has 22 universities out of which there are 2 central Universities, 14 state public Universities and 1 State Open University²². The number of engineering colleges has increased from 10 in 2013 to 29 today. There are 49 Polytechnics and 15

Type of institute	No. of Institute	Intake Capacity (2015-16)
ITI	624	1,18,117
Polytechnic	49	27,230
Engineering	29	4,019
Total	702	1,49,366

research institutes in the state. Renowned educational institutes and other apex institutions like Indian Institute of Technology (IIT), Patna; National Institute of Technology (NIT), Patna; Indian

²¹ Department of Science & Technology, GoB, <http://dst.bih.nic.in/EngineeringCollegeDetails.aspx>; <http://www.sbtebihar.gov.in/Docs/Seat-2015-16.pdf>

List of Private ITI - <http://labour.bih.nic.in/docs/itis-with-affiliated-units.pdf> ; <http://labour.bih.nic.in/Admissions.htm>

²² Economic Survey – 2016-17, Government of Bihar

Institute of Information Technology, Bhagalpur; BIT Mesra Extension Centre, Patna; Central Institute of Plastic Engineering and Technology (CIPET), Hajipur; National Institute of Fashion Technology Patna are already functional in and around Patna.

► **Vocational Training:**

The Directorate of Employment & Training, in Ministry of Labour, is the apex organisation for development and co-ordination at State Level for the Programmes relating to vocational training including Women's Vocational Training²³. It functions with the major objectives of providing Vocational Training to the youth in Bihar.

There are 246 vocational Training institutes in Bihar²⁴. Employment through Skill Training and Placement (EST & P) program launched under National Urban Livelihoods Mission is being implemented in 42 towns of Bihar. Its objective is to provide skill training to BPL youth and help them in placements.

²³ <http://labour.bih.nic.in/Employment.htm>

²⁴ <http://labour.bih.nic.in/Files/SDIS/SDIS-02-25-08-2014.pdf>

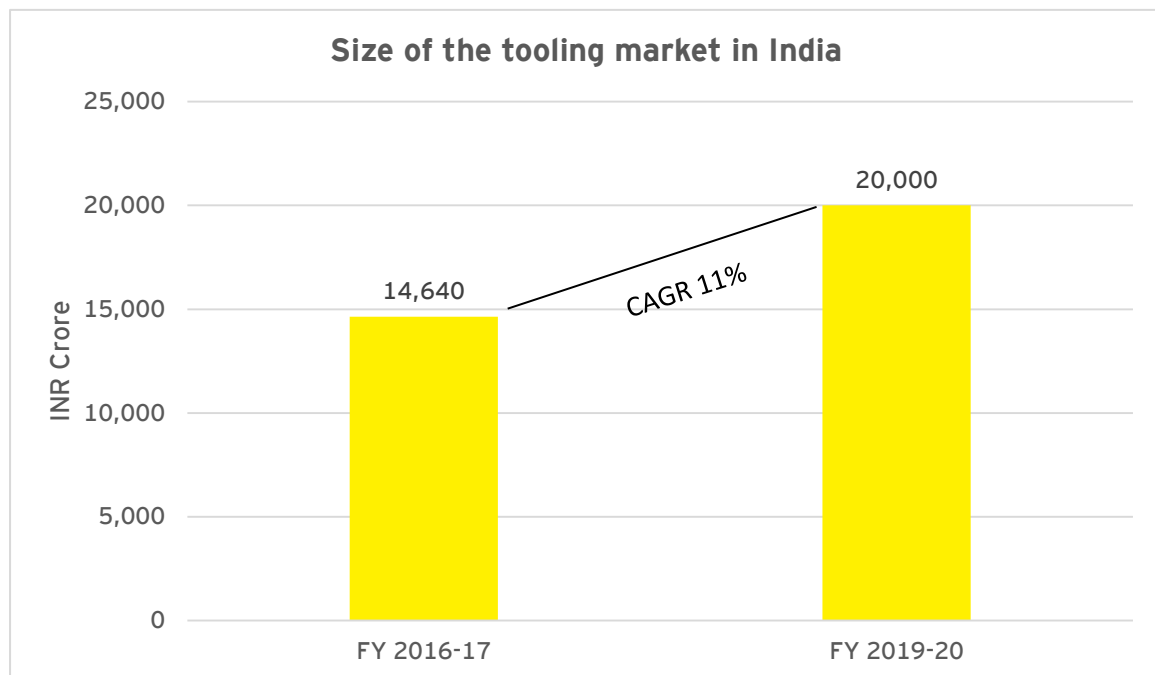
5 Opportunity and need assessment

5.1 Overall Market size of Tooling Industry

The tooling industry, that consists of developing and manufacturing dies, moulds, casts, as well as testing and prototyping serves as the interface between product design and product manufacturing. Growth of these manufacturing related industries, therefore, drives the growth in demand for tooling. The constraints to the growth and competitiveness of the Indian tooling industry mirror the ones affecting manufacturing as a whole. The scarcity of skilled workers and problems related to their retention, as well as the lack of access to a high-quality design and prototyping facility, has hurt growth.

It is estimated that the tooling market in India will reach to INR 20,000 crore by FY 2020 with a CAGR of 11% from the current market of 14,640 crore over the next three years (TAGMA 2016-17). The trend of growing demand for tooling market is illustrated in the figure below:

Figure 7: Size of the Tooling market in India



Source: Indian tool room industry report, TAGMA (2016-17)

Indian Tool Room industry size is estimated at ~INR 14,650 Cr. (2016-17)²⁵ which can be divided into two key segments - domestic (captive and commercial) and imports. Domestic Tool Rooms market is estimated at INR 12,020 Cr out of which INR 7,200 crores is generated from captive tool rooms and commercial tool rooms (CTRs) account for INR 4,820 crores. Imports are to the tune of

²⁵ TAGMA Report 2016-17

INR 2,700 Cr. In order to arrive at the addressable market for MSME TCs, a further analysis of the above three segments has been carried out.

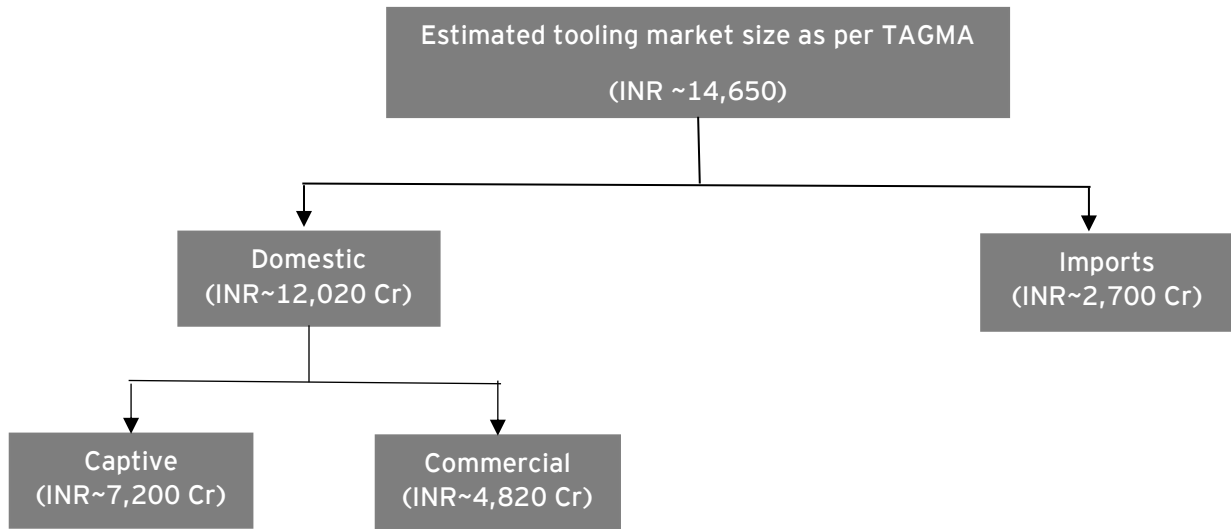


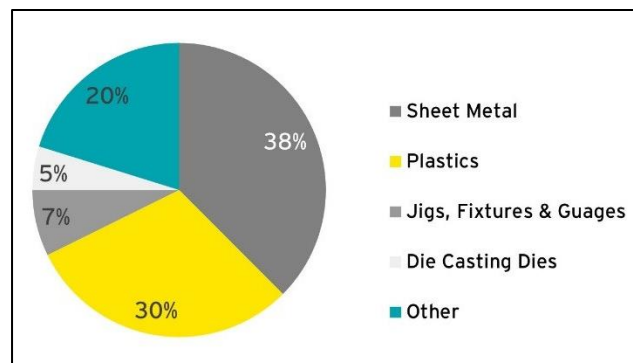
Figure 8: Structure of Tooling Market

In-house (Captive) Tool Rooms: Captive

Tool Rooms mainly belong to the large and medium scale companies that develop tools for in house requirement, e.g. auto component, plastic, packaging etc. Such Tool Rooms have state of the art equipment to meet the internal requirements. Auto components and OEMs constitute around 60% of this segment. Quality tooling is critical to produce high quality

finished components and such companies perceive that quality of the components can be maintained only by developing tools in house or through imports from their foreign counterparts which also ensures steady supply as per requirement. Another major reason for captive tool making is that these companies don't want to share their designs of tools to safeguard intellectual property of the company. Nearly 70% of auto and auto component companies except from Indian manufacturers, primarily import their tooling or have a captive Tool Room mainly due to lack of raw material quality and IP content. Indian Commercial Tool Rooms suffer from capacity constraint causing an increase in the lead time for manufacturing the tools to meet the demand of the end users. Thus, captive segment does not present a significant opportunity that can be targeted by MSME tool rooms.

Figure 9: Composition of captive segment

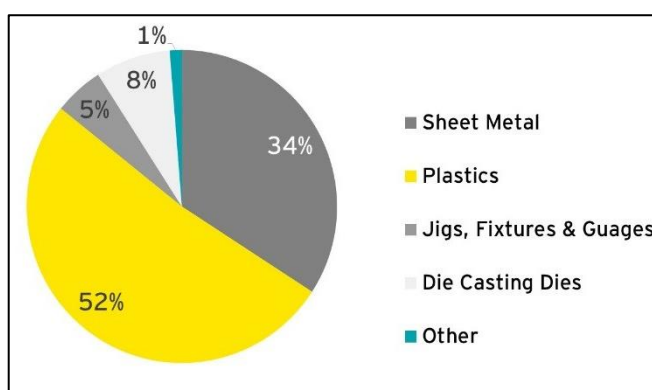


Commercial Tool Rooms (CTRs):

Commercial Tool Rooms account for ~ 49% of the total tooling market. Commercial Tool Rooms supply tooling on a commercial basis to a variety of industries and operate as independent companies. Besides manufacturing tooling, some Commercial Tool Rooms also undertake precision machining and component manufacturing. This segment with an estimated market size

of the 7,200 crores (in year 2016-17) is the immediate low hanging fruit which can be addressed by MSME TCs by supporting Commercial Tool Rooms. It has been observed that Commercial Tool Rooms have insufficient capacity that leads to an increase in lead time for manufacturing of tools.

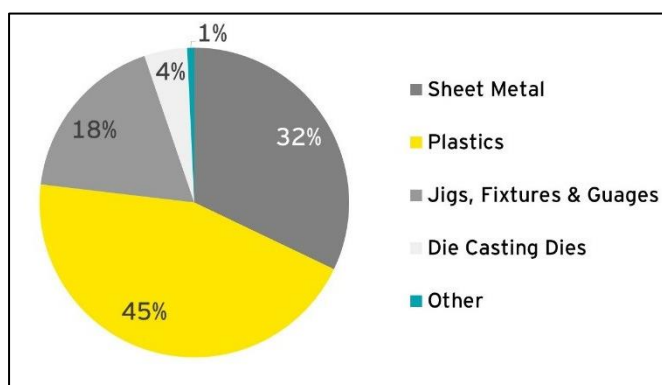
Figure 10: Composition of CTRs segment



Imports: Imports account for 18% of the total tooling market which is around INR 2,700 crores. There is a 20% decline in the market share of imports from INR 3400 Cr in FY 2012-13 to INR 2700 Cr in FY 2016-17. This indicates that end users are increasingly relying on domestic CTRs to meet their tooling need.

As per TAGMA report and our discussions with some of the Private Tool Rooms, key reasons for tooling imports are;

Figure 11: Composition of imports segment



- ▶ **Quality:** Better surface finish, lower turnaround time and higher degree of accuracy by ability to meet the tolerance range.
- ▶ **Complex Designs:** Lack of technical know-how, design and technical capability for critical and complex design with most of the CTRs
- ▶ **Capacity:** Insufficient capacity of Indian tool rooms to meet domestic demand and lack of infrastructure to make certain types of tools also results into imports.
- ▶ **Lead Time:** Higher lead time (12-16 weeks) offered by domestic CTRs whereas typical lead time offered by foreign CTRs are 8 -12 weeks.

- ▶ **Cost:** Higher price, non-availability of materials at par with the international standards, use of out dated technology due to absence of advance machinery compromises the quality of commercial tool rooms leading to demand for imports. In Countries like China and Taiwan, the tooling cost is lower than India.
- ▶ **Design:** International companies based in India prefer procurement of their tooling from their parent company to maintain design standards across the globe e.g. LG & Samsung import most of their tooling from Korea.

Import share are observed to be higher in segments like automotive, consumer durables and electronics²⁶.

Total addressable market for MSME Tool Rooms is about INR 9,900 crores (7,200 for Commercial Tool Rooms + 2,700 crores imports), especially those imports which take place as a result of insufficient capacity of domestic Commercial Tool Rooms.

To start with, the primary focus could be addressing the capacity constraint in the domestic tool room industry in the short run. However, a focused approach towards specialised tool production in the long run can help capture a part of imports which is being replaced by domestic supply from Commercial Tool Rooms. This would require additional support to Tool rooms just more than financial support and assistance. In the long run - MSME TCs can address rest of the market by,

- ▶ Increase in specialisation,
- ▶ Process standardisation,
- ▶ Safeguards to protect IP,
- ▶ Sharpen focus on quality and reduction in lead times

5.1.1 Primary Research

As a part of preparing the DPR, discussions with some OEMs, MSMEs, industry associations, and other stakeholders in the Patna region were carried out. The objective of the primary research was to understand the business requirements, issues, challenges, and future requirements of the industry to develop a deeper appreciation of the requirements that the Technology Centre Systems Program of the O/o DC MSME can serve. The research also included the support requirements of players with respect to designing, training, manufacturing and consultancy.

Stakeholder workshop was held at Patna on 23 February 2018 with members of industry associations, MSMEs and State Government.²⁷ Meetings and detailed discussions were held with

²⁶ TAGMA Report 2016-17

²⁷ Details about stakeholders workshop in Annexure 18.2

government institutes and small manufacturing units in the vicinity like CIPET and Hero Cycles to understand their needs and potential areas of support.

Key inferences drawn from the primary research are as follows:

- ▶ The primary operations which will be carried out at the GE Locomotive factory at Marhaura under construction are:
 - Fabrication
 - Assembly
 - Painting

Hence there is an immense requirement of highly qualified welders trained on the latest welding technology to support the fabrication job. Also fitters for assembly jobs

- ▶ The main requirement of the leather & footwear sector and textile & garment sector and units with regard to general engineering is for repair and maintenance of basic tools used. Hence, installation of reverse engineering facility with high precision to facilitate maintenance jobs/development of new parts for imported machinery in case of wear and tear is required.
- ▶ Workshop with CNC machines for producing machine components
- ▶ Due to high concentration of Food Processing units there is a requirement of trained manpower on process automation
- ▶ 3 D printing facilities for prototyping purposes (both metal and plastic)
- ▶ Installation of a Heat Treatment Facility
- ▶ Facilities for custom fabrication of spare parts and cast iron foundry setup
- ▶ There is an overall demand for skilled and trained manpower for various industrial jobs in the area due to dearth of technical educational institutes, ITIs etc in the State. Therefore emphasis should be laid on the training courses in line with the industry requirement
- ▶ With the formulation of Bihar Industrial Investment Promotion Policy, 2016, the focus of the state is on promotion of accelerated economic growth. In line with this objective the government has initiated reforms for easy land allotment, development of Industrial Area, single window clearance etc. This will further support the entrepreneurs in establishing manufacturing units in the region. Hence, there is a need for an incubation centre to assist the entrepreneurs by providing advisory and prototyping facility during the initial phase.
- ▶ The main managerial manpower requirements of the companies and industrial units are engineering (B. Tech engineering/ diploma engineering and tooling engineering) with project management skills and manpower handling skills. The machine operators are generally ITI graduates in the respective field of manufacturing.
- ▶ Approximately 20% of the companies face human resource problems w.r.t. project management skills, leadership and motivational skills, manpower management skills, less availability of workforce, disciplinary issues and industrial training.

Summary of challenges faced by players based on primary research:**a. At the industry level****▶ Absence of or limited automation in the manufacturing process in India;**

- Leads to low machine utilisation of around 50-55% on an average (best in India is around 70-75%) compared to 95-99% abroad in China where a single operator manages multiple machines
- Main reason is lack of knowledge/ awareness of low cost automation technologies

▶ Lack of standardisation

- Limited or very small number of standardised components for mould design in India cause delay in the production process. For every mould to be developed, designing is done from scratch to finish. In China & Malaysia the standardised component usage is very high and therefore concentration is more on core & cavity design of the mould resulting in better quality and faster production
- Use of Standardised components helps to deliver moulds in 6 week in China compared to 16 weeks required in India

▶ Lack of availability of skilled workers & high attrition/ job hopping, shortage of trained manpower at machine operator level**▶ Low capacity and lack of capability to develop heavy and precision machines requiring a high proportion of the CNC machines to be imported (2/3rd of the total CNC machines) mainly because of the capital intensive nature of investment****▶ Others**

- **Limited/ slow adaptability of technology** by domestic TRs due to perception of quality about domestically developed products
- **Dispersed/ unorganised industry structure**
- **High cost of inputs** makes Indian machines costly to users as compared to those imported

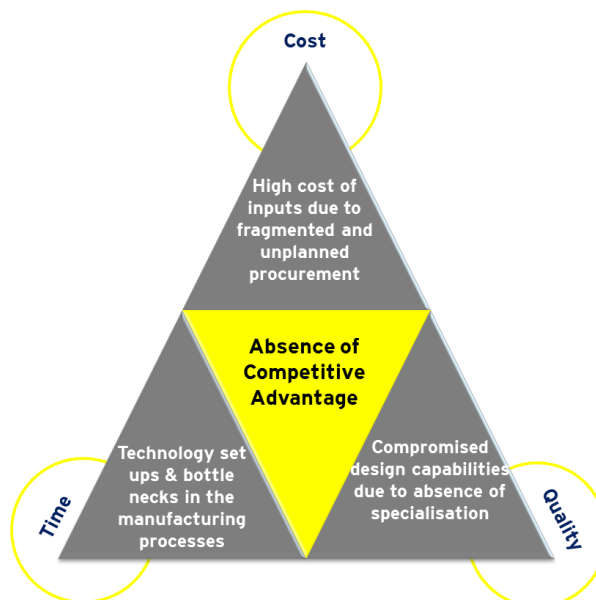
b. Other macroeconomic factors

- ▶ High interest rates** of borrowing (~14%) which discourage investments by compromising viability
- ▶ Lower customs duty** making imports more attractive and does not encourage domestic transfer of technology and local manufacturing and / or value addition
- ▶ Export efforts constrained by high cost** of maintaining a presence in overseas markets

5.1.2 Challenges faced by MSME TRs

An analysis of the existing MSME TRs in India reveals that limited efficiency in production has caused loss of some of its clients to private Tool Rooms or cheaper options from other countries. One of the key reasons identified has been the generic nature of tool development by MSME Tool Rooms rather than catering to a specialised category.

Figure 12: Absence of competitive advantage



Generalised Tool Rooms are the norm in India due to;

- ▶ High capital investment requirement,
- ▶ To cater to a larger market,
- ▶ Low volumes in specific categories,
- ▶ Better risk management and
- ▶ Absence of specialisation

Whereas these Tool Rooms produce a variety of tools, they lack competitive advantage in any of the categories due to lower efficiencies mainly due to the technology used. Time taken for delivery of the product is longer due to;

- ▶ Technology set ups and bottle necks in the manufacturing processes,
- ▶ High cost of inputs due to fragmented and unplanned procurement,
- ▶ Lower design capabilities due to lack of specialisation

All these factors result in escalated costs and a further loss of competitive advantage. This reflects in the low volumes of tool production orders, which prevents the industry in tapping into the advantages of large scale production and economies of scale.

If MSME Tool Rooms specialise in a particular tool or tool production for a specialized sector, chances of developing competitive advantage become high. In Germany, a TR of **Zitzmann Inc.** specialises in particular type of mould development required for manufacturing glass bottles. It has got substantial competitive advantage in the production of such tools. Similarly, in China a TR of **China Taoshi Mould** has more than 120 machines ranging between 40,000 - 75,000 rpm that specialises in a particular type of moulds whereas for the Indian counterpart the machines range between 12,000 to 20,000 rpm. This results in on an average, procurement of a certain type of mould from China takes one third of the time it takes to be procured from within India. This is mainly due to low productivity and non-standardised use of tooling components in India.

Specialisation in the production process leads to some degree of standardisation enabling the Tool Room to maintain inventory levels which subsequently reduce the turnaround time for procurement. Absence of design facilities/ good designers in the MSME TRs is another important issue. Further,

non-alignment of the compensation structure for designers as per that of the market makes it difficult to retain the designers in the long term.

Case study 1: Specialised tool rooms in the world - Zitzmann GmbH & Co.KG, Germany

- ▶ Zitzmann glass mould is a large supplier of high quality moulds for the leading glass companies in Germany
- ▶ Specializes in manufacturing of moulds for complex container designs such as;
 - **High quality perfume flacons**
 - **Medicine bottles, tins, jars**
 - **Shaped bottles 3ml - 4250ml**
 - **Block moulds, solid blank mould**
- ▶ Its production portfolio includes complete mould sets, semi-finished parts, accessories in normal casting, special casting steel or bronze, vacuum full profile coating as well as flame spraying full profile coating
- ▶ It's in house facilities include latest technologies and production methods like;
 - **CAD/CAM design using Catia V5**
 - **The latest CNC machines in the turning and milling sector**
 - **Full profile welded moulds**
 - **Induction heat treatment and additional plasma welding**
- ▶ It has around 120 highly skilled technicians producing more than 30,000 moulds per year

Case study 2: Specialised tool rooms in the world - China Taoshi Mould, China

- ▶ A well-known and one of the biggest plastic mould designing and manufacturing enterprise
- ▶ Manufacturer of moulds, specializing in plastic moulds for automobiles, house electric equipment, electronic products, motorcycle, and other daily-used pieces etc.
- ▶ In house facilities include;
 - **Large-size CNC equipment including high speed CNC and EDM machines etc.**
 - **Advanced CAD/CAM/CAE system**
 - **Workstation and software of Pro-E, FFCOE, CIMATRON, etc.**
- ▶ It has more than 600 employees including middle/high administrators and around 180 technicians

5.2 Market opportunity

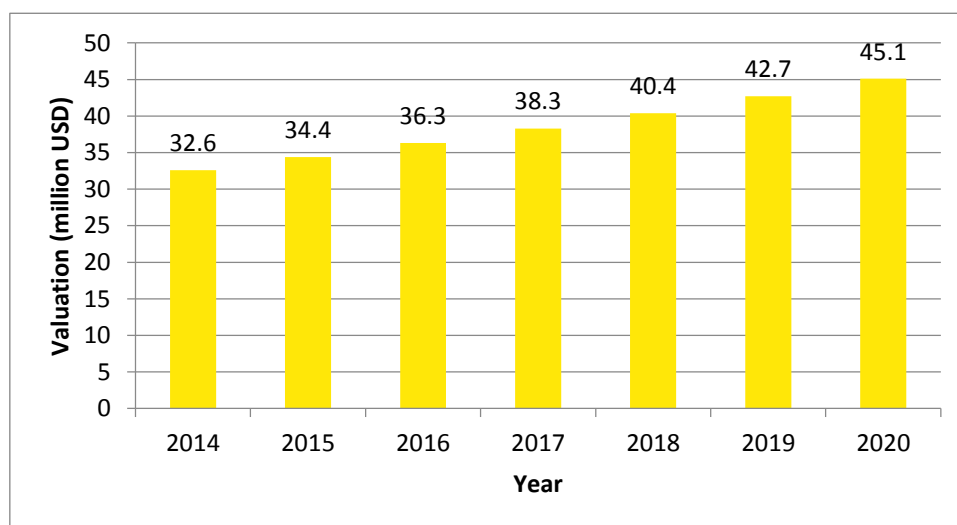
5.2.1 Overview of Welding Industry

Bihar is one of the fastest growing states in the country. During the period 2005-06 to 2014-15, the GSDP of Bihar at constant prices grew annually at 10.5 percent, which is one of the highest among all major Indian states²⁸. This scale and pace of the economic change is result of a number of comprehensive reform programs initiated by the government. The reforms ranged from improving the state infrastructure, policies, promotion of FDI and most importantly revamping the law and order. The state has set forth priority sectors to drive the industrial growth leveraging the existing resources at its best.

Bihar managed to get 2 big foreign investments through the Indian Railways for setting up Locomotive factories in the state. Global transportation leaders GE and Alstom won the contract for setting up a diesel Locomotive factory at Marhaura and an electric Locomotive Factory at Madhepura respectively. This is a landmark achievement in terms of driving growth and promoting skill development in the region. The major requirement of the combined INR 20,000 Cr investment calls for fabrication and assembly operations which demands highly skilled manpower to meet the requirement at its facility.

This investment has provided the opportunity for up-skilling of the large manpower available in the state for the fabrication and welding work. Global market for welding consumables in 2014 surmounted to approximately US\$10.7 Billion, which is forecasted to reach US\$ 17.8 Billion²⁹ by 2020. The expected CARG for the 5-year period from 2014 to 2020 is demonstrated to be 8.9%.

Figure 13: Global welding consumables market



²⁸ Bihar Industrial Investment Promotion Policy-2016

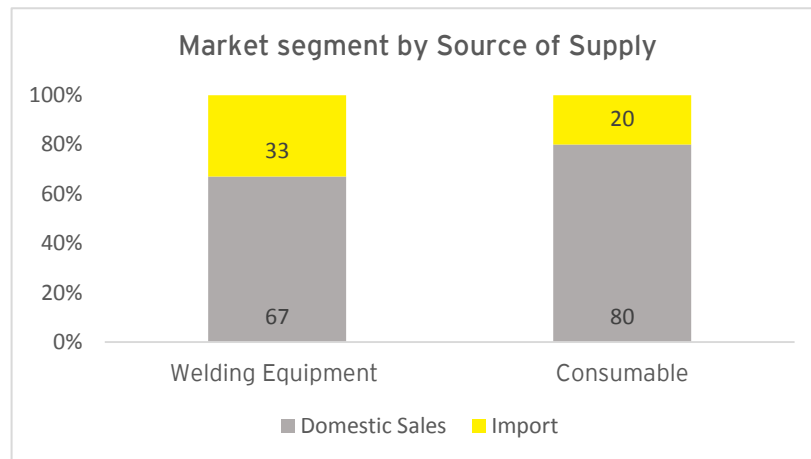
²⁹ Frost & Sullivan 2015

5.2.2 Overview of Welding Industry in India

The market growth of the welding industry in India is estimated at INR 4,000 Cr in FY 2016 which includes 30% market size of Welding Equipment market and 70% market size of the Welding Consumables. The welding consumables market is forecasted to grow at a compounded annual growth rate (CAGR) of 10-11%, at INR 4,251 Cr by FY 2019-20. Welding equipment industry, on the other hand is expected to grow at CAGR of 6-7% between and FY 2015 and 2020.

The welding industry is fragmented with around 50% controlled by the unorganized players. Major sectors where the welding jobs are required infrastructure, heavy engineering and automobile.

Under the Consumables sector the imports include only 20%, with the majority 80% demand met by the domestic suppliers. Some of the key players dominating the organized market include ESAB India Ltd., Ador Welding Ltd., D&H Welding Electrodes India Ltd., EWAC Alloys Ltd., etc³⁰.



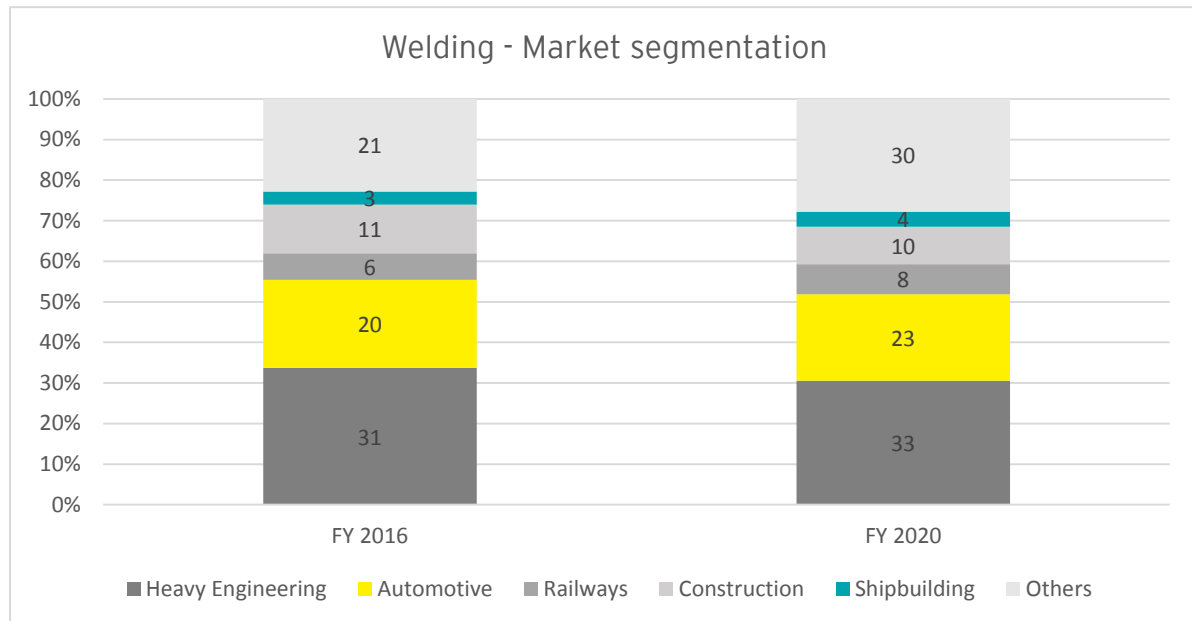
Demand for welding consumables has been observed to be in correlation to the Steel production rate in the country. Final user industries such as transportation, construction, oil & gas, and power are likely to spearhead the Indian welding consumables market in the future. Demand for steel in India is projected to grow by 6.2%³¹ in 2015 and 7.3% in 2016 as compared to the increase in global steel consumption by 0.5% and 1.4% in 2015 and 2016, respectively. These growth indicators showcase a strong case for the future of welding and its place in the manufacturing sector as a critical trade.

The welding market segments comprise of Heavy Engineering, Automotive sector, Railways, construction and shipbuilding. The heavy engineering segment comprised of the maximum market share at 33% in 2016 and is expected to increase moderately by 2020. It is followed by the

³⁰ CII report – An Overview of Indian Welding Industry

³¹ Welding consumables market dependency on Steel; Transparent Market research

automotive sector which holds the second highest market share at 20% and expected to increase to 23% by 2020 as shown in the figure below.



5.2.3 Casting and Foundry

Foundry and casting facility was requested by the Department of Industries, Government of Bihar during the second stakeholder meeting held on 2 April 2018. The view presented was that foundry and casting is the basic starting point for establishment of any manufacturing unit. Therefore, it is important to train manpower in this field to promote manufacturing and industrial development in the state. Once skilled manpower is available, this will help initiate the establishment of manufacturing units and contribute to the economic growth of the state.

In order to support the above vision of the state, it is planned to include a casting and foundry setup for the purpose of training manpower at the new TC site proposed in Patna.

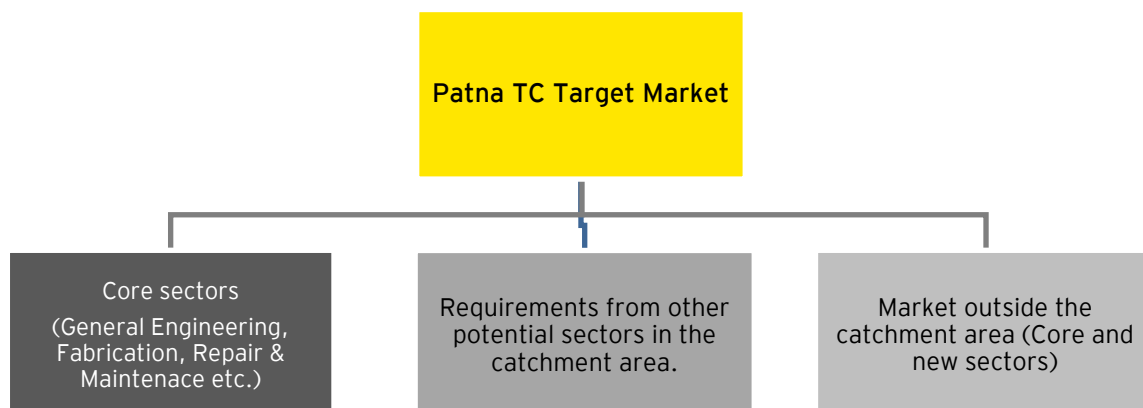


Figure 14: Target Market Structure of Patna TC

5.2.4 Market in core sectors in the catchment

Bihar is the fastest growing state with the Gross State Domestic Product (GSDP) growth at a CAGR of 12.14% between 2011-12 and 2016-17. Bihar's per capita GSDP increased from US\$ 365.1 in 2011-12 to US\$ 598.3 in 2016-17. The state has PSUs like Indian oil Corporation (IOCL), Barauni, National Thermal Power Corporation (NTPC), Barauni, Barh, HPCL Biofuels Ltd etc. The state also has few Central Government Ministerial Undertakings which include an Ordnance Factory, Nalanda, Rail Wheel Plant, Bela, and Jamalpur Railway Workshop etc.

There are 7,35,232 micro, 12,241 small and 702 medium units in the state of Bihar³². Totalling to 7,48,375 MSME units in the state, out of these 43,574 MSME units are in Patna district. These units in Patna operate in the areas of Engineering, metal sheets fabrication, repairing and services, wood based furniture, readymade garments and embroidery etc.

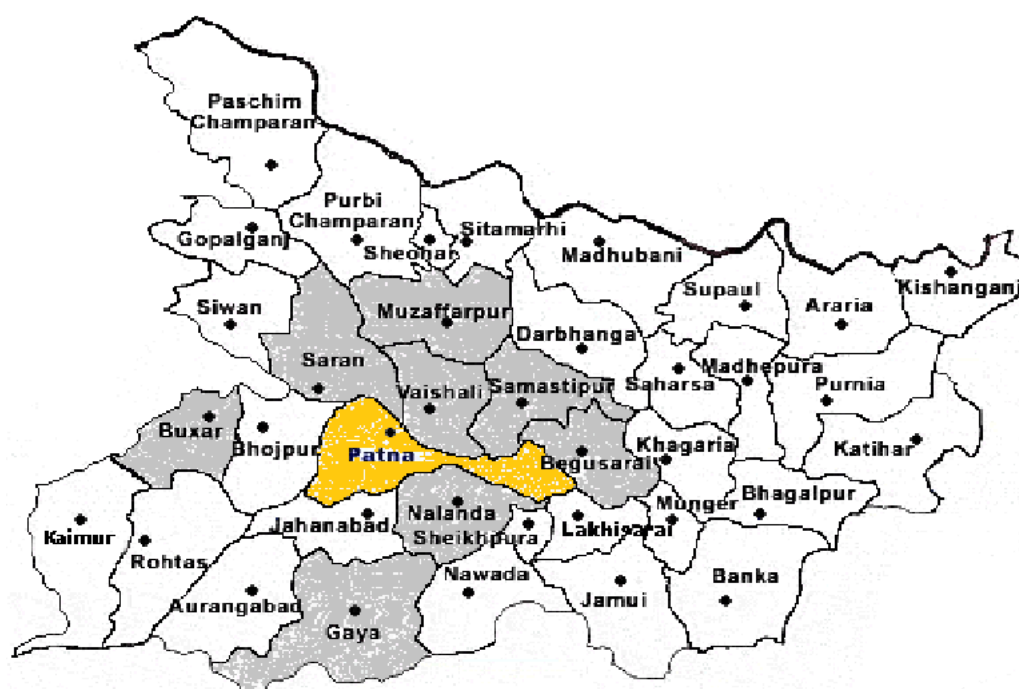


Figure 15: Core industrial District in the Catchment area

The district of Vaishali comprises of two Industrial Area- the Industrial Area, Hajipur and E.P.I.P., Hajipur, which are just 10kms from the city of Patna. Hajipur Industrial Area has achieved a significant industrial growth, availing the comparative advantage of transport facility, capital city in vicinity etc. There are 17 Large/Medium scale units which are established in the district. A total investment of 18,669 lakh has been made to the MSMEs in the FY 2015-16 providing employment to 11,235 people. The goods are exported to only Nepal as of now, however the export revival plan has been initiated. Many food processing companies like Britannia, Anmol Biscuits, Lumbini

³² https://udyogaadhaar.gov.in/UA/Reports/StateBasedReport_R2.aspx

Beverages Ltd (Pepsi), Amrapali Foods etc, and other manufacturing units like Hero Cycles, Avon Cycles, and many more small units in various sectors are operating in this region.

The following table enlists the prominent players in and around Patna in general engineering, FMCG and other major sectors,

Table 7: Composition of major manufacturing players in the Patna catchment

Type	Key players ³³
General Engineering Industries	▶ GE Transportation, Marhaura, Saran ▶ Alstom, Madhepura ▶ Hero Cycles, Bihta, Patna ▶ Avon Cycles, Hajipur, Vaishali ▶ Jamalpur Locomotive Workshop, Jamalpur ▶ Rail Wheel Plant, Bela, Saran ▶ Ordnance Factory, Nalanda ▶ Balaji Mini Steels & Re-rolling Pvt. Ltd., Bihta, Patna ▶ Neelkamal Steels Pvt. Ltd., Patna ▶ Gisco TMT, Patna ▶ Maa Mundeswari Cycle Industries, Aurangabad
FMCG	▶ Britannia Industries Limited, Hajipur, Vaishali ▶ ITC, Munger, ▶ Emami, Agrotech ▶ Bansal Biscuits Ltd. (Anmol Brand), Hajipur, Vaishali ▶ Lumbini Beverages (Pepsico), Hajipur, Vaishali ▶ Lavanya Udyog Pvt. Ltd. (Parle Biscuits), Bela, Muzaffarpur ▶ Molson Coors Cobra India, Bihta, Patna
Others	▶ Indian Oil Corporation Ltd, Barauni Refinery ▶ NTPC, Patna ▶ Hindustan Fertilizer Limited, Barauni ▶ J K Lakshmi Cement, ▶ Godrej Agrovat Ltd, Hajipur, Vaishali ▶ HPCL Biofuels Ltd, ▶ K. K. Birla Group, Sugar Company ▶ Riga Sugar Co Ltd ▶ Siddhi Refoils & Industries

³³ Source : Udyog Mitra-Patna District profile, Success Stories

The demand for General engineering and Fabrication in the key catchment districts of Patna are as follows:

Table 8: Sector wise table spread of MSMEs in key catchment District

District	Distance from proposed TC (Kms)	General Engineering Units	Metal Based Units	Electrical and Electronics	Wood, Rubber, Plastic, Mineral based units	Repairing and Servicing	Grand Total
Patna	35	66	104	24	165	121	480
Vaishali	63	224	311	326	564	428	1853
Muzaffarpur	99	645	360	600	2134	669	4,408
Nalanda	120	459	59	3	494	499	1,514
Begusarai	155	360	126	462	1004	623	2,575
Gaya	106	862	388	18	1254	1021	3543
Saran	48	200	564	265	417	521	1,967
Total		2,816	1,912	1,698	6,032	3,882	16,340

Source: DIP Data, Ministry of MSME

Core Industrial Districts in the catchment area of the Patna district include Vaishali, Muzaffarpur, Nalanda, Begusarai, Gaya and Saran which will be expecting to get most out of the new proposed TC in Patna. Key Highlights of the Catchment Area have been presented in the table below:

Table 9: Catchment Area Profile

District (total MSMEs)	District Profile	Units in General Engineering and Fabrication	Key highlights
Patna (940)	▶ There are 4 Industrial areas in the district namely Patliputra, Fatuha, Bihta and MIP Bihta. ▶ New projects in IT/ITes/ESDM sector, Textile and garment, Food Parks have been propose in the industrial area of Bihta which will be near to proposed TC site location ▶ Existing clusters of MSMEs in the district mainly concentrate on manufacturing of Engineering Products, Fabrication and Machining; ready-made garments and embroidery	▶ Patna district have more than 3000 MSMEs in general and Auto Engineering sectors apart from other sectors. ▶ Technical educational institutes of national importance like IIT and NIT Patna are locate in close proximity to the TC site. The TC will be used to provide trainings and undertake project work from students of these institutes.	▶ Patna District has the capital of the state. ▶ In terms of Infrastructure, Patna is accessible through 2 national highways, strong railway network and Jai Prakash Narayan Airport. A new airport at Bihta is proposed which will be connected through a 40 km 4 lane road from Patna city to support regular flights to and from major Indian and foreign cities such as Delhi, Mumbai, Kolkata, Sri Lanka, Bangkok, Kathmandu, Kuala Lumpur etc. ▶ Tooling requirement arises majorly from the engineering units, textile and footwear units in the district.
Vaishali (3,116)	▶ Hajipur Industrial Area is the major Growth center for both district and the state. ▶ Export Promotion Industrial Park (EPIP), Hajipur is a muliti-product export processing zone	▶ Hajipur Industrial Area consists of 224 engineering units with an investment of INR 15.48 crore. ▶ Hajipur has some of the largest names in the food processing plants located in the area like: Britannia	▶ Hajipur is an industrial town just 10 km away from the capital city Patna. It is second fastest growing city in the State. ▶ Large Scale beverages and food processing companies

District (total MSMEs)	District Profile	Units in General Engineering and Fabrication	Key highlights
	Existing industries comprise of food processing, plastics and packaging, plastic and wood based furniture, metal based fabrication and electrical machinery units	Industries Ltd, Lumbini Beverages Pvt.Ltd (Pepsi), Anmol Biscuits, Amrapali Foods, etc. Other factories include plastic pipe units, Avon Cycles and Hero cycles	are present in these Industrial Areas - General Engineering and Tooling requirement arises majorly from the large food processing units, cycle manufacturing units etc. - Major items which are exported from the region are cold drinks, - The industrial area boasts of an export turnover of Rs 1,700 crore and revenue of Rs 1,400 crore in form of central excise, commercial tax, income-tax, property tax, etc.
Muzaffarpur (10,542)	- The district has an Industrial Estate named Bela Industrial Area at Muzaffarpur covering an area of 970 acres with 267 plots developed in the area - The Industrial sector in the district mainly concentrate on manufacturing of Engineering Products, Metal based Fabrication and Machining. There is a good amount of food processing, textile and leather based industries	- Muzaffarpur District has 645 engineering units with 3600 number of employment. - This industry in the district boasts a total investment of Rs. 12 crore.	- The district of Muzaffarpur is 70 km from the state capital Patna and has seen substantial investment in industry over the years. - Kanti Thermal Power Station, NTPC is a coal based power plant operating in the district - General Engineering and tooling requirement arises because of a significant demand in the Engineering unit production, Metal based

District (total MSMEs)	District Profile	Units in General Engineering and Fabrication	Key highlights
			fabrication, and repairing sector (textile and leather cluster).
Nalanda (2,853)	▶ The existing Industrial area in the district is Biharsharif Industrial Area, Ramchandrapur. The majority of the units in the 10.6 acre area acquired for industrial development are under construction. ▶ The industrial sector mainly concentrate on Steel and other metal fabrications, Handloom, Ready-Made Garments and Embroidery, Mineral based industries, Leather footwear cluster.	▶ Nalanda has 459 engineering units with 1,490 number of employment. ▶ Major industries in Nalanda are handloom, weaving, textile garment manufacturing, and leather footwear. Cloth dyeing is also prevalent. ▶ This industry boast a total investment of Rs. 545.32 crore in the engineering sector	▶ The district of Nalanda is around 80 km from the capital city of Patna. Significant investment is made to develop a 10.6 acre Industrial Area in the district ▶ General Engineering and tooling requirement arises because of a significant demand in the Engineering unit production, Metal based fabrication, repairing & maintenance jobs in textile and garment sector, and leather sector.
Begusarai (4,212)	▶ Industrial Area Barauni ▶ The industrial sector mainly concentrates on Engineering Units, Metal based fabrication, wood based manufacturing, chemical and chemical based units, leather based manufacturing, repairing and servicing,	▶ Begusarai has 4,212 registered industrial units with 11,422 number of employment. ▶ The industries in Begusarai boost a total investment of Rs. 123 crore. ▶ Engineering Cluster - Bauarini comprises of refinery and power plant parts manufacturing. Total number of functioning units	▶ The district of Begusarai is located 125 Kms away from the state capital Patna. ▶ Major Industries are Indian Oil Refinery, Barauni Thermal Power Corporation, Hindustan Fertilizer Corporation, Barauni dairy, Bihar Carbon Pvt. Ltd., Neo Carbon Pvt. Ltd., Premier Industries, Graphite India, etc. ▶ Oil Refinery, Chemical fertilizers plant and Thermal

District (total MSMEs)	District Profile	Units in General Engineering and Fabrication	Key highlights
		are 20 with a turnover of INR 250 Lakh.	Power Station, at Barauni would require significant repair and maintenance jobs ▶ Tooling requirement arises because of a significant demand in the Metal based fabrication, and repairing sector.
Gaya (7,572)	▶ The district has one Industrial Area at Gaya ▶ The industrial sector mainly concentrate on Engineering units, Metal Based cluster, Agro based production.	▶ Gaya has 862 engineering units with 2,503 number of employment. ▶ This industry in Gaya boasts a total investment of Rs. 8.72 Crore.	▶ The district of Gaya is located 98 Kms away from the state capital Patna and has seen substantial investment in industry over the years. ▶ Tooling requirement arises because of a significant demand in the Metal based fabrication.

District (total MSMEs)	District Profile	Units in General Engineering and Fabrication	Key highlights
Saran (5,898)	▶ GE has made an investment of INR 14,656 crore Diesel locomotive Factory, under construction in Marhaura (227 acres). The facility is around 70 km away from the capital city Patna ▶ The industrial sector mainly concentrates on manufacturing of Engineering units, metal based fabrications and wooden based. Repairing and servicing and agro based industries.	▶ Saran has 200 registered engineering units and 265 Electrical machinery and transport equipment with 1204 number of employment.	▶ The district of Sagar is located 75 Kms away from the state capital Patna and has seen a FDI from GE in the recent years. ▶ Fabrication and testing requirement arises because of a significant demand in platform assembly and other fabrication operations at the GE Locomotive Facility

5.2.5 Market in other potential sectors in catchment area

The region has potential to tap the demand from other growth sectors in and across the neighbouring districts in the catchment area within upcoming sectors like food processing, textile and garments, leather and footwear etc. particularly in the area of repair and maintenance.

Typical opportunities for TC within the catchment in existing and new sectors would be amplified due to existing and proposed major projects in the area like:

a) Food Processing: The state being primarily an agrarian economy with 77% of the workforce engaged in agricultural activities³⁴, is one of the top producers of fruits, vegetables and meat in India. Food processing has developed as one of the key sectors in the state as agro and allied activities contribute nearly 24.84% of the State Domestic Product. The state has 3 Mega Food parks and 12 export zones coming up. As of 2016, there are around 407 food processing units employing 48,500 people.

- Three Mega Food Parks in the state of Bihar namely: - Mums Mega Food Park Pvt. Ltd. (in Buxar), Pristine Mega Food Park Pvt. Ltd. (in Khagaria) and JVL Mega Food Park Ltd (in Rohtas)³⁵
- 12 Agri Export Zones, with focus on products like Litchi, Vegetables and Honey, have been identified by State Government in Muzaffarpur, Samastipur, Hajipur, Vaishali, East and West Champaran, Bhagalpur, Begu Sarai, Khagaria, Sitamarhi, Saran and Gopalganj³⁶
- The industrial area of Hajipur, in Vaishali district which is 10 km from the Patna city, houses many biscuit factories and fruit juice extraction plants. Brands like Britannia, Anmol, Bansal, Sona biscuits, Amrapali Foods etc have their manufacturing units in this area.
- The FMCG players Emami, ITC and leading UAE Company in transportation - Al Sahraa have proposed investments worth INR 12,000 crore in the state. Emami has planned to establish an edible oil refining plant, ITC wants to set-up an integrated food park including units for production of biscuits, milk products etc. and Al Sahraa is set to establish a logistics park.

³⁴ <http://krishi.bih.nic.in>

³⁵ <http://pib.nic.in/newsite/PrintRelease.aspx?relid=126059>

³⁶ http://apeda.gov.in/apedawebsite/trade_promotion/Agri_Export_Zone.htm



Figure 16: Mega Food Park, Bihar

- b) **Textile Park:** The Bihar Government has proposed to set up a 115 acre apparel and textile park at Bihta near Patna City. It is in line with the newly formed policy which aims to boost the textile and leather sector in the state. Several incentives like exemption from land registration and conversion fee are being offered to industrialist and textile manufacturers.
- c) **Leather and Footwear:** The Patna district has around 1500 units in the Leather Footwear cluster. The turnover is around INR 840 Lakh and provide employment to 10,000 people. The other major clusters are located in Biharshariff, Nalanda, Chhapra. Footwear Design and Development Institute, Bihta, Patna plays a key role in imparting education, facilitating the industry by bridging the skill gap in the areas of Footwear, Leather Accessory & life style products in state. Bata, one of India's leading manufacturers and marketers of footwear products has a tannery at Mokamehghat and a leather footwear factory at Bataganj in Patna. A new leather hub has been setup at the Industrial Unit of Fatuha in Patna district.

5.2.6 Market outside catchment area

- a) **Handloom, Power Loom and Silk cluster:** Champanagar in the district of Bhagalpur is the hub of handloom of weavers. Other handloom clusters lie in the districts of Madhubani, Swan, Rohtas, Nalanda, Banka etc. The textiles manufacturing include various types of silks and cotton ranging from bed sheets, dress materials, stoles etc. The government is taking initiates to revive the

industry by providing amenities like adequate power supply, product quality monitoring, distribution of equipment to revive employment

- b) Sugar Industry:** Most of the sugar mills are located in the North western part of the Bihar state in the districts of West Champaran, East Champaran, Gopalganj and Sitamarhi. Sugar mills thrive in this region. Key players in the sugar industry are K. K. Birla Group, Riga Sugar Co Ltd, Vishnu Sugar Mills Ltd, Eastern Sugar & Industries Ltd. HPCL Biofuels Limited a subsidiary of Hindustan Petroleum Corporation Limited (HPCL) has taken over revival of the 2 integrated sugar ethanol co gen Plants under the Bihar State Sugar Corporation Ltd (BSSC). There are 11 sugar mills currently operation in the state with a sugar production of 6 Lakh MT (2015-16).

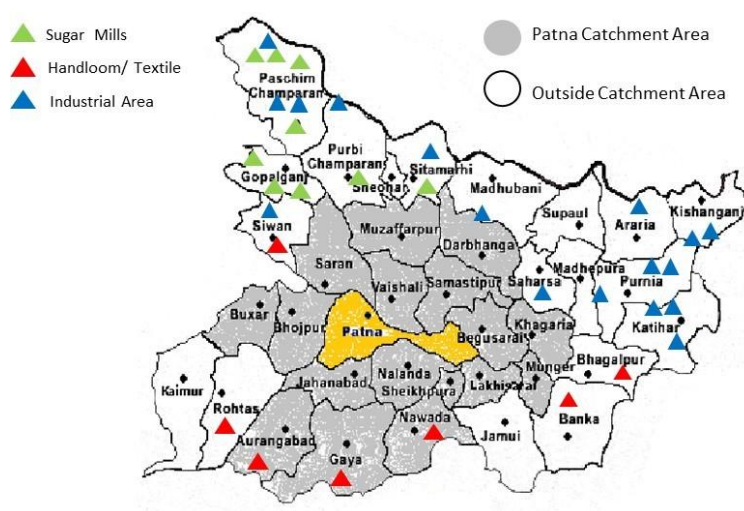


Figure 17: Market outside Catchment Area.

- c) Industrial Area:** Bihar Industrial Area Development Authority (BIADA) has 4 regional offices at Patna, Darbhanga, Muzaffarpur, and Bhagalpur. There are 50 Industrial Areas (IA) / Industrial Estates (IE) / Large Industrial Estates (LIE) / Growth Centres (GC) / Mega Industrial Parks (MIP) in various sectors under the above mentioned 4 offices. Figure 17 highlights the Industrial areas under BIADA, outside the Patna TC catchment. These industrial areas comprises of small units engaged in activities in various sectors like agricultural equipment, automobile repairing and servicing, plastic goods, furniture, small rice mills, steel fabrication, gun manufacturing, paper mills etc. The Patna TC can assist these MSME units in process improvement and engineering jobs as per the requirement, for their growth and development.

5.3 Opportunities associated with other proposed major projects in Bihar

Following are some additional upcoming major projects planned in the near future in Bihar.

- ▶ **Ancillary Park at Bihta:** The government has earmarked 79 acres of land at Bihta to set up an ancillary Park to cater to the requirements of GE and Alstom locomotive projects at Marhaura and Madhepura respectively³⁷.
- ▶ **NIT Patna Campus at Bihta:** The new campus of National Institute of Technology, Patna has been allotted land at Sikandarpur village in Bihta. Indian Institute of Technology Patna and Maulana Azad College of Engineering and Technology (MACET) are other technical institutes in the area. The close proximity to the Tool Room to the technical colleges will be attractive for the technical training and projects.
- ▶ **Bihta Air Base Expansion:** The existing Air Base at Bihta which is around 35 Km away from the Patna City has been proposed for revamp. The project will be carried out in 2 phases, first with 600 acres of land the then 790 acres of land development during the second phase. The new airport will help reduce the air traffic which is directed to existing Jay Prakash Narayan Airport in the city and provide better connectivity. The Industrial Area of Bihta will immensely benefit from this new airport in its vicinity. Also a 4 lane, 40 km expressway is planned to connect the Patna city to the upcoming airport in the outskirts of the city, at Bihta.
- ▶ **Eastern Dedicated Freight Corridor (EDFC):** The Indian Railway project involves the construction of a 1,839 km-long freight line extending from Ludhiana in Punjab to Kolkata in West Bengal. The corridor will pass through the states of Uttar Pradesh, Bihar and Jharkhand in between. The industries will greatly benefit from this line as it will enhance the transportation facility, reduce time by providing quick and easy access to the ports of Kolkata and Haldia in West Bengal. It will increase the prospects of domestic and international export from the state.
- ▶ **Mega Industrial Park at Bihta, Patna:** The government has acquired around 120 acres of land for the development of the Industrial Park at Sikandarpur Village at Bihta. A 25 acre Textile Park, 25 acre IT Park and 67 acre for IT Park/Textile/Food Park has been proposed. It will be a multi-product industrial park near the capital. Its close vicinity to Patna makes it attractive for the industrial setup.

³⁷ https://www.telegraphindia.com/1170630/jsp/bihar/story_159352.jsp

Social and Environmental Safeguards



6. Social and Environmental Safeguards.

6.1 Socio-economic profile of district

- **Sector composition:** Patna has a Gross District Domestic Product (GDDP)³⁸ of INR 51,071 crore which amounts to 25% of the Total State GDP.

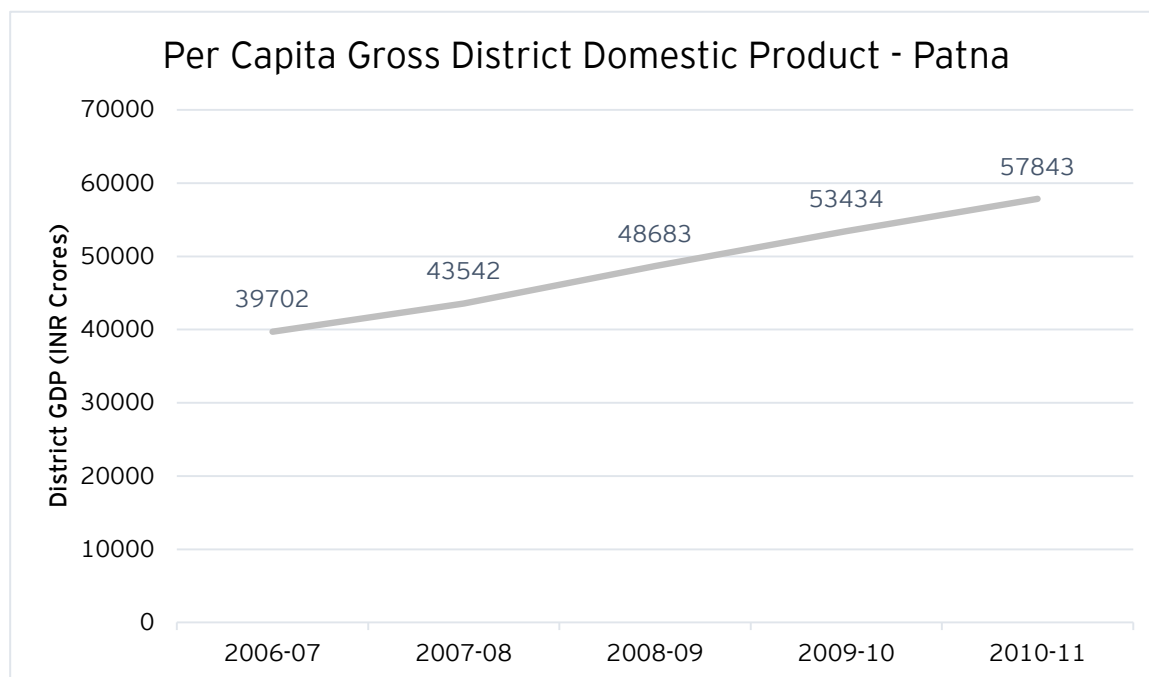


Figure 18: Growth of District GDP of Patna³⁹

Primary Sector: The net area sown in the district is 65.16 percent of the total geographical area. The total cropped area is 194,925 hectare (2013-2014) and 754 hectare (2013-2014) of the culturable land is not being cultivated⁴⁰. The land use for agriculture is more or less optimum due to the availability of plenty of water in the region. Patna district is situated in the south Bihar alluvial plains (Zone III B) among the three agro-climatic zones of divided Bihar. Paddy is the main crop of the district. Other major crops are Maize, Pulses, wheat, potato, onion, other vegetables, flowers, etc. The cropping is mainly dependent upon rain fed irrigation. Other sources of irrigation in the district are tube wells, canals and other wells. Patna has long been a major agricultural center of trade, its most active exports being grain, sugarcane, sesame, and medium-grained Patna rice. Horticulture and orchards are developing in the district. The land holding in Patna are generally small and fragmented, 79% of the land holdings are less than 1 hectare.

³⁸ data.gov.in

³⁹ Udyog Mitra, Department of Industries-District Profile Patna

⁴⁰ Bihar Statistical Hand Book - 2016

Secondary Sector: Patna has emerged as a manufacturing hub in Bihar, with the highest number of industrial units. It has 4 Industrial Areas namely, Patliputra, Fatuha, MIP Bihta and Bihta.

- ▶ There are total of 12,231 registered industrial units in the district with 21 registered medium & large units.
- ▶ A total of 940 Micro & Small Enterprises and Artisan Units exist in Patna ; which include 117 Agro-based, 104 metal based(fabrication units), 66 Engineering units, 121 repairing and servicing units
- ▶ Other popular small scale industries include leather, handicrafts and textile and ready-made garments

There is rising trend of growth in the food processing and packaging industries in the Patna district. This is because of the availability of surplus agro product in the district and vast market creating sufficient demands for the same.

Tertiary Sector: Initially the economy of Patna was largely dependent on agriculture with a small industrial sector. However there has been a significant increase in service sector of the region. Hospitality, Tourism, public administration, transport and business services are key services activities in Patna.

- ▶ **Education:** Patna's literacy rate stands at 70.68%. At the Intermediate college level, courses are available in the area of science, arts and commerce. The state has institutes of national importance such as Indian Institute of Technology, National Institute of Technology & All India Institute of Medical Sciences, Patna which provide skilled manpower to industries. Other famous colleges in the region include Maulana Azad College of Engineering and Technology, Indira Gandhi Institute of Medical Sciences, National Institute of Fashion Technology (NIFT Patna) etc. The following table gives information regarding the number of educational institutions present in Patna district during 2010-11;

Table 10: Educational Institutions in the District (2010 – 2011)⁴¹

Education	Number
Primary schools	2198
Middle Schools	1129
Secondary / senior secondary schools	357
Colleges	25
Technical Universities	1

⁴¹ Udyog Mitra, Department of Industries-District Profile Patna

- **Health:** The status of health delivery system in the Patna has been widely appreciated. The following table gives an overview of health infrastructure in the district during 2010-11:

Table 11: Health Infrastructure in Patna District⁴²

SN	Type	Numbers
1.	Allopathic hospitals	6
2.	Beds in allopathic hospitals	
3.	Ayurvedic hospitals	1
4.	Primary health Centres	24
5.	Dispensaries	32
6.	Sub health centres	60
7.	Private hospitals	25

⁴² Patna District Profile, Ministry of MSME (<http://dcmsme.gov.in/dips/Patna.pdf>)

6.2 Social and environmental screening

Environmental and social screening enables the envisaged risks to be addressed at the very beginning of designing and conceptualizing the implementation of the expansion or the green-field development. The two main objectives of environmental and social screening are to:

- ▶ Enhance the environmental and social sustainability of a proposed project. This aspect of screening focuses on the environmental and social benefits of a project.
- ▶ Identify and manage environmental and social risks that could be associated with a proposed project. This aspect of screening focuses on the possible environmental and social costs of an intervention and may point to the need for environmental and social review and management.

6.2.1 Social screening

As per World Bank guidelines TCSP has a two-tier approach⁴³ to Social Screening Process (SSP) as defined by World Bank which is as follows;

- ▶ **No Social Screening Process (NSSP)** is applicable if,
 - Expansion/modernization of an existing TC takes place within its existing complex/campus and/or within an established and operational sites such industrial estates, industrial parks, export promotion zones etc.
 - New TC is to be established within established and operational sites such as industrial estates, industrial parks, export promotion zones etc.
- ▶ **Full Social Screening Process (FSSP)** is applicable if a new TC is to be established on land acquired from private title holders and/or on Government land under different tenure systems provided by the Government to establish a new Centre
- ▶ **Indigenous People's Social Screening Process (IPSSP)** will be undertaken
 - If a new TC is to be established in an area with high indigenous population comprising tribal populace and
 - If the area is covered by Govt. Policies and Plans such as Tribal Sub Plans and Panchayati Raj Extension to Scheduled Areas

Further, Resettlement Policy Framework (RPF) applies to all components of Technology Centre Systems Program that requires acquisition of private land and transfer of Government/public land and that are likely to have adverse social impact including involuntary resettlement.

⁴³ As per TCSP Environmental management framework - Draft (9 December 2013), MoMSME

In context of Patna TC;

- ▶ The identified site for the proposed TC at Patna;
 - Land has been allocated by the State Government to O/o DC-MSME for the development of the TC by O/o DC-MSME.
 - Declaration has been received from the state government to go ahead with the TC development.
 - Clearances received from the department for being free from any kind of encumbrances and squatter settlements. Further site visit by PMU consultants has resulted the same verification (Non-Incumbency certificate in respect of land is attached in Annexure).
- ▶ The allocated site for the proposed new TC at Patna is in an Industrial area planned by the government. So, FSSP would not be applicable as *‘the land for the establishment of the TC is not acquired from any private title holders and/or on Government land under different tenure systems’*.
- ▶ Hence, in this case NSSP will be applicable since the new TC is to be established within an established and operational site of the industrial estate.

Also, the proposed location of the TC is not established in an area with high indigenous population comprising tribal populace and the area is not even covered by any Govt. Policies and Plans such as Tribal Sub Plans and Panchayati Raj Extension to Scheduled Areas. Hence, this rules out the undertaking of IPSSP.

The responsibilities related to social management will ultimately reside with the respective TC. The PMU will facilitate, support the implementation of the Social Management Plans and prepare a six-monthly report on all aspects of Resettlement Policy Framework and Process.

6.2.2 Environmental screening

Environmental safeguards are an integral component of the TCSP project. TCs are like mini industries; hence planning, development and management of the TCs involve several critical environmental, health and safety obligations. Incorporation of best environmental practices and processes are an integral part of any expansion or development of any green-field TC. The Environmental Management Framework (“EMF”) of the project outlines and details of the environmental aspects to be considered in each phase of the project.

The foremost and most essential stage of environment management is to conduct an environmental screening. The primary objective of the environmental screening is to identify the environmental issues, concerns and environmental risks associated with the use(s) of the Site. Environmental screening enables the envisaged risks to be addressed at the very beginning of designing and conceptualizing the implementation of the expansion or the green-field development. Further, the screening analyses the environmental setting, surrounding land use, historical land use and related issues concerning the respective environmental context. As a consequence, the outcome of the screening process will be categorization of the project into one or more of the following categories:

- ▶ No further action is needed, either because no significant environmental impact and risks were identified, or because sufficient environmental review has already been conducted and environmental management recommendations have been incorporated into the project;
- ▶ Environmental sustainability elements need to be integrated into project design because there are possible environmental and social benefits, impact, and/or risks associated with the project (or a project component) but these are limited in nature, predominantly indirect or very long-term and so extremely difficult or impossible to directly identify and assess; and
- ▶ Further environmental and social review and management is needed because potential environmental and social impact or risks are associated with the project (or a project component) and it is possible to identify these with a reasonable degree of certainty. In some cases, determining the significance of these impact or risks will require environmental and social assessment which, in turn, will lead to the identification of specific environmental and social management measures that need to be incorporated into the project.

As a requirement Initial Environment Screening is conducted at all these sites to ascertain the potential environment impact of these developments, if any. Based on the observations, appropriate measures shall be planned in the Environment Management Plan (EMP) of the proposed Site.

The methodology for environment screening includes desk study, site visit, interview with relevant stakeholders and study of available literature and analysis of data/information.

- ▶ Desk study involves collection and review of the secondary data available in the public domain. This may involve analysing the geo-physical location and seismic activity of the site historical aerial photographs (Google Earth), soil type, land use pattern and readily available historical information; and
- ▶ Site visit/s is/are conducted to collect first hand data/information about the new/existing site. Physical assessment and verification of the site features, topography, existing structures etc. and other major environmental observation to evaluate any possible environmental impact. Interviews are conducted with relevant stakeholders including the site officials for understanding site specific information. The field visit helps to confirm the observations made through secondary data review and identification of additional environmental concerns (if any). Following aspects are analysed and assessed during environmental assessment:
 - Associated change in land use pattern
 - Level of land clearance associated with the development
 - Protected area/ Biodiversity sensitive area in the vicinity
 - Cultural heritage in the vicinity of the site
 - Indigenous people in and around the site
 - Effect on surrounding features due to construction/operations
 - Water source available at site for operations and envisaging the additional pressure on water sources
 - Sources of air/ noise emissions on the site and associated concerns
 - Concerns associated with use of chemicals, handling, storage and disposal of hazardous waste on site
 - Risk of natural calamities on site

To assess the potential environment impact of TCSP, the sites were visited and stakeholders were consulted to gather the relevant information. Stakeholders including MSME officials, representatives of industrial development and other Government officials were consulted during the site visit. Based on this preliminary review, the potential environment impacts of envisaged expansion/new TRTCs were gauged as per the current scenario and anticipated activities during construction and operation phase of the TRTCs.

Site description and environmental setting

The Site is located within Bihta Industrial Area of Patna district. The Site has a relatively flat terrain (agricultural, low lying land) and was vacant during the Site visit. The project does not

involve land acquisition from private players. The Site is owned by Government of Bihar and has been allocated to MSME.

The EY team and World Bank will conduct the environmental screening to identify the environmental issues, concerns and environmental risks associated with the use(s) of the Site. Further, the screening will include analyses of the environmental setting, surrounding land use, historical land use and related issues concerning the respective environmental context. Below is the checklist used to conduct environment screening at the selected site by the World Bank and PMU Environment Specialists:

Table 12: Checklist for environmental screening

S.N	Issues	Yes/No	Remarks
1	Will the expansion or new tool room affect the land use pattern?	No	The allotted land is in a designated industrial area earmarked for industrial operations
2	Will the development include significant land disturbance or site clearance?	No	The land is clear from vegetation and there are no trees.
3	Will the project involve acquisition of land from private players?	No	The land has been allotted to MSME by BIHAR government and is an earmarked industrial zone. Therefore, does not involve acquisition of land from private players.
4	The selected site is defined as industrial / commercial / residential?	Yes	Industrial zone
5	Is there any protected area or biodiversity sensitive area in the vicinity which is likely to be affected by the operations of the tool room?	No	No biodiversity sensitive areas are present near the site.
6	Is there any archaeological or cultural/heritage structure in the vicinity of the site?	No	There is no archaeological or cultural/heritage structure in the vicinity of the site.
7	Is there any group of indigenous people in and around the selected site?	No	There are no indigenous people in and around the selected site.

8	Will the construction activity affect the surrounding around the tool room?	No	The construction and operation of the Tool room is not envisaged to have any impact of the surrounding area.
9	What is the source of water available at the site (Ground water, surface water, municipal supply, etc.)? Is the water requirement envisaged to put additional pressure on the water sources?	No	As per the Site representatives, ground water will be used for the operations within the industrial area. As per the District Groundwater Information Booklet, 2013 the ground water level ranges between 5 - 10 meter below ground level (bgl). Considering that the operations are not water intensive, additional water requirement is not envisaged to put additional pressure on the water sources
10	Were any sources of air emissions observed on the Site?	No	No sources of air emission were observed on the site during the site visit.
11	Were any sources of noise identified on the Site?	No	No sources of noise were observed on the site.
12	Were any chemicals used on or in the vicinity of the Site?	No	No chemicals were being used on the Site during the Site visit.
13	Does the Site involve handling, storage and disposal of hazardous waste? If yes, what are the different types of waste envisaged from the TC?	No	As the Site did not involve any operations, no chemicals were handled on the Site.
14	Is the project located in the area of seismic faults? In case yes, in which seismic does the location lie?	Yes	The TC location falls in the Seismic zone IV and V, these may be designed to be capable of handling an earthquake in case there is one in the future.
15	Is there any record of natural calamity in the area in the past? If yes, what is the probability of the same effecting the operations of TC in the future?	No	There is no record of natural calamity in the region.

6.3 Gender equity and social inclusion strategy

Gender, Equity and Social Inclusion Plan (GESIP) is an important aspect of the social management framework. TCSP also aims to create more choices for young people entering labour force (including women and those who belong to vulnerable sections of society) in terms of providing opportunities for hands-on-technical skills development at varying levels and types through TCs. This is in accordance with Government of India's focus on inclusive growth focusing on poverty reduction and group equality and also with World Bank's Country Partnership Strategy with emphasis on engagement, transformation and inclusion.

GESIP will be formulated for the proposed Patna TC, during its operational phase which would not only be an outcome of the participatory process but also be rooted in the national and state policies for gender and social inclusion. Areas to be considered while preparing GESIP will also be in line with the RFD of the programme and would comprise the following (but not limited to):

- ▶ Criteria for admission into vocational education and training for skills development
- ▶ Increased opportunities for employment to women trainees
- ▶ Timings of training
- ▶ Ease of Location of TC
- ▶ User friendly campus infrastructure esp. for differently abled sections
- ▶ No. of women rest rooms
- ▶ Training Aids and infrastructure
- ▶ Any other component

The PMU will prepare and monitor the strategy to help with the preparation and implementation of a GESIP with particular emphasis on inclusion of young women as well as those who belong to weaker and underprivileged sections of society. For example, those who belong to SC/STs, backward castes, minorities and those who are differently abled. Good practices coming out of the GESIP will be documented and replicated/scaled up further in new TCs.

GESIP Strategy roadmap (Suggestive)

- ▶ Develop a module/ guidance notes for preparing TC specific GESIPs covering the following aspects:
 - Gender gaps
 - Importance of gender
 - Identification of gender specific issues and constraints that hinder the implementation of GESIP (human capital, access to information, access to finance, institutional factors, socio-cultural norms, structural factors, political/ legal)

- Use of gender-disaggregated data to analyse the business environment
 - Identify communication channels to reach intended program beneficiaries
 - Useful links and tools
 - Case studies/ best practices
 - Core questions and indicators
-
- ▶ Capacity building of TC focal points identified to work on GESIP. Analysis of existing pool of potential trainees and their eligibility in terms of gender and social inclusion and in terms of eligibility criteria as set out in national and State policies
 - ▶ Hand holding support for planning and implementing GESIP
 - ▶ Setting up institutional arrangements at TC level for transparent and accountable implementation and monitoring of GESIP based, among others, on specific and measurable indicators. Develop reporting and monitoring formats to assess progress every 6 months
 - ▶ Organize and facilitate monthly meetings (for 6 months) for GESIP coordinators to identify issues and best practices and synthesize learning's' within and across sectors

6.4 Sample monitoring and reporting template

The monitoring of environmental parameters would be undertaken on quarterly basis. The responsibility of the same would lie with the concerned TC and a copy of the consolidated performance will be sent to the O/o DC MSME for their records and recommendations. The suggestive template for monitoring and reporting for the same to be adopted by the TC's is given below. Further, during operation and maintenance of the TC, a number of potential EHS impact may be expected based on the kind of activities undertaken. These possible aspects are delineated in the EHS section of this DPR.

Table 13: Sample monitoring and reporting template

SN	Parameter	Frequency of monitoring and reporting
1	Water consumption	Quarterly
2	Water Cess Report	Quarterly
3	Energy consumption	Quarterly
4	Waste generation and disposal - Municipal Solid Waste - Hazardous waste - Non-hazardous waste - Other categories	Quarterly
5	Safety records Near Misses First Aid cases	Quarterly
6	Training No of students and other trained	Quarterly
7	Air pollution and Noise pollution	6-monthly
8	Internal audit report	Quarterly
9	Update of legal register	6-monthly

Regulatory Approvals required



7. Clearances required and respective authorities

The proposed TC at Patna is one of the Greenfield projects proposed under TCSP. This would include development of physical infrastructure including facilities like production, training, administration, hostel, canteen, utilities etc. keeping in view the long-term sustainability. The same would require clearances at different levels during construction such as approval of layout plan, environmental clearance, electricity and water supply connection, health and safety clearance and other associated clearances. Obtaining these clearances would be crucial for timely completion of the project and therefore needs to be planned well in advance. The following table gives indicative details of the various clearances along with the respective approving authorities and the tentative time required. However, considering that land has already been allotted to O/o DC-MSME for development of TC, some of these regulations may not be applicable.

Table 14: Clearances required and respective authorities

S. No	Required clearance/ approvals ⁴⁴	Department /agency	Tentative time limit for approval (days)
1.	Registration under VAT Act	Commercial Taxes Department	24 hours
2.	Registration under CST Act	Commercial Taxes Department	24 hours
3.	Tax Clearance Certificate	Commercial Taxes Department	1 day in case of non-default of tax payment
4.	Land conversion - Conversion of land use	Revenue & Land Reforms Department	90 days (If the requisite amount is deposited with application) 165 days (if additional amount needs to be deposited over and above the amount deposited with application)

⁴⁴ Indicative list of clearances/ approvals

S. No	Required clearance/ approvals ⁴⁴	Department /agency	Tentative time limit for approval (days)
5.	Land Allotment	Bihar Industrial Area Development Authority (BIADA)	30 days if allotment is to be made at the District Level 60 days in case Government's approval is required
6.	Allotment of plots in Industrial Areas	Bihar Industrial Area Development Authority (BIADA) / State department	60 days
7.	Issue of NOC to the authority concerned regarding conversion of land use	Bihar Industrial Area Development Authority (BIADA) / State department	15 days
8.	Environmental Clearance (Consent of Air and Water Pollution)	Bihar State Pollution Control Board (BSPCB) and Ministry of Environment and Forests, Government of Bihar	Site/environment clearance: 90 days, NOC to establish: 45 days, NOC to operate: 30 days, Renewal of consent: 30 days
9.	Electricity Connection	Bihar State Electricity Board / Bihar State Power Holding Corporation Limited/State department	Loads up to 60 HP: 66 days, Loads above 60 HP and up to 300 KW: 90 days, Loads above 300 HP and up to 3000 KW: 180 days, Load above 3000 KW and up to 33KV: 375 days
10.	Water connection	Water Resources Department, Government of Bihar / State department	Up to 30 days
11.	Fire safety	Bihar Home Guard &	Up to 30 days

S. No	Required clearance/ approvals ⁴⁴	Department /agency	Tentative time limit for approval (days)
		Fire Service Directorate/ State Fire Service Headquarters, Government of Bihar / State department	
12.	Approval of place and for permission to construct building under the Factories Act)	Labour Resource Department	15 days
13.	Approval of factory layout plan under factories Act, 1948	Labour and Employment Department - Factories and Boilers Inspectorate	30 days
14.	License for running the factory	Labour and Employment Department	45 days
15.	Registration of shops and commercial establishments	Labour and Employment Department - Labour Department	10 days
16.	Permission to establishments having more than 50 labours under Industrial Employment	Labour and Employment Department - Labour Department	45 days
17.	Lift	State department	NA

S. No	Required clearance/ approvals ⁴⁴	Department /agency	Tentative time limit for approval (days)
18.	Borewell	Central Ground Water Authority	NA
19.	Society registration	Indian societies registration act 1860/ Registration, Excise and Prohibition Department, Government of Bihar	NA

8. Manpower and Human Resource development

The success of an institute or an organization majorly depends upon the skill set and experienced human resource available with them. Hence, it's planning, recruitment and development is one of the most important aspects while designing a new Technology Centre. As a part of the study we have analysed organizational structures of some of the existing Technology Centres to understand the major functional areas, number and level of employees, contractual staff and other related aspects. In continuation, we have also discussed the same with O/o DC-MSME and some of the heads/GMs of the existing TRs.

As per the existing structure, there are following functional areas/streams in a TR:

- ▶ Production
- ▶ Design
- ▶ Training
- ▶ Consultancy and Marketing
- ▶ Administration and Accounting

The level of employee heading a particular Functional area/stream/department varies in some of the TCs. In an Indo German TC Administration and Accounting is headed by a Manager while in Indo Danish TCs this is being headed by a Senior Manager. Sanctioned employee strength in these existing TCs typically varies from 110-120. **Proposed organization structure**

While analysing the existing organizational structures and designing the new one, we have taken some considerations into account which have been discussed and validated with the O/o DC-MSME. Some of the key considerations are as below:

- ▶ As per the decision taken in the Empowered Finance Committee, the total sanctioned strength for any new TC would be 60 in contrary to the existing ones which have total sanctioned strength of 110-120.
- ▶ In the proposed organizational structure for Patna TC, the main revenue streams are Training, Production and Design & consultancy. These departments will be headed by Senior Managers who would directly report to GM/DGM.
- ▶ In contrary to the existing structures and target of sanctioned employee strength of not more than 60, we have proposed only 7 levels as compares to the existing structures which have 9 levels in the hierarchy. Below these levels, the resources will be hired as contractual employees on need basis.
- ▶ In the existing structure consultancy and marketing department were clubbed into one, but in the proposed structure for Patna TC it has been proposed to have marketing as a separate department and consultancy be clubbed with the design department. This has been done after having discussions with some heads/GMs of the existing MSME TCs and understanding the

customer requirements to meet the technical experts while pitching for any consulting assignment. Moreover, production projects' catering to component manufacturing or tool designing requires consulting. Most of these projects are mutually exclusive with less replicability across designs.

- ▶ The other two departments namely, Marketing and Administration and Accounting are proposed to be headed by Manager level position and they will directly report to GM/DGM. This has been done as the administration and accounts department is lean and a manager level employee would be able to manage the same. Also, as stated above, the total sanctioned strength cannot exceed 60.
- ▶ Consistent efforts will have to be made to optimize the revenue from training, production and business advisory. With this in mind, the design and consulting department have been strengthened with a sanctioned strength of 7 experts which will mainly work in the areas of Design support, Quality systems support, Product development and engineering solutions, Project consultancy in setting up of TR, training centre and others. These experts will be supported by internal production team and external experts on need basis.
- ▶ In contrary to the sanctioned strength (4-5 employees) in marketing department of many existing TCs, the sanctioned employee strength in the proposed structure has been reduced to 2 only (1 Manager and 1 officer sales). This has been proposed keeping in mind that the GM or Deputy General Manager will devote his/her significant time in marketing and sales. Also, the respective departmental heads (Senior Managers) will be responsible for the sales and marketing efforts of their departments. Moreover, above all TCSP aims to hire Technology Cluster Manager to facilitate all the market linkages for the proposed TC. The role of TCM for marketing would be very crucial and it will act as an additional arm of the marketing wing of the proposed TC. Considering all the above factors into account, a lean marketing department has been proposed for the proposed Patna TC.
- ▶ The maintenance manager though will be a part of the production department but will have an added responsibility to support the maintenance of machines in the training department as well. He/she will be supported by 1 Senior Engineer and 2 Senior Technicians.
- ▶ Based on our discussions with the O/o DC-MSME and heads of the existing MSME TCs, there was a need for dedicated manager for the short term trainings. In the structure for Patna TC, we have proposed separate manager for mechanical, electronics and short term trainings. Keeping in mind the scale and the number of trainees in the short term courses (both mechanical and electronics), the manager short term would mainly be responsible for administration, planning, quality control, issue of certificate to trainees, fee collection and others. Even one of the managers (from mechanical and electronics) would be additionally responsible for placement of students which will include industry interaction, managing training and placement, delivering presentations etc.
- ▶ While estimating the numbers we have considered the following considerations:

- The final semester trainees of Tool Design and Manufacturing course would also work with the design and consultancy department. This will help them in getting the hands-on experience and will also provide support the department
- In continuation to the above, even the final semester trainees of Diploma in Tool & Die making, Post Diploma in Tool Design, Post diploma in Tool Manufacturing and CNC Machinist would work in the production department depending upon the skill set and interest area.
- In addition to the regular employees, the training department will have the maximum number of contractual faculty in the form of guest faculty and full time contractual faculty. The figure for number of contractual faculty have been arrived at by taking various factors into account namely - existing employees in training and production, the number of courses vis-à-vis the number of trainees, trainee to teacher ratio, projected revenue numbers over the years, number of shifts in production vis-à-vis the utilization and others. The TC will sub-contract the assistants in the administration, accounts and stores department for providing the support to the departmental team on day to day basis.
- The requirement of staff for the house-keeping and security will be outsourced to a third party agency on yearly contract basis

Based on the considerations stated above, the organisational chart in figure 19 demonstrates the target organizational structure to be achieved in 5 years (by 2021-22) from inception. Though, we have provided the figures till 2026-27 since we are estimating the revenue and expenditures for next 10 years.

As highlighted above, the proposed Technology Centre at Patna will be divided into five functional areas/departments. These are:

- ▶ Production
- ▶ Training
- ▶ Design and consultancy
- ▶ Marketing
- ▶ Admin and Accounting

It is recommended that the GM and the DGM divide these five areas/departments between them, depending on competency, work-load and previous experience. Overall GM would be responsible for the management and financial health of the TC.

The chart consists of 5 levels in addition to the General Manager (GM) and the Deputy General Manager (DGM).

- ▶ The third level consists of Senior Managers as the departmental heads of design and consulting, production and training. They will report directly to either the GM or the DGM, depending upon the division of departments within them.

- ▶ The fourth level will consist of Managers who will be supporting Senior Managers in their respective domains. But for marketing and admin and accounting department, as explained above manager will head this department and directly reporting to GM or DGM.
- ▶ The fifth level consists of senior engineers (Sr. Engg.) and Sr. Officers. Level six consists of engineers (Engg.) and officer / foreman.
- ▶ The final level consists of senior technicians with requisite operational level expertise.

The responsibilities of each position and qualifications required to fulfil roles are covered in the following section. Hence, the recommended final organisational structure for the proposed TC is based on experience from established MSME Technology Centres, discussions with O/o DC-MSME and heads of some of the existing TCs, expert opinion and knowledge and experience with organisational planning.

Table 15: Sanctioned strength of key resources

S. No.	Designation	Proposed Sanctioned Strength
1.	General Manager	1
2.	Deputy General Manager	1
Department		
3.	Administration and accounting	7
4.	Design and consultancy	7
5.	Production	18
6.	Training	22
7.	Incubation Centre	2
8.	Marketing	2
	Total	60⁴⁵

In addition to the above sanctioned strength, we have recommended additional employees as contractual employees. Based on the requirement, we have estimated around 140 contractual employees (128 in training & 12 in production) by end of FY 2030. The figure for number of contractual employees have been arrived at by taking various factors into account namely - existing employees in training and production, the number of courses vis-à-vis the number of trainees, trainee to teacher ratio, projected revenue numbers over the years, number of shifts in production vis-à-vis the utilization and others.

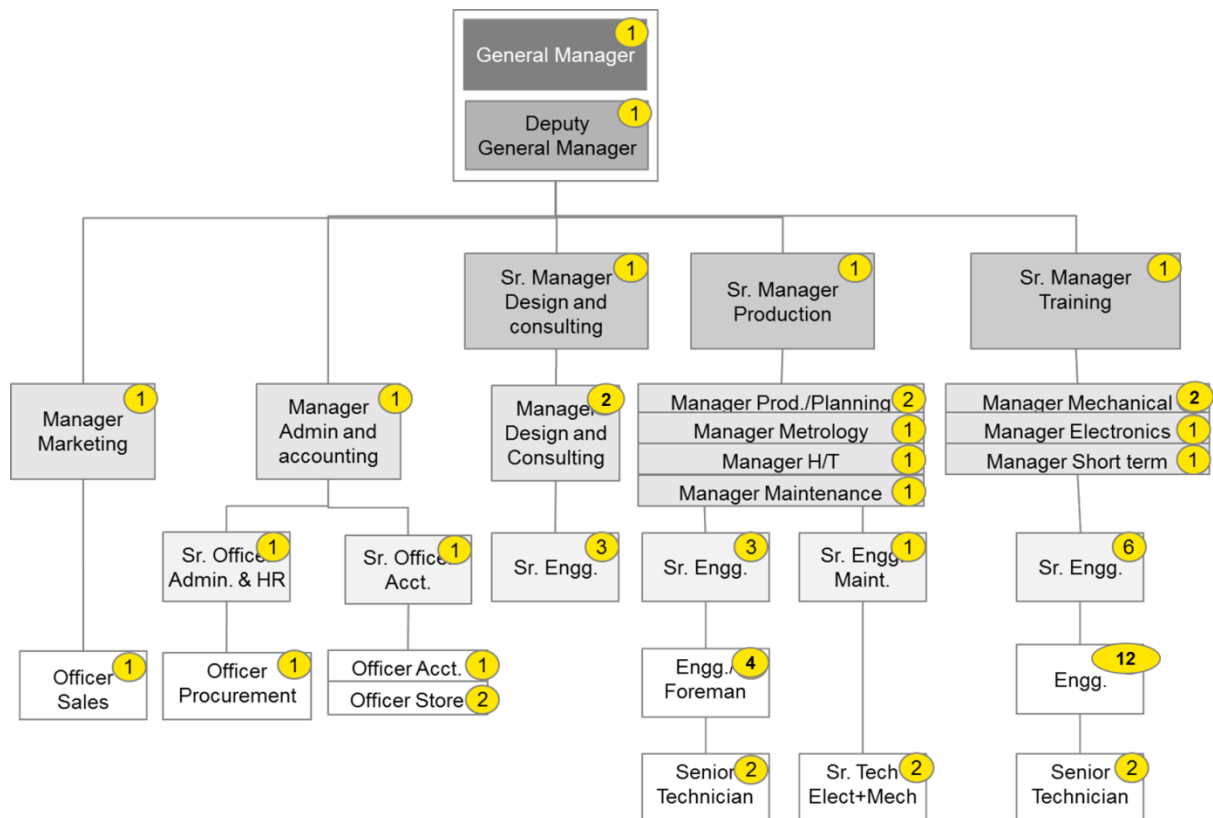
⁴⁵ The details and basis of number of employees is provided in the next section

While considering the ratio for trainee to teacher, we have used the following assumptions after discussion with existing GMs and O/o DC-MSME.

- Trainee to teacher ratio for theory classes - 60:1; with theory classes conducted for 20% of time
- Trainee to teacher ratio for practical classes - 20:1; with practical classes conducted for 80% of time

After calculating the weighted average of the above ratios we got the overall trainee to teacher ratio of 28:1. Post discussions, we have considered trainee to teacher ratio of 25:1 for calculating the number of employees in the training department (regular and contractual faculty) keeping in mind the employees who will be on leave at any given point of time.

Figure 19: Proposed organisation structure



8.2 Phase wise induction of human resources

As discussed in the above sections, the proposed TC will have 60 employee as sanctioned strength and the target structure will be achieved within 5 years from 2020-21. Therefore due care has been taken during the study to phase the recruitment of employees. On the same lines, initially some positions have been proposed to be vacant when establishing the organizational structure of the TC. This has been proposed keeping in mind the time it will take to be fully operational. Vacant positions will also create incentives for high performers to obtain higher positions when the time comes for fulfilling these.

The phase wise estimated staffing over next few years as part of human resource planning has been done through the identification and analysis of the various types of activities and skill sets required for smooth and efficient functioning of the proposed TC. Multiple rounds of discussions with industry experts, World Bank, O/o DC-MSME and heads of some of the existing MSME TCs have been undertaken to arrive at the requirement of human resources needed to meet the business objectives in the short and long term of the proposed TC.

The following provides the details of recruitment in various phases over next few years. This phasing is suggestive and can be modified based on the need and revenue generating capabilities of the TC during operations. Some of the considerations which have been taken into account while recommending the phasing of employees are as below:

► **Year 2020-21: 2 staff members**

- GM will be involved in project implementation and work out the strategy for marketing, training, production and consultancy with the help of TCM. GM will also monitor the progress of construction and procurement of machines etc. GM will also be responsible for planning of recruitment of required manpower.
- Manager - Administration & Accounts will be responsible to get statutory registrations like sales tax and PF, opening of TC's bank account, getting power and water connection etc. Manager will also support GM in recruitment of people in the coming years.

► **Year 2021-22: 20 staff-members**

- Three senior managers will be recruited to further recruit staffs in respective departments. These would also be responsible for orientation and training of respective staff members.
- Senior officer - administration & HR will be recruited to support the GM and manager - administration and accounts for further recruitment of staff and forming of systems to conduct day to day administrative activities
- The first long term training programme will commence this year and one senior engineer, one engineer and one senior technician will be recruited for installation of machines and conducting theory and practical training
- By second half of this year, production and design staff will be recruited. The respective senior managers would be responsible for orientation and training of these staff members. These staff will undergo training (preferably at another Tool room at Aurangabad and/or Ahmedabad) for a period of 3-6 months to make them fully trained before start of the operations of the proposed TC
- Manager - maintenance and senior technicians will be recruited to install and commission machines for production and training. They will also be responsible for installing the power supply system
- Stores and accounts officers will be recruited to maintain statutory records and support the operations

► **Year 2022-23: 42 staff- member**

- Production will commence during this phase and hence more engineers and senior engineers will be recruited. The number of staff has been decided based on estimated number of machines commissioned during this phase and number of shifts in production
- This year some short term training courses will commence along with the starting of the second year of the long term course.
- Officer sales will be recruited to support manager marketing for preparation of detailed marketing plan of the TC. The staff would be engaged in various marketing activities for wider reach of the proposed TC across the region. This would be crucial for promotion of the TC and would help departments increase their revenue
- The Design and Consultancy department has been planned to commence its commercial services during this year and hence manager and senior engineers will be recruited to meet the requirement.

► **Year 2023-24: 52 staff members**

The proposed TC would be fully operational by this period with activities in production, training, design and consultancy etc. Additional staff will be recruited for smooth undertaking of the gradual increase in the activities across all the departments.

It is recommended to leave the position of the DGM vacant initially. The position of the DGM can be filled by a high performing senior manager within design and consulting, production or training depending upon the requirement, skill set and experience.

Rest of the positions will be filled gradually as TC activity escalates and the manpower requirements increase. The tables below summarize the phasing of the organizational completion within each area; Administration and Accounting, Design and Consulting, Production, Training and Sales and Marketing, in addition to the positions of the GM and DGM. The numbers represent the numbers of employees within the specific position at a given point in time. The timeline spans from 2017 to 2026.

Table 16: Summary of phase wise induction of resources

Year	20-21	21-22	22-23	23-24	24-25	25-26	26-27	26-27	27-28	28-29	29-30
Full time employees											
Total	2	20	42	52	57	60	60	60	60	60	60
Contractual employees											
Total	-	3	25	44	65	78	97	112	126	140	140

Below tables depicts the hiring of number resources in every department every year starting from 2020-21 to 2025-26. In the year 2029-30, the TC is recommended to hire the complete sanctioned strength of 60 employees.

Table 17: Department wise induction of fulltime resources

General Manager							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
General Manager	1	1	1	1	1	1	1
Total	1	1	1	1	1	1	1
Deputy General Manager							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Deputy GM	-	-	-	-	-	1	1
Total	0	0	0	0	0	1	1
Administration and Accounting							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Manager Admin. and Accounting	1	1	1	1	1	1	1
Sr. Officer HR	-	-	-	-	-	1	1
Sr. Officer Accounting	-	1	1	1	1	1	1
Officer Procurement	-	-	1	1	1	1	1
Officer Store	-	1	1	2	2	2	2
Officer Admin	-	1	1	1	1	1	1
Total	1	4	5	6	6	7	7
Design and Consulting							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Senior manager		1	1	1	1	1	1
Manager			2	2	3	3	3
Sr. Engg.			2	3	3	3	3
Total	0	1	5	6	7	7	7
Production							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Senior Manager	-	1	1	1	1	1	1
Manager Prod/ Planning	-	-	1	2	2	2	2

Manager Metrology	-	-	1	1	1	1	1
Manager Maintenance	-	1	1	1	1	1	1
Sr. Engg. Maintenance	-	-	-	1	1	1	1
Sr. Engg. Prodn	-	3	3	3	3	3	3
Engg. / Foreman	-	2	5	5	5	5	5
Senior Technician	-	1	2	2	2	2	2
Senior Technician Maintenance (Mech + Elect)	-	1	1	2	2	2	2
Total	0	9	15	18	18	18	18
Training							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Senior Manager	-	1	1	1	1	1	1
Manager Mechanical	-	-	1	1	1	1	1
Manager Electronics	-	-	1	1	1	1	1
Manager Short term	-	-	-	-	-	1	1
Sr. Engg.	-	1	5	6	6	6	6
Engg.	-	1	4	8	10	10	10
Senior Technician	-	1	2	2	2	2	2
Total	0	4	14	19	21	22	22
Incubation Centre							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Manager	-	1	1	1	1	1	1
Officer	-	-	1	1	1	1	1
Total	0	1	2	2	2	2	2
Sales and Marketing							
Year	20-21	21-22	22-23	23-24	24-25	29-30	30-31
Manager Marketing	-	1	1	1	1	1	1
Officer Sales	-	-	1	1	1	1	1
Total	0	1	2	2	2	2	2

8.3 Roles and responsibilities

While conducting the study, we had series of discussions with the O/o DC-MSME and some heads/GMs of existing MSME TRs on the prospective roles and responsibilities of the employees for the Patna TC. Below is summary of the suggestive roles and responsibilities (including the minimum qualification levels) of the individual employees which can be referred to while recruiting.

Table 18: Roles and responsibilities of proposed positions

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
General Manager	B.Tech (Mechanical) with MBA or M.Tech	15 Years with 8 years in similar role	▶ Tool Manufacturing/Design/ Product development/ Training. ▶ Experience in Project Implementation will be preferred	▶ Over all responsible for the administration and financial health of the TC ▶ Key responsibility areas include (but not limited to); Marketing, Administration, HR, Accounts, Production, Design & consultancy etc. ▶ Responsibility for achieving the target KPIs set by the GC
Deputy General Manager	B.Tech (Mechanical) with MBA or M.Tech	12 Years with 5 years in similar role	▶ Tool Manufacturing/Design/ Product development/Training. ▶ Experience in Project Implementation will be preferred	Head of Production, Design, Consultancy and Training
Manager - Admin. and Accounting	CA/ICWA or MBA with bachelor's	8 Years with 3 years in similar role	▶ Experience in the area of Administration, HR and Accounting	Head of Accounts, Administration and HR: ▶ General housekeeping of TC

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
	degree in Commerce/ Accounting / Finance		▶ The Manager must also have basic knowledge of government laws, regulations and state specific compliances ▶ Familiarity with ERP/accounting software	▶ Bookkeeping, accounting and finance including financial analysis ▶ TC security ▶ Payroll ▶ Procurement management and store keeping
Sr. Officer - Admin. & HR	MBA or Equivalent	5 Years	▶ Experience in the area of HR and Administration ▶ Familiarity with Industrial laws and compliances	▶ Housekeeping of TC ▶ Security systems operation ▶ Transport System and management ▶ Payroll
Sr. Officer - Accounting	Bachelor's degree in commerce/Acco unting / Finance with M.Com. or MBA	5 Years	▶ Experience in accounting and Tax ▶ Should be familiar with latest accounting software	▶ Bookkeeping and accounting ▶ Financial analysis
Officer - Accounting	M. Com. or MBA or Equivalent in Accounting	3 Years	▶ Experience in accounting and Tax. ▶ Should be familiar with latest accounting software	▶ Bookkeeping and accounting ▶ Handling of Cash, Banking etc.
Officer Store	Diploma in Mechanical or Equivalent	3 Years	▶ Experience in Store keeping, including inventory management	▶ Managing store ▶ Issue of consumable and non-consumable stores and keeping records

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Experience in Computer systems / software for store keeping operation	
Officer Procurement	M. Com. or MBA or Equivalent	3 Years	▶ Experience in Procurement processes ▶ Knowledge of Govt. Procurement rules and processes will be desirable	▶ Procurement ▶ Vendor Development
Senior manager - Design & Consultancy	M.Tech in Mechanical engineering.	10 Years with 5 years in similar role	▶ Experience in product modelling, design, tool design ▶ Proficiency in one of the areas in Tool Design, either Sheet metal press tool or Plastic mould ▶ Practical Experience in use of CAD/CAM/CAE in product and tool design ▶ Experience of Tool trial ▶ Experience of assembly and inspection of Jigs and Fixtures ▶ Knowledge of Quality systems ▶ Experience in technical consultancy will be preferred	Responsible for designing tools, moulds and die casting w.r.t. ▶ New product development planning and its execution ▶ Quality systems ▶ Value engineering ▶ Tool try outs and proving ▶ Consultancy to MSMEs In charge of Incubation centre ▶ Helping members of Incubation centre in getting orders and execution of the same
Manager- Design & Consultancy	B. Tech in Mechanical engineering.	8 years with 3 years in a similar role	▶ Experience in product modelling, design, tool design	▶ Designing tools, moulds and die casting ▶ Product development ▶ Quality systems ▶ Value engineering

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Proficiency in one of the areas in Tool Design, either Sheet metal press tool or Plastic mould ▶ Practical Experience in use of CAD/CAM/CAE in product and tool design ▶ Knowledge of Tool trial ▶ Experience of Jigs and Fixtures ▶ Knowledge of Quality systems ▶ Experience in technical consultancy will be preferred	▶ Tool try outs and proving ▶ Consultancy to MSMEs: Deliver functional consulting on assigned areas to ensure MSMEs are able to successfully use the solutions
Sr. Engineer- Design & Consultancy	B. Tech in Mechanical engineering	5 Years	▶ Experience with designing sheet metal tools, plastic moulds or die casting ▶ Knowledge of high end CAD software, analysis software and metrological instruments ▶ Experience of consultancy in the areas of product development, quality systems and value engineering	▶ Designing tools, moulds and die casting ▶ Product development ▶ Quality systems ▶ Value engineering ▶ Tool try outs and proving ▶ Consultancy to MSME
Sr. Manager Production	M. Tech. in Mechanical Engineering	10 Years with 5 years in similar role	▶ Experience with tooling or manufacturing and at least 3 years of leadership experience	▶ Overall responsible for Production, production planning and control, including quality assurance of Tools and components, Tool trials etc.

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ The Sr. Manager should have experience in metal or plastic mould and/or die casting ▶ The Sr. Manager should also have hands on experience with CAD and CEM software, and programming of CNC machines ▶ Experience to debug tool, analyse problems, root causes & take corrective improvement actions when tool is not able to produce as per part specifications	▶ Overall responsible for relevant software CAD/CAM/CNC ▶ Overall responsible for machine maintenance and upkeep ▶ Ensuring on-time deliveries ▶ Deliver budgeted quantities as per required quality standards ▶ Manpower deployment and controlling manpower costs as per target
Manager- Production	B. Tech in Mechanical Engineering	8 Years with 3 years in a similar role	▶ Experience with tooling or manufacturing ▶ Knowledge of metal or plastic mould and/or die casting ▶ Hands on experience with CAD and CAM software, and programming of CNC machines ▶ Experience to debug tool, analyse problems, root causes & take corrective improvement actions when tool is not able to produce as per part specifications	▶ Production ▶ CAD/CAM/CNC programming and operation ▶ Responsible for timely delivery of tools and components ▶ Responsible for Tool Trial ▶ Responsible for Consultancy to MSMEs ▶ Should have good knowledge of Quality and inspection

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
Manager- Production planning	B. Tech in Mechanical Engineering	8 Years with 3 years in a similar role	▶ Experience in tooling or manufacturing ▶ Experience in metal or plastic mould and/or die casting. ▶ Experience in CAD and CAM software, and programming of CNC machines ▶ Knowledge of ERP software	▶ Preparation of stage wise / machine wise scheduling in co-ordination with head of production team ▶ Production Planning and Control, and further dispatching of jobs ▶ Estimate & manage to get raw materials and component requirements ▶ Responsible from issue of raw materials to dispatch of final product to customers including routing
Manager- Metrology	B. Tech in Mechanical Engineering	8 Years with 3 years in a similar role	▶ Practical knowledge and experience of handling CMM and measuring Instruments ▶ Knowledge of Quality assurance and systems	Head of QC and metrology section with in production
Manager- Heat treatment (HT)	B. Tech in Metallurgy/Mec hanical Engineering	8 Years with 3 years in a similar role	Practical Experience in heat treatment of engineering products including tool steel	Head of heat treatment section and responsible for heat treatment operation
Manager- Maintenance	B. Tech in Mechanical/ Electrical/	8 Years with 3 years in a similar role	▶ Knowledge of Installation and commissioning of machines and equipment	▶ Head of Machinery maintenance including preventive maintenance, repair etc. of machines and equipment

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
	Electronic Engineering		▶ Practical experience in preventive and repair maintenance of machines and equipment ▶ Practical experience of maintaining utility equipment like sub-station, UPS, water treatment plant, DG set etc.	▶ Responsible for Power supply, energy conservation water system in the campus
Senior Engineer- Production	B. Tech in Mechanical Engineering	5 Years	▶ Knowledge and experience in tool manufacturing, metal cutting through CNC programming and operation ▶ Experience of precision components ▶ Tool assembly ▶ Tool trial	▶ CNC machine programming and supervision of machining and assembly of tools ▶ Machinery maintenance ▶ Quality assurance ▶ Team work
Engineer- Production	Diploma in Tool & Die Making or Equivalent	3 years	▶ Knowledge and experience in tool manufacturing, metal cutting through CNC programming and operation ▶ Tool assembly ▶ Tool trial	▶ CNC machine programming and operation ▶ Assembly and trial of Tools
Foreman	Promotion from Senior Technician	3 years as Sr. Technician	▶ Knowledge and experience in tool manufacturing, metal cutting through CNC programming and operation ▶ Tool assembly ▶ Tool trial	▶ CNC machine programming and operation ▶ Assembly and trial of Tools

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
Senior Technician (Electrical maintenance / Mechanical maintenance/ tool assembly & manufacturing)	Diploma/ ITI in respective areas	1 year after Diploma or 5 Years after ITI in respective areas	Experience in Maintenance of machines and equipment (electronics or mechanical)/ Experience in CNC machine programming and operation/ Experience in Tool assembly and trial	▶ CNC machine programming and operation ▶ Assembly and trial of Tools ▶ Also work as Maintenance Technician in Mechanical/ Electronics
Senior Manager- Training	M. Tech. in Mechanical engineering	10 Years with 5 years in a similar role	▶ Experience with tooling / manufacturing and training in metal cutting / tool engineering / industrial automation systems ▶ Experience with designing curriculum and preparing lecture plans and course material for long term and short term training and teaching	▶ Overall responsible for planning and executing training activities ▶ Overall responsible for designing curriculum and preparing lecture plans and course material ▶ Responsible for Quality and Certification in training
Manager Training- mechanical/ Electronics	B. Tech. in Mechanical or Electronics or Electrical Engineering	8 years with 3 years in a similar role	▶ Experience with tooling / manufacturing and training in metal cutting / tool engineering / industrial automation systems ▶ Experience with designing of curriculum and preparing lecture plans and	▶ Planning and implementing of training activities in manufacturing and tooling, Mechatronics, IT etc. including market assessment to discover training demand ▶ Evaluation of training activities and identify improvements

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			development of course material for long term and short term training and teaching	▶ Curriculum design ▶ Lecture plans and course material
Senior Engineer-Training	B. Tech. Mechanical or Electronics/ Electrical	5 Year	▶ Experience with tooling / manufacturing and training in metal cutting / tool engineering / industrial automation systems ▶ Experience with designing curriculum and preparing lecture plans and development of course material for long term and short term training and teaching experience ▶ Knowledge of CAD/CAM/CNC	▶ Undertake training courses in manufacturing/ tooling and related courses
Engineer-Training	Diploma in Tool & Die Making/Electronics	3 Years	▶ Experience in tooling / manufacturing and training in metal cutting / tool engineering / industrial automation systems and teaching	▶ Undertake training courses ▶ Demonstrate practical skills to trainees ▶ Deliver theory lectures
Manager - Incubation Centre	M. Com. Or MBA or Equivalent	8 Years	▶ Experience in management, administration, and marketing in the sector ▶ Familiarity with regulations and compliances	▶ Helping members of Incubation centre in getting orders and execution of the same

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
Officer - Incubation Centre	M. Com. or MBA or Equivalent	3 Years	▶ Experience in the area of Administration and Marketing ▶ Familiarity with Industrial laws and compliances ▶ Prior experience of marketing and promoting in the sector	▶ Administration and Promotion
Manager- Sales & Marketing	M. Tech. in Mechanical Engineering preferably with MBA	10 years with 5 years in similar role	▶ Marketing of TC product range ▶ Supporting Sr. Managers of respective departments to acquire orders ▶ Follow up with prospective and existing customers	▶ Plan and evaluate marketing activities towards all stakeholders ▶ Stakeholder analysis ▶ Sales according to targets
Sales Officer	BE/B. Tech Mech. with MBA or Equivalent	3 years	▶ Marketing of TC Products ▶ Customer Follow-up & Complaints ▶ Should be familiar with Computerised accounting procedures ▶ Feed Back, Dues Collection	▶ Execute marketing and sales activities ▶ Sales invoicing, taxes etc.

8.4 Governance structure

8.4.1 Governance Model for the new TCs

All the existing 18 TCs have been set up under the Societies Registration Act, 1860. The management of affairs mainly rest with the Governing Council constituted by MoMSME, Government of India with the Additional Secretary and Development Commissioner of Ministry of Micro, Small and Medium scale Enterprises (DC-MSME) acting as the President of the Society and Chairman of the Governing Council (GC).

This arrangement has proved effective as most TCs have supported local MSMEs well and have performed financially. Each TC has a separate society and has very decentralized authority and governance structure. DC, MSME being chairman and other two members Director -Tool Room and representative of IF-wing of MoMSME are common members in all 18 GCs.

The Patna TC will also be set up under the Societies Registration Act, 1860 and will function as the current TCs are functioning.

The benefits of registering under the Societies Registration Act, 1860 are listed in the table below:

Table 19: Comparison of Society Registration Act and Companies Act

Features	Registered Society
Setting up and running cost	Nominal
Formation	Simple
Jurisdiction	Registrar of society
Meetings	Annual Meeting As per Law. Governing Body meeting as per the rules of Society.
Governance	Vests with governing body as per the rules framed by them. Law specifies no rules & regulation
Membership transfer	Impossible
Statutory Regulations	Limited
Transparency	Transparent (As society act is not so exhaustive requiring statutory compliance for each and every step of business operation)
Perception commercial lenders	Less comfortable

Features	Registered Society
Interest of commercial lenders	Less secured, as Act doesn't provide any rules regarding how the interest of lenders can be settled in the case of bankruptcy
Accountability	More (Can be established, if the rules, regulation and by-laws of the Society are framed in manner to fix accountabilities)
Financial Management & Disclosures	Best practices can be adopted through framing regulations. However, Act doesn't provide anything specific on this
Modification of Objects	Easy Legal Procedure
Penalties	Lesser
External audits	Subject to lesser audit requirement. As Act doesn't provide for various kind of audits of the Society. However, generally the society provide for audit regulations and compliance to audit observations as part of their bye-laws and rules and regulations
Basic Document	Memorandum of Association Articles of Association with rules & regulations

The Table above outlines the benefits of registering under the Societies Registration Act, 1860.

8.4.2 Composition of the Governing Council

As mentioned above, the proposed TC will be set up under the Societies Registration Act, 1860. The management of affairs primarily rest with the Governing Council constituted by MoMSME, Government of India with the Additional Secretary and Development Commissioner, Ministry of Micro, Small and Medium Enterprises (DC-MSME) acting as the President of the Society and Chairman of the Governing Council of each TC.

The Governing Council of TC will comprise four types of members as explained below:

Table 20: Governing Council of Patna TC

Representation in the Governing Council	Suggestive recommendations
(i) Ex-officio members	
Representative from Government of India ► Development Commissioner, Ministry of MSME as Chairman,	► Secretary, Industries ► Commissioner/Director, Technical Education & Training

Representation in the Governing Council	Suggestive recommendations
▶ Industrial Advisor or Director of TR or Program Coordinator, ▶ Director DI-MSME of the respective States, ▶ Representative from Integrated Finance Wing of the Ministry of MSME. Representative from State Government ▶ Official from concerned industry department, ▶ Official from concerned department of technical education/training.	
(ii) Institutional members	
▶ Representative of state level industrial promotion body ▶ Representative of association of small scale industries ▶ Representative of the local chambers of commerce and industries/ Industry Promotion Institution/NSIC.	▶ Patna/ District MSME association ▶ Bihar Chamber of Commerce and Industries/ Department of Industries
(iii) Professional and other members	
▶ One expert representing the fields of finance & accounts/ law/management, ▶ One representative of small scale tool producers, ▶ One representative of OEM, ▶ One representative of major manufacturers in the region ▶ Representative of Technical University of the state which governs engineering colleges	▶ To be nominated by O/o DC-MSME ▶ To be decided by O/o DC-MSME
(iv) MD/Executive Director/GM/PD of the Society	
On his appointment, the Executive Director or General Manager of the Society shall automatically become ex-officio member of the Governing Council during the tenure of his office, as <i>Member Secretary</i> .	

▶ Role of the governing council

The Governing Council will discharge such duties and responsibilities, exercise such powers and undertake and carry out such activities as considers essential with a view to attain the aims and objectives as per the Memorandum of Association of the Society, with particular reference to the following;

- To prepare and execute plans and programmes for the establishment of the TC based on the plan of operation and to carry on its administration and management after such establishment.
- To prepare, consider and approve the policies and strategies of the Society and to reconsider and amend the said policies and strategies whenever appropriate.
- To receive grants and contributions and to have custody of the funds of the society.
- To prepare, consider and approve the budget estimates of the society every year.
- To prepare and maintain accounts and other relevant records and annual statement of accounts including the balance sheet of the society.
- To open, conduct and prescribe courses of study, training and research in tool management and allied subjects.
- To fix and receive such fees and other charges from persons undergoing training as may be necessary.
- To prescribe rules and regulation for the admission of candidates to the various courses of training.
- To lay down standards of proficiency to be demonstrated before the award of diplomas, certificates and other distinctions to the trainees.
- To institute and award scholarships, prizes and medals.
- To provide for and supervise the residence, health, discipline and the well-being of the trainees in the Society.
- To create subject to the provisions of Rule 68 supra technical, training, research, administrative, ministerial and other posts under the Society and to make appointments thereto on such terms and conditions as deemed appropriate.
- To co-operate with any other organisation in the matters of education, training, management and allied subjects.
- To enter into arrangements for and on behalf of the society.
- To sue and defend all legal proceedings on behalf of the Society.
- To appoint committee or committees for the disposal of any business of the Society or for advice in any matter pertaining to the Society.
- To delegate to such extent it may deem necessary any of its power to any officer or committee of the Governing Council.
- To consider and pass such resolution on the Annual Report, the annual accounts and the financial estimates of the Society as it thinks fit.
- To make, inform, adopt, amend, vary or rescind from time to time rules and by-laws for the regulation of and for any purpose connected with the management and administration of affairs of the Society and for the furtherance of its aims and objectives.
- To make, adopt, amend, vary or rescind from time to time rules and by-laws for
 - For the conduct of the business of the Governing Council and the committee(s) to be appointed by it,

- For delegation of its powers,
 - For fixing quorum.
- To sell, lease, mortgage or exchange and otherwise transfer all or any portion of the properties of the Society.
- To establish a provident fund for the benefit of the employees of the Society.
- To perform such additional functions and to carry out such duties as may from time to time be assigned to it by the Society.
- To establish procedure in respect of services and technical advice to be rendered to the industry by the Society and the levy and collection of charges for the same.
- To delegate its powers as may be deemed fit and appropriate but not the powers for:
 - Altering, extending or abridging the purposes of the TC within the meaning of the Societies Registration Act, 1860.
 - Amalgamating the TC either wholly or partially with any other TC having similar aims and objectives.
 - Altering, extending or abridging the Rules and Regulations of the TC within the meaning of the Societies Registration Act, 1860.
 - Shifting the existing location or altering the capacity of the TC.
 - Making capital investment exceeding the approved budget.
 - Borrowing money except for working capital exceeding the approved budget.
 - Transferring by way of mortgage, pledge, hypothecation or otherwise any assets, moveable or immovable, except as security for working capital.
 - Appointing bankers and auditors.
 - Generally anything extraordinary and of major importance.

► **Roles and responsibilities of the member secretary (GM/PD/MD)**

- Plan, direct, co-ordinate, organize and supervise day-to-day work of the society.
- Implement policies, strategies and such programs of the society and attend to all statutory requirements imposed thereon.
- Prescribe the functions, duties and responsibilities for all officers and staff of the society, give them appropriate instructions and exercise such supervision and disciplinary control as may be necessary.

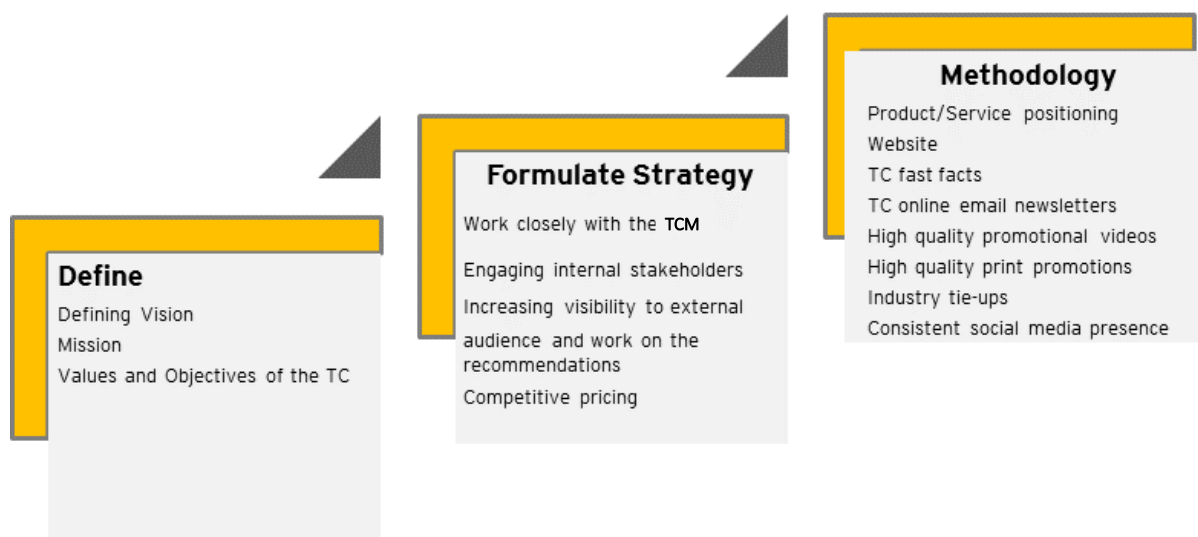
► **Roles and responsibilities of the O/o DC-MSME in management of the TCs**

- Support DC-MSME in executing the responsibilities as the Chairman of the Governing Council of all TCs.
- Support in implementation of strategic projects and policies from the central to the TC levels.
- Act as the nodal point of coordination between the TCs and the DC-MSME.

9. Marketing plan of Patna TC

The marketing plan of Patna TC would require specific actions to engage with potential customers and clients in the catchment area. A series of activities is therefore required to be planned for effective marketing of Patna TC to promote its business, product or services. A broad suggestive framework for marketing of Patna TC would include the following;

Figure 20: Suggestive framework for marketing of TC



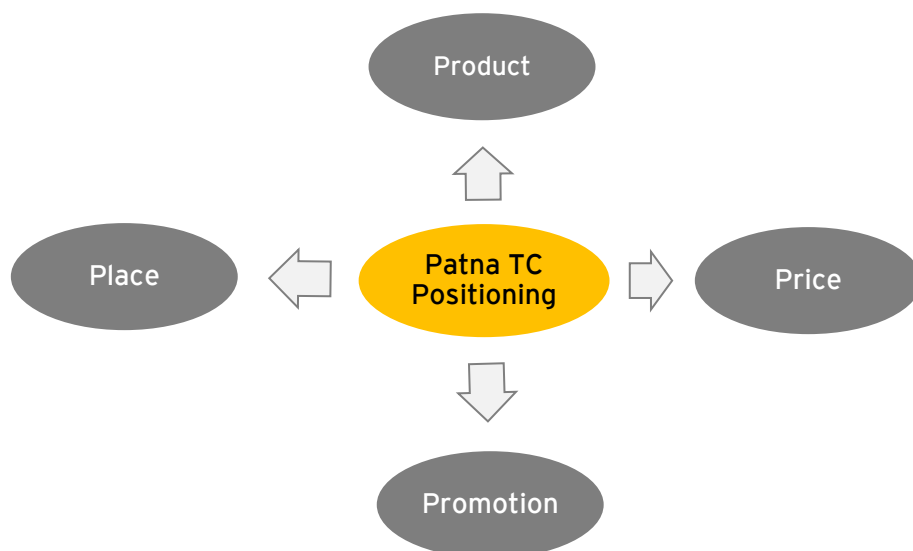
In line with the above suggestive framework, a detailed Go to Market plan of the proposed TC will be prepared subsequently by the Technology Cluster Manager (TCM) along with the GM and marketing team of the TC. The role of TCM for marketing would be very crucial and will act as an additional arm of the marketing wing of the proposed TC. It will further strengthen its market linkages with the MSMEs in the cluster it serves. TCM will also market the TC within the trade and industry associations, academia, educational institutions, applied research institutions, service providers, other government support institutions, workers and skill seekers.

As part of the marketing initiative, TCM would work closely with MSME clusters in the region to understand their needs and requirements and involve OEMs/ large players in the region. Based on the observations, the marketing strategy of the TC would be customized targeting various focus groups including technical and training institutes. Further, the TCM would be part of the consolidation of the results and recommendations of the diagnostic into a strategic plan for cluster development. The TCM would also represent the TC in various industry oriented outreach programs and workshops. This would help in two ways; promoting the TC and understanding industry perspective and future areas of focus. The same will help to identify key areas of focus for the TC and align the future marketing strategies accordingly.

Hence, the TCM would promote the TCs in among the newly developed partnerships for mutual benefit around identified programs / initiatives.

The plan should clearly position the proposed TC's marketing mix with respect to its four Ps - product, price, place and promotion. The suggestive points which needs to be taken care while designing the Go to Market Plan for the Patna TC has been highlighted below:

Figure 21: Positioning of marketing mix for proposed TC



Product

A General Engineering TC is proposed to be developed at Patna based on the two FDI projects in Locomotive Manufacturing Facilities which require Metal Fabrication, Welding, testing etc. Also, existing and up-coming food processing industries, textile and garment industry and leather and footwear industry requirement will be for tooling, repair and maintenance etc. The product and service offering of the proposed TC therefore has been carefully derived keeping in view the existing gaps to address specific requirements of this sector. Further the shortlisted specializations and respective courses to be offered by the proposed TC have been done keeping in view the shortage in the availability of required skill sets in the labour force across the industry.

The summary is provided below:

The key offerings of the proposed TC will be; manufacturing of tools, training for skill development with respect to various specialisations, consultancy services in general engineering. Focus areas would include:

- Long and short term training programmes in CNC/ CAD/CAM, advance welding, industrial and process automation etc.
- Manufacturing of moulds, jigs and fixtures etc. for general engineering

- Consultancy services in the field of product and tool design, manufacturing etc. for improved quality and productivity.

Price

As per the study and discussions with GMs of some of the existing TCs, the proposed TC should adopt the cost plus pricing approach for its products and services during its initial years of operation and thus ensuring operating profit for sustainability. Most of the existing MSME TCs follow the cost plus pricing approach only for all of their products and services

As a differentiator from the existing MSME TCs, it is proposed that once the TC strengthens its brand and credibility in the market it should gradually move towards market-based pricing with defined margin levels (margin based costing). Then, the TC will have to work towards optimisation of its processes and operations to sustain its margins in the competitive environment.

The above mentioned pricing models are suggestive and will depend on the detailed analysis while preparing the Go To Market Plan with the support of the TCM.

Promotion

Promotion of TCs products and services is one of the most important components of the Go To Market Plan for a new set-up. Hence, below are some of the suggestive points which might be considered while making the final Go To Market Plan for the proposed Patna TC.

► Increasing visibility to external audience

- Encourage and execute early communication and promotion of activities by TC which are relevant to key external audiences including industry, media, technical media etc.
- Producing a steady, reliable stream of quality outbound communications that highlights;
 - Research innovations and technology evaluations coming from the TC and its partnerships.
 - Special events and conferences hosted or supported by TC.
- Working with industry partners to identify projects for joint publicity.
- Develop Facebook/ LinkedIn/ Twitter/ YouTube presence to connect to students.
- Ensure current marketing message is being maintained with all social media platforms administered by these TC.

► Engaging internal stakeholders

- Conduct media and website training on a regular basis for all interested faculty and staff.
- Leverage active partnerships with the industry and community, inviting departmental and staff participation.
- Ensure department faculty and staff are informed of the progress of the TC with respect to each goal.

► **Other Activities**

- **Website:** Develop a website showcasing all highlights of the TC.
- **TC fast facts:** Fast fact can be a two-page information sheets describing the highlights of TC. It can be made available online and increase the visibility to external audiences.
- **TC online email newsletters:** Preparation and delivery of high-quality email newsletters from TC to industrial units, associations and other partners with the latest research announcements, news and more of engaging and interesting information to these external audiences.
- **High quality print promotions:** High quality print promotions coordinated by TC communications, which maintains the Patna TC as a brand to be utilised in outreach efforts.
- **Industry tie-ups:** Partner with Industries and other technical education institutes to increase the visibility of TC. Explore opportunities to participate in publications and other co-branding opportunities with these partners from time to time.
- **Maintain consistent social media presence:** Ensuring consistent, exciting messaging is posted on active social media platforms including the TCs Facebook page, Twitter account, YouTube channel and others. Promote the presence of TC on these platforms to students, alumni and supporters while acting as a social media hub for internal departments

Place

Patna is strategically located at the centre of Bihar has significant advantage of its proximity with Kolkata, Jamshedpur and the eastern markets. FDI from GE and Alstom locomotive plants to be set up in the state will promote the development of engineering ancillary units in and around the plants. Metal Fabrication, food processing plants, footwear, plastics manufacturing plants and other engineering firms operate in the region. Further, Bihar state Government is planning to invest in the district in order to make it next industrial hub. 25 acres of industrial land has been allotted by the government for construction of IT/ESDM park (25 acres), Garment Manufacturing Park (25 acres) in the industrial area of Bihta, 115 acres for textile park. Apart from these, several other projects are coming up; for instance 3 Mega Food parks are planned in the districts of Khagaria, Rohtas and Buxar.

As a part of developing the go to market plan GM would work with the TCM, during the final stages of the construction, to prepare a detailed marketing plan keeping in view the focus areas of the TC. This team, with support from TCM, would be responsible to conduct the suggestive activities as mentioned in the promotion component and lead the marketing initiative for the TC.

In view of the above broad framework the following would be undertaken for marketing of the TC during its inception to start with. It is proposed to keep aside an initial one time marketing budget for completing most of the below mentioned activities through third party vendors:

Table 21: Suggestive marketing activities, ownership and timeline

Phases	Activity	Ownership	Timeline
Preparation of promotional materials	- Designing brochure of TC (through outsourcing) - Short video film of TC infrastructure and facilities available (through outsourcing- post completion of the infrastructure/construction) - Development of TC website (through outsourcing)	Marketing team, GM and TCM	Construction and Post construction phase
Pre marketing activities	- Preparing list of industrial association bodies in the Patna catchment, district and state. - Preparing list of industries in consultation with DIC. - Shortlisting of perspective players' with respect to product range and process. - Design a brief questionnaire. - Preparing list of engineering colleges, ITIs, polytechnics, in the catchment area.	TCM and GM	Construction phase
Targeting the manufacturing units	- Send the brochure along with cover letter and short questionnaire to the shortlisted industries. - Seek time from large industries and industry body associations to give presentation on the capability statement of Patna TC with respect to manufacturing of tools etc. - Send representatives to get the filled questionnaire or fill the questionnaire circulated earlier. - Analyse the questionnaires received with respect to production, consultancy, training requirements of industries. - Meeting the key industrial units identified in the analysis to further understand their needs with respect to tool manufacturing, production support, training of employees etc. - Organise as well as participate in industry oriented outreach programmes/ seminars/ workshops/ boot camps etc.	GM, Manager Marketing and TCM	During installation and commissioning of machines for manufacturing

Phases	Activity	Ownership	Timeline
Targeting OEMS	OEMs are important because they involve many industries including MSMEs in the manufacturing of a product. The TC will plan for targeting the same through the following; - Take appointment and meet the OEMs in the region to understand their specific needs with respect to support required in tool manufacturing and training of employees etc. - Presentation on the capability statement of the TC with respect to manufacturing of tools, training etc. - Get their vendor details and understand their portfolio of product requirement at various levels - Plan to Increase product portfolio to cater to the OEMs and their vendors	GM, Manager Marketing and TCM	During installation and commissioning
Targeting technical and vocational training institutes and high schools	- Meet the principle/ HoD of the institutes and present on the capability statement of Patna TC with respect to training infrastructure, faculty, real time learning with on job learning etc. - Seeking permission and presenting the same to final and pre final year students - Getting permission to display the brochure of TC on the notice board of these institutes. - Organise as well as participate in industry oriented outreach programmes/ seminars/ workshops/ boot camps etc.	Marketing team (GM) and TCM	During installation and commissioning of machines for training

A vibrant white-on-grey doodle illustration representing entrepreneurship. The scene is filled with celebratory and growth-oriented imagery. At the top left, a globe shows flight paths. In the upper center, two hands clink champagne glasses. Below them, a large crowd of stylized figures celebrates around a central globe. The word "Entrepreneur" is written multiple times in various fonts and sizes. To the right, a tall tree is constructed from banknotes, topped with a star. Above it, the word "GROWTH" is written vertically. Below the crowd, the word "PASSIONATE" is written in a flowing script. In the bottom right corner, the word "WORLD" is written in large, bold letters. On the left side, there's a building sketch and a circular diagram with four numbered steps (1, 2, 3, 4) connected by arrows. A lightbulb labeled "IDEA" sits near the bottom center, next to gears and a rocket. A trophy with a globe on top stands prominently in the lower middle. The entire composition is a dense, energetic collage of business-related concepts.

10. Focus area for Patna TC

The proposed TC in Patna will be focused on General Engineering with facilities such as; Welding, metal Fabrication Training, Production support, Incubation Centre and Advisory Services. Out of the three areas, skill development/training will be the key driver of TC's operations. The details of these facilities are explained below.

10.1 Training

The TC at Patna will provide professional training in various courses with focus on general engineering. The TC will be able to produce highly skilled technical workforce, with greater career prospects in the General engineering industry. The duration of courses will be both short and long term, ranging from 1 month to 48 months in various specializations like; Tool Room & CNC Manufacturing, CAD/ CAM, Advance Welding , Electronics and IT, Industrial and process Automation, etc. The batch size; number of batches per annum and respective fee have been decided on the basis of capacity of existing TCs and NCVT norms. A soft skill lab for training in English language and communication facilities will also be established in the TC. Soft skill module will be an integral part of all the medium to short term courses. The TC will start training activity from the first year of its operation across all specializations. The details of the courses in various specializations is given below:

Table 22: Details of specialization, courses, duration and capacity intake

N o.	Specialization	Course name	Duration (months)	Batch size	No. of Batch/ year	Annual intake
	Tool Room	Advanced Diploma in Tool & Die making	48	60	1	60
		ITI (NCVT) Machinist Trade	24	30	1	30
		ITI (NCVT) Fitter	24	30	1	30
		Advanced Machinist Course	24	60	1	60
		Post Diploma in Tool Design	12	30	2	60
		Post Diploma in Tool Manufacturing	12	30	2	60
		Post Diploma in CNC-Programing & Operation	12	30	2	60

N o.	Specialization	Course name	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Adv. Certificate Course in Tool Design & CAD/CAM	12	30	2	60
		Adv. Certificate Course in Tool & Die Manufacturing	12	30	2	60
		Certificate Course in Tool & Die Making	12	30	2	60
		Master Certificate Course in Tool Design	6	30	2	60
		Certificate Course in Machine Tool Operations (Turning, Milling, Grinding)	12	30	2	60
		Master of CAD/CAM/CNC	6	30	2	60
	Sub Total					720
2	CNC Manufacturing , CAD/CAM	CNC lathe programming and operation (Full Time)	2	30	6	180
		CNC lathe programming and operation (Part Time)	4	30	12	360
		CNC Milling Programing and Operation (Full Time)	2	30	6	180
		CNC Milling Programing and Operation (Part Time)	4	30	12	360
		CAD/CAM/CNC Engineer (Full Time)	4	30	3	90
		CAD/CAM/CNC Engineer (Part Time)	6	30	2	60
		Auto CAD	1	30	6	180
		ANSYS	1	30	6	180
		Hyperworks Suite (Hyper Mesh, Hyper Form, RADIOS)	1	30	6	180
		CAD Modelling with UNIGRAPHICS	1	30	6	180

N o.	Specialization	Course name	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		CAD Modelling with CREO Parametric	1	30	6	180
		CAD Modelling with CATIA	1	30	6	180
		CAD/CAM Solidworks	1	30	6	180
		STAAD. Pro	1	30	6	180
		Computer Integrated Manufacturing (CIM)	1	30	6	180
	Sub Total					2850
3	Advance Welding Courses	Basic Arc and Gas welding (Full Time)	3	20	4	80
		Basic Arc and Gas welding (Part Time)	6	20	2	40
		TIG welding (Full Time)	2	20	4	80
		TIG welding (Part Time)	4	20	2	40
		MIG welding (Full Time)	2	20	4	80
		MIG welding (Part Time)	4	20	2	40
		Flux Core Arc Welding	3	20	2	40
		Master Course in Advanced Welding Technologies	12	20	1	20
	Sub Total					420
4	Foundry and Casting	Advanced course in Foundry Technology	18	20	1	20
		Non Destructive Training - Level 1	1	20	6	120
		Non Destructive Training - Level 2	1	20	6	120
		Certificate Course in Foundry Technology	6	20	2	40
	Sub Total					300
5	Electronics and IT	Basic computer and Hardware (Part Time - 4 hrs)	2	30	12	360

N o.	Specialization	Course name	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Advanced Hardware & Networking (Part Time - 4 hrs)	4	30	6	180
		VLSI Design	4	30	4	120
		Embedded System Design	4	30	4	120
		Electronics Maintenance (Part Time)	4	30	4	120
		Additive Manufacturing	2	10	6	60
		Advanced PLC Programming and SCADA (Part Time)	4	30	4	120
		Power Electronics and Industrial Drives (Part Time)	4	30	6	180
		Solar Energy System Technician (Full Time)	3	30	4	120
	Sub Total					1380
6	Industrial and process Automation and Others	Industrial Hydraulics	1	20	6	120
		Industrial Pneumatics	1	20	6	120
		PLC Programming	1	20	6	120
		Industrial Automation Technician	4	20	3	60
		Industrial Automation Design	4	20	3	60
		Certificate course in Industrial Automation with PLC, AC Drive and CNC Maintenance	6	20	2	40
		Certificate course in Metrology and QC	3	20	4	80
		Advance Certificate Course in Inspection & Quality Control	6	30	2	60
		Diploma in Mechatronics	36	20	1	20
	Sub Total					680
7	Training on Testing	Mechanical: Physical Properties of metal and Non Metal product/material	4	20	3	60

N o.	Specialization	Course name	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Metallurgical Testing	4	20	3	60
	Sub Total					120
8	Rural Artisan, Technician and Skill Training	Courses on Rural Artisan, Craftsman & Technician Training	3	2500	1	2500
	Sub Total					2,500
	Grand Total					8,970

The TC will have adequate installed infrastructure like machines, software, computers etc. required to provide training to the proposed number of students under various specializations. The following table provides the estimated cost of these machines:

Table 23: Proposed list of machines for training

S.No.	Training Machines	Nos	Value (lakhs)	Total
Advanced Machines				
1.	CNC-Milling	5	30	150
2.	CNC Turning Centre	5	35	175
3.	CNC Lathe	5	25	125
4.	CNC Vertical Machining Centre	5	30	150
5.	CNC EDM Wire Cut	1	60	60
6.	CNC EDM Die Sinking	1	60	60
7.	CNC Milling & Lathe Simulation Modules	30	2.5	75
8.	Tooling for machine tools @ 5% of Machine Cost	1	39.75	39.75
Conventional Machines				
9.	Conventional Milling-V-H-U	10	15	150
10.	Conventional Lathe	10	10	100

S.No.	Training Machines	Nos	Value (lakhs)	Total
11.	Surface Grinding	6	5	30
12.	Cylindrical Grinding	4	10	40
13.	Tool & Cutter Grinder	1	20	20
14.	Pedestal Drilling Machine (25 mm)	2	2.5	5
15.	Radial Drilling Machine (50mm)	1	5	5
Department of Agri/Rural & Traditional Enterprises and EDP Cell				
16.	Agri / Food Processing Sector : Facility for aseptic packaging for processed food products (Up to 1 Litre capacity is preferred). Freeze drying facility for processing of agriculture and horticulture products i.e. vegetables and fruits	1	300	300
17.	Agricultural Implements Manufacturing Sector Facility for sheet Bending Laser/water jet profile cutting	1	350	350
18.	Traditional Enterprises & Rural Artisans Facility for investment casting for manufacturing handicraft items made out of non-ferrous metals to cater the needs of traditional enterprises and rural artisans	1	250	250
Labs and Supporting machines				
19.	Material Handling equipment Trolley (2 No.), Jib Crane 1 Ton (1 No.)		2	2
20.	Welding workshop for 30 including simulator	1	200	200
21.	Welding QC Lab	1	50	50
22.	Die Casting Setup(including furnace, die casting machine etc.) 80 Tonne	1	50	50
23.	Solar Energy Lab	1	30	30
24.	Computers for CAD/CAM/CAE Labs	310	0.75	232.50

S.No.	Training Machines	Nos	Value (lakhs)	Total
25.	Automation Lab for 20	1	250	250
26.	IT, IoT Industry 4.0 Lab AR/VR Lab	1	100	100
27.	3 D Printer	1	15	15
28.	Material & Metallurgical Test Lab	1	50	50
29.	Tech aids (Audio Visual)	30	1	30
30.	Tech aids (Smart Board)	10	1	10
31.	CAD/CAM/CAE and Analysis Software License	300	0.3	90
32.	Work benches and Hand Tool	20	2	40
33.	Furniture for labs	60	0.25	15
34.	Classroom Furniture @ 60 seats	8	3	24
35.	Contingency @5%			163.66
	Total			3,436.91

10.2 Production

On the basis of focus sector for the proposed TC, following are the machines identified for production/ manufacturing activities at the proposed TC. The list will be further validated by Technology Cluster Manager for finalisation and to initiate procurement. The TC will provide various machining support to MSMEs in the catchment area. The growing concerns related to climate change, energy security, scarcity of natural resources and increasing environmental regulations is putting more emphasis on sustainable production activities in manufacturing process. Due care therefore has been taken during the identification of machines for production systems and associated services, processes, plants and equipment in the TC. This will make the TC environmental friendly and energy efficient and would be better equipped to manufacture more products with less material, energy and waste.

Table 24: Proposed list of machines for production/ manufacturing activities

S.N.	Machine	Size	Number	Value (lacs)	Total Cost
1	CNC Milling - 5 axis	750*500*500	1	250	250
2	CNC VMC - 3 Axis	1200*900*500	1	150	150
3	CNC VMC - 3 Axis	800*600*450	1	100	100
4	CNC Lathe	250*750 mm	1	35	35
5	Conventional Vertical Milling	1200*300*400 mm	1	25	25
6	Conventional Lathe	400*1200 mm	1	20	20
7	CNC EDM Wire Cut	500*500*400 mm	1	100	100
8	CNC EDM Die Sinking	500*500 mm	1	100	100
9	Tools & Tooling Systems(@10% of machine value)				78
10	Radial drill machine	63mm	1	10	10
11	Surface Grinding	800 x 400 mm	1	25	25
12	Surface Grinding	500 x 200 mm	1	15	15
13	Cylindrical Grinding	Dia 200x750mm	1	40	40
14	Hydraulic press	100 T	1	15	15
15	Mechanical Press	100 T	1	15	15
16	Injection Moulding	100 T	1	30	30
17	Vacuum Heat Treatment Facility		1	200	200
18	Work Benches with Bench Vices & Hand tools		10	2	20
19	Auxiliary Eqpts (Drill m/c, Bench grinder, Surface Plates etc.)		1	20	20

S.N.	Machine	Size	Number	Value (lacs)	Total Cost
20	Additional Material Handling Equipment - Trolley (2 no.), Jib Crane (2 T, 1 no.) and EoT(10 T)			30	30
21	Compressor (approx. 125 CFM) including piping and accessories		1	5	5
22	Metrology Lab with CMM		1 lot	250	250
23	NABL accredited - Material Testing Facility for engineering products		1	260	260
24	NABL accredited - Testing Facility for LED bulbs/assemblies		1	150	150
25	NABL accredited - Testing Facility for essential oils extracted from aromatic plants		1	120	120
26	CAD-CAM Software CATIA,UG etc. and Analysis Software		15	10	150
27	3D Printing(polymer) with scanner		1	200	200
28	Scanning/Drafting/Printing		1	5	5
29	CAD-CAM Workstations		15	1	15
	Contingency		5%		121.65
	Total Production Machines & Equipt.				2,554.65

10.3 Additive Manufacturing Facility

The new Patna Technology Centre is planned to have an additive manufacturing facility for both training purposes and to give MSMEs access to prototyping services at reasonable costs. The centre will have 3D printing capability which will be able to produce functional prototypes, presentation models, casting patterns and production parts in a variety of materials. There is a high demand for tool designing and reverse engineering for repair and maintenance jobs as expressed by the representatives from food processing units, leather manufacturing, garment manufacturing units etc. The centre will also have the capability to digitize physical objects through 3D scanning processes and thus will be able to help the MSMEs in reverse engineering of vital components also. The centre will conduct training programmes for personnel from academia and industry.

Initially the centre may start with manufacturing prototypes in plastic and can eventually manufacture prototypes in steel as per the demand and requirements of MSMEs in the catchment area.

10.4 Industry 4.0, AR, VR Labs

With the innovations in technology the tides of industrial revolution had started flowing from harnessing power from natural resources to electricity mass production followed by IT and automate production and now it's shifting into technology that is blurring the lines between the physical and virtual spheres i.e. Industry 4.0.

With the imminent developments in this field, countries which used to set up their establishments in other developing countries, due to availability of cheap and skilled labour, no longer need to do so as Industry 4.0 does not rely on manual labour force. With the manufacturing sector shifting onto the virtual platform, countries no longer need to set up their businesses in other nations, vast research and development in this field no longer require widespread and complex networks. Although it proves to be cost efficient it will also cause the displacement of workers by machines thereby exacerbating the gap between returns to capital and labour.

As we see today, the future is Industry 4.0.

However in India the, MSMEs are yet to adopt this technology immediately. Nevertheless keeping up with these technological advancements has become essential in the ever competitive world. Therefore, we aspire to promote the adoption of industry 4.0 by the industry today in India.

To support this, we have planned an Industry 4.0, AR, VR etc. lab with the primary aim to provide exposure to the students by allowing them to have a first-hand experience with the widespread technology advancements. The labs will contain virtual as well as physical machineries and equipment which will provide a better platform for understanding and development.

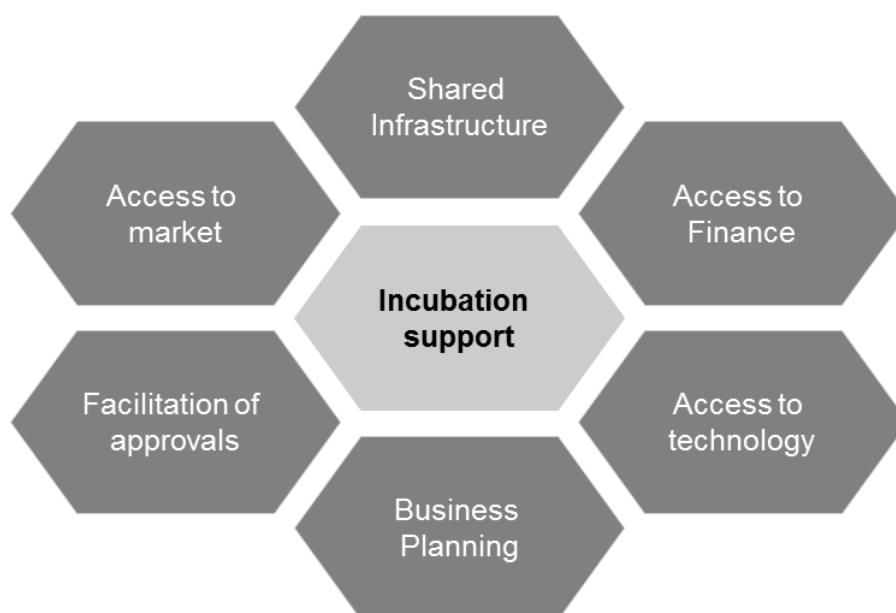
10.5 Incubation Centre

Promoting emerging technological and knowledge-based innovative ventures that seek to nurture ideas from professionals is important for development MSMEs. Such entrepreneurial ideas need to be fostered and developed in a supportive environment before they become financially sustainable or attractive enough for venture capital. Hence need arises for incubation centres to promote budding individual innovators and to assist them to become technology based entrepreneurs. Typical areas of Incubation support include

- Idea conceptualisation & business planning - Technology commercialization,
- Access to infrastructure - networking, office space
- Access to finance - bank loans, loan funds, guarantee programs, investors
- Access to technology - access to machines, designing support
- Access to market - Introduction to strategic partners
- Facilitation of approvals - regulatory compliances, clearances

The incubation centre may also provide support to promote networking and forging of linkages with other constituents of the innovation chain for commercialization of their developments.

Figure 26: Key areas of incubation support



Typically the incubation support initiatives provide support to new businesses for an initial period of 2-4 years.

Business incubators differ from traditional research and technology parks in terms of scale and assistance. Research and technology parks are typically large-scale projects that house corporates, government companies or university labs to very small companies. Typically research and technology parks do not provide business assistance services, which are the hallmark of business incubators. However, research and technology parks may house incubation programs.

Several initiatives in this direction of incubation have been taken by various departments of Central Government. Some of them include

► **Incubators scheme for MSMEs- A component of National Manufacturing Competitiveness programme to improve competitiveness of MSMEs (MoMSME)**

The term ‘innovation’ covers a very wide domain. According to MoMSME, innovation signifies any activity and new/ ingenious procedure or product that is likely to be of use to society and marketable in the long run. The scheme seeks to provide small dose of assistance, to students/ ex-students of science and technology and entrepreneurs to try out their innovative ideas (new processes/ products) at the laboratory or workshop stage and beyond (to the extent possible) with an objective to carry the idea from concept stage to ‘know-how’ stage and then to ‘do how’ stage.

► **Technology Business Incubator (TBI), Department of Science & technology, (MoST)**

TBI is a flagship programme of National Science and Technology Entrepreneurship Development Board (NSTEDB) and focuses on incubation of potential ideas and innovations through a well-defined venture/ enterprise creation process and by effectively utilizing the requisite expertise, facilities and other infrastructure available within the host institution and the adjoining region. The incubation period is expected to be 2-3 years. Key areas of assistance in the TBI scheme include:

- Market survey/ marketing,
- Business planning and training,
- Organising management/ technical assistance,
- Obtaining statutory approvals,
- Information dissemination on product ideas/technologies,
- Syndicating finances,
- Arranging legal and IPR services,
- Provision of work space, shared service facilities

The proposed MSME technology centre at Patna will house incubation facilities to promote new entrepreneurs and MSMEs in the catchment area.

10.5.1 Incubation Centre at Patna TC

Patna TC will provide space for new age entrepreneurs and young minds to transform their innovative ideas into viable business propositions. The major role of TC will be to facilitate a platform for a budding entrepreneur to start a business venture with minimum risks. Patna TC will ensure that incubates have access to technological assistance which will be generated through mentors with multidisciplinary expertise. Young enthusiasts with creative pursuits with an inherent zeal to be entrepreneurs will be encouraged to take advantage of this novel initiative. Patna TC will facilitate interdisciplinary research with special emphasis on development and innovation of high-growth-knowledge-based-business and nurtures the indigenous products. Technical support, business mentoring, space availability and soft loan facility subject to availability will be the key services of the TC.

The Incubation Centre proposed at the Patna TC will offer the basic shell infrastructure with latest technologies, world class manufacturing plant and machinery on rental basis for a 2 year period. This Incubation Centre is expected to fuel the growth of enterprise which has successfully crossed the stage of pilot order and ready to execute larger orders. The Incubation Centre would support entrepreneurs to develop end products for commercialization. The Incubation Centre would comprise of the following facilities:

- a) Shell infrastructure for setting up an manufacturing facility with space between 20-40 square meter

- b) Support Business facilities like office space, conference rooms, reception area etc.
- c) Business Support: Provides assistance in company formation, provides assistance for Regulatory Clearances, Vetting Business Plans, etc.
- d) Technical Support: The incubatee companies are provided with support of machineries, testing and calibration equipments, product assessment facilities and mentors for technical support.
- e) Financial Support: The MIC will provide financial support to the Incubatee Companies in the form of Soft Loan with minimum simple interest, from the funding agencies.
- f) Legal Support: The Incubatee Companies would also be assisted in filling patent, patent harnessing as and when required on chargeable basis.
- g) Networking: The MIC will provide Networking with Domains Experts, Consultants, Venture Capitalist and other funding agencies.
- h) IT Support services like internet, video conferencing, Wifi etc.
- i) Electricity and power connection with sub-meters
- j) Registrations and Clearances for setting of a manufacturing unit such as environmental clearances, fire safety, license for running a factory, registration for commercial establishment etc.

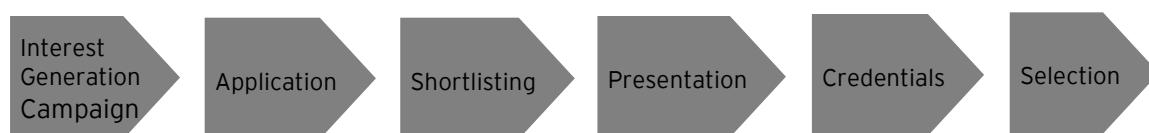
No common plant and machinery has been planned for the first phase of the TC. The Technology Partner will assess the required common equipment than can be purchased by the TC and offered to MSMEs on rent. This will also be driven by the need of the entrepreneurs and will become a part of the incubation centre. In the meantime, the entrepreneurs can utilize the common facilities already available at the TC.

The Incubation Centre would not only provide space, latest technologies but also help in connecting with suppliers and skilled workers. One of the key points this Incubation Centre aims to achieve is to ensure focus on quality control from the get-go. Members of the Incubation Centre would be encouraged to start work in a setup concentrated on following environment, protocols and ethics from day one. It is therefore expected that when these enterprises come out of the Incubation Centre they could be examples of world class manufacturing practices.

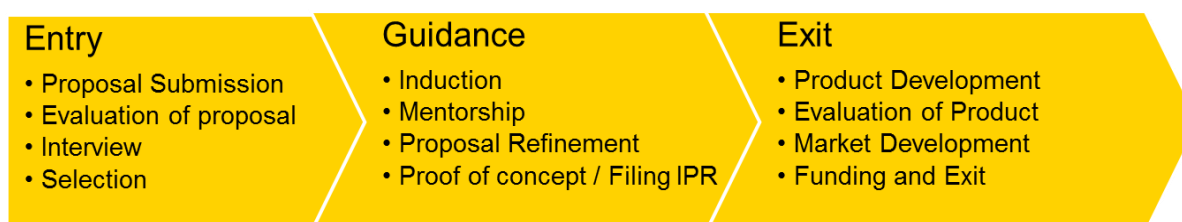
10.5.2 Proposals & Selection

The success of an Incubation Centre depends on the ideas it gets for ripening. To get an 'out of the box' ideas an interest generation campaign shall be in operation throughout the year. The campaign

can have conferences, seminars, road shows etc. The other processes which can be a part of robust selection process are listed below;



The incubation centre will have robust processes for entry and a systematic strategy for the exit of incubates. The entry process will involve stages like proposal submission, interview etc. A model which will be followed for the development of processes is given below;



The key parameter for the exit of incubates can be:

- ▶ Completion of incubation period
- ▶ Raising substantial investment from VC/angel investor/ Govt. etc.
- ▶ When the number of employees of the company exceeds 10/15 or so
- ▶ When annual revenue of the company exceeds substantial amount.

10.5.3 Investments/ Sustainability of incubation centre

There are various government schemes which can be availed to set up an Incubation Centre. Few of the Govt. Schemes and other ideas which can be used for investments generation and sustainability of Incubation Centre are listed below:

- a) Modified Special Incentive Package Scheme (M-SIPS) - The scheme is promoted by Department of Electronics & Information Technology (DeitY), Govt. of India. Under this scheme subsidy is provided for investments in capital expenditure, 20% for investments in SEZs and 25% in non SEZs. There are other incentives as well which can be availed by state govt. for setting up Incubation Centre.
- b) Atal Incubation Centre (AIC) - The Govt. of India under AIM, intends to establish 'new' incubation centres across India by providing them financial support. Under the scheme, the incubation centre will provide necessary and adequate infrastructure along with high quality assistance services to start-ups in their early stages of growth. The government will also provide a financial assistance of Rs 10 Crore under the scheme if the area provided by the institution is more than 10,000 square feet. Accordingly the area proposed in

Incubation Centre is 950 square meter which is in line with the requirement. The AIC scheme can be used by TC to set up Incubation Centre.

- c) Incubation Centre should have facilities which can provide pay per use support to existing and upcoming manufacturing facilities that are keen to be competitive in the ESDM sector.
- d) The Incubation Centre would provide World Class Manufacturing plant and machinery on rental basis for 2-3 years with area ranging from 800-900 Square-meter.
- e) Few of the facilities within the Incubation Centre can be set up on PPP model in collaboration with existing reputed companies present in state such as GE, Britannia etc.
- f) An international investment promotion cell can be set up to encourage foreign investments and form alliances with trade bodies from Japan, Taiwan, US and other countries to facilitate technology transfer.

10.6 Consultancy

MSMEs are plagued with bottlenecks and inefficiencies that compromise their competitiveness and presence in the market. Handholding is required to enable MSMEs to develop competencies in the areas of product & process development, operation improvement, streamlining and standardisation of processes through adoption of international norms, new technologies and capacity enhancement. Quality and technical relevance of products need to be maintained by supporting product development, component manufacturing, precision engineering, process automation and adherence to quality norms.

Therefore, Patna TC would have a dedicated professional wing to assist MSMEs by providing consultancy services in the field of Design Support (incl. Product Design), Engineering Solutions (Development of Jigs & Fixtures for Machining, Welding etc., Quality System Support, Project Consultancy (curriculum development, community colleges, trainers etc.), Low cost Automation Solution support, Productivity Improvement. The support of TCM will be taken wherever required. Consultancy will be provided in the following areas:

- ▶ Product development and engineering solutions
- ▶ Project consultancy in setting up of private TRs, training centre etc.
- ▶ Design support
- ▶ Quality systems support
- ▶ Productivity improvement through cluster approach
- ▶ Curriculum development, Course material development for ITIs, Polytechnic etc.
- ▶ Trainers training to ITI, Polytechnic and Community Colleges
- ▶ Lean manufacturing
- ▶ Business incubation services
- ▶ Other consulting projects
- ▶ Vendor development for MSMEs

Since providing consulting services requires the expertise in specific domain, the TC would hire the required resources to increase the in-house capability. Illustrative phasing of the areas/domains where the TC can provide consulting services has been suggested below. This has been designed keeping in mind the resource planning and future revenue projections as well.

The designing and consulting department will be equipped with high-end workstations, CAD/ CAM software, and analysis software. The design and consulting department is recommended to have 7 experts. The consulting team will also be supported by the production and training departments on need basis. In addition to the above, 30 trainees of final semester tool design course will also work with design department in shifts on daily basis. It is also proposed to have tie-ups/ collaborations with other MSME TCs in specialized areas of project consultancy as and when needed. The table below represents the projected revenue estimates for 10 years, keeping in mind the impetus on the consulting services for the proposed TC. The revenue estimation has been done using the average machine hour rate.

Table 25: Areas of consulting and estimated revenue

S. No	Consulting Areas	Suggestive Rev Year 1	Suggestive Rev Year 2	Suggestive Rev Year 3	Suggestive Rev Year 4	Suggestive Rev Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
						15%	15%	15%	15%	15%	15%
1.	Design Support	-	5,00,000	5,50,000	6,05,000	6,95,750	8,00,113	9,20,129	10,58,149	12,16,871	13,99,402
2.	Product Design Support	-	2,00,000	2,20,000	2,42,000	2,78,300	3,20,045	3,68,052	4,23,260	4,86,748	5,59,761
3.	Engineering Solutions (Development of Jigs & Fixtures for Machining, Welding, etc.)	-	2,00,000	2,60,000	3,38,000	3,88,700	4,47,005	5,14,056	5,91,164	6,79,839	7,81,815
4.	Quality System Support	-	1,00,000	1,00,000	1,50,000	1,72,500	1,98,375	2,28,131	2,62,351	3,01,704	3,46,959
5.	Project Consultancy (curriculum development, community	-	-	1,00,000	3,00,000	3,45,000	3,96,750	4,56,263	5,24,702	6,03,407	6,93,918

	colleges, trainers, etc.)										
Total		-	10,00,000	12,30,000	16,35,000	18,80,250	21,62,288	24,86,631	28,59,625	32,88,569	37,81,854

*The suggestive revenue from design support during second year after start of operations has been estimated on the basis of usage of CAD Software like CATIA, UG or other analysis software etc. The TC is provisioned to have 5 numbers of such software packages which with an average estimated rate/hour of INR 200. So with installed capacity @ 70%, the revenue from this stream during one shift of operation is estimated to be around $5 \times 8 \times 70\% \times 200 = \text{INR } 5,600$. Assuming 30% capacity utilisation for 300 days during 2nd year, the total estimated revenue from CAD Software like CATIA, UG packages is INR 4.9 lakhs. Hence, the total estimated revenue from design support is around INR 5 lakhs for Year 2.

Table 26: Proposed areas of consulting

Consulting Stream	Focus Area (Recommended)
Design Support	▶ Tool design in the field of sheet metal, press tool and plastic moulds.
Product Design	▶ Support MSMEs in designing products to be supplied to OEMs. This will require 3D modelling and may include reverse engineering etc.
Engineering Solutions (Development of Jigs & Fixtures for Machining, Welding etc.)	▶ Designing the machining processes involving jigs and fixtures design, cutting tool selection, machine selection, cycle time and tack time selection and achieving the final shape and quality
Quality System Support	▶ Supporting MSMEs in establishing quality systems, quality improvement and acquiring necessary certifications
Project Consultancy (curriculum develop, community colleges, trainers etc.)	▶ Supporting training institutes in curriculum develop, community colleges, trainers etc. ▶ This may also involve setting up of Tool Rooms and vocational training centres on turnkey basis for various companies under CSR initiatives and for Government

Based on the focus areas recommended above, revenue estimation has been done for the identified consulting streams. These estimations are purely based on the historical data, prevailing market rates and discussions with the existing TRs.

Table 27: Estimated revenue from consulting

Consulting Stream	Approximated Revenue Estimation
Design Support	▶ Revenue estimation from CAD Software like CATIA, UG etc. - 5 Nos. and hourly rate of Rs 200. This is initially estimated to run in 1 shift (8 hrs.) at 25% capacity. The installed capacity assumed to be 80% running for 300 days a year. Therefore the calculation would be, $25\% \times [(10 \times 100 \times 8 \times 300) \times 80\%]$ = INR 4,80,000 per year
Product Design	▶ Revenue from other Engg. Analysis software like ANSYS, mould flow, auto-form etc. for product design is estimated to be INR 48,000 per. Considering 4 jobs in the first year, the revenue would be $48,000 \times 4 = 1,92,000$ per year.

Consulting Stream	Approximated Revenue Estimation
Engineering Solutions	Rate of INR 250/hr with an estimation of minimum requirement 100 hours per product. We have estimated initially at least 8 products in first year. Therefore, $8 \times 250 \times 100 = \text{INR } 2,00,000/\text{year}$
Quality System Support	Estimated rate of INR 50,000 per unit. We have estimated serving at least 2 units in the initial year. Therefore, $50,000 \times 2 = \text{INR } 1,00,000/\text{year}$
Project Consultancy (curriculum develop, community colleges, trainers etc.)	Revenues from these assignments vary significantly depending upon the nature of the assignment. We have estimated a range of INR 1-4 lacs per assignment with 1-2 assignment per year

10.7 Centre of excellence for manufacturing skill development

The state of Bihar has immense potential for industrial growth as seen from the recent government initiatives to promote the manufacturing sector through policy reforms, investment in infrastructure, incentives for FDI etc. As a result of this the state is seeing many up-coming projects to promote industrial growth. In order to supply skilled manpower to the up-coming manufacturing industries, The TC is going to play a vital role. It shall work as a nodal skill development centre. It shall not only provide advanced training in manufacturing technology but also work as a key facilitator for existing ITIs and polytechnic institutions in the catchment area. The following services shall be provided by the TC in order to increase competitiveness of ITIs and Polytechnic institutions.

- ▶ **Curriculum Development Support:** The TC shall assess curriculum of these institutions and provide support in developing modular training program which are latest and high on demand by the local industry. Based on the assessment of utilization of the existing infrastructure, the TC shall advise new courses for the institute.
- ▶ **Mentorship for new institution:** The TC shall work as a mentor and provide support in setting up new ITI and small skill development sector in manufacturing field.
- ▶ **Testing and certification of the skill:** The TC will work as a nodal organization to provide common platform to test and certify the skill level of the trainees.
- ▶ **Training of Trainers:** The TC shall provide access to new and advanced technology for the trainers of these institutions and shall provide necessary training to upgrade their skill set.

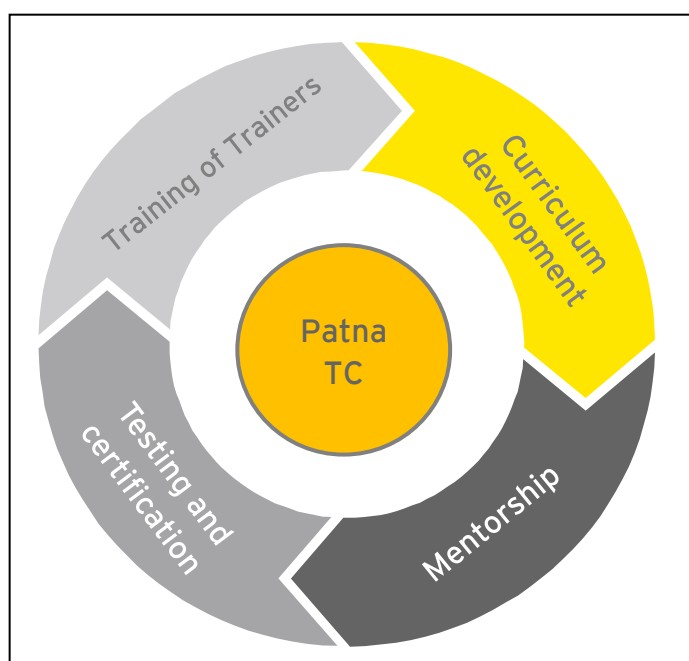


Figure 22: Support for other training institutions

10.8 Proposed support system to enable private TRs tap the market

A collaborative approach with private TRs can help to augment capacity to support MSME.

- ▶ **Productivity and Quality club:** To form a productivity and Quality Club where engineering units in a cluster under MSME may join the club on a reasonable annual fee. The value to the MSMEs would be as follows; MSME TC needs to earmark one expert (with support from TCM if required) for the cluster for a period of 12 months with minimum 12 assured visits. The expert would mentor the MSME units individually towards improvement of their system and process to increase the productivity of the unit and quality of its product. These members may also enjoy preferential treatment in other services of the Tool Room e.g. designing and testing, CAD/ CAM etc. The club will facilitate for;
 - **Partnerships and collaborations:**
 - Develop better partnerships with corporations located in the state and in the catchment.
 - Collaborations with academic and applied research institutes to commercialise new technology/ innovations.
 - **Facility Sharing:** Sharing the Tool Room facility like high end design, analysis, intricate machining etc.
 - **New Market:** Jointly exploring potential new markets/ programs and execution the same.
 - **Innovation:** Promote emerging technological and knowledge-based innovative through seminars and clinics.

- ▶ **Partnering with small tool rooms and MSMEs to make them competitive:** The objective of the same is to carry out activities with potential to develop competitive advantage over time. Rather than two or more Tool Rooms in the catchment producing similar kind of products, a group of Tool Rooms can specialise in selected jobs which would further improve the focus on factors such as quality, costs and time.

- **Case Study – Consortium with MSMEs - CTTC Bhubaneswar**

In 2013, CTTC Bhubaneswar has formed a consortium with 15 MSMEs from different industries in Odisha.

Objective

To obtain jobs/ work orders from customers for the consortium. These jobs, once received will be executed by different members of the consortium according to their capabilities and capacity. The majority of the work will be performed by the consortium members. In the initial period, CTTC will support the MSMEs to undertake final machining and inspection for the products.

Over the period, as MSMEs equip themselves and develop in-house capabilities to independently execute the jobs, CTTC's support will reduce. Further, the number of MSMEs in the consortium is expected to increase, which would in turn strengthen the existing consortium and its capability to pitch for more specialised jobs.

CTTC has jointly pitched for jobs for consortium with its clients like

- Ordnance factory, Balangir
- HAL Koraput

Key Benefits

- As part of the consortium, the MSMEs can pitch for bigger and long term jobs and plan their investments in a better way. This will in turn encourage formation of new MSMEs and strengthening of existing MSMEs in Odisha
- Currently for some of the jobs, CTTC has to reach out to MSMEs outside Odisha. Over the period as MSMEs in Odisha get better equipped, these jobs can be performed by them.
- Gradually CTTC will move up the technology curve and would provide support mainly for higher end technologies and so on.

10.9 Technology collaboration

The TC at Patna will venture into multiple new areas and to facilitate technology transfer and improve market linkages, role of TCM has been planned under TCSP.

- The TCM will help identify and define globally competitive technological capabilities required in the cluster and assist proposed TC in building this capability through planning and handholding over a period of 33 months. The Technology Cluster Manager (TCM) is required to enhance the capability and service offerings of TCs such that they transform to become models of manufacturing excellence for MSME. They need to become a trusted partner for MSMEs to learn how to attain manufacturing excellence and attain associated excellence in skills development. The services of the TCs include being exposed to the potential impact of new and relevant technologies, trainings on use of technologies/equipment, providing access to cutting-edge equipment, developing and testing new products and patenting. The key objectives of the TCM in terms of assistance in technology transfer include:

- In conjunction with all stakeholders of the TCSP identify and define the globally competitive technological capability required by TCs, assist in their execution and provide handholding during their roll out.
- Supporting the up gradation of the existing TCs and establishment of new TCs for the manufacturing sector
- Augment services being offered by the TCs with respect to identified technologies and clusters with respect to training, production assistance (including optimization of equipment utilization) and technical advisory, resulting in increase in revenues of TCs focused at the manufacturing sector
- Support TCs to increase productivity and competitiveness of general engineering focused MSMEs by
 - Exposing them to existing and expected future technologies
 - Develop skills of the workers and students in the identified technologies and clusters
 - Offering advice/recommendations to MSMEs (clients) who directly or indirectly supply to large players or component manufacturers.

All investment decisions (technological & other) and work prioritization in TCs must be intrinsically connected with the market place and efficiently translate market needs to products and services that (satisfy these needs), & will be enabled by technology and enriched by global knowledge & expertise of the various stakeholders including the TCM, empowered by global networks and people.

- The TCM will also facilitate cluster and market development to realise improved competitiveness. The TCM will work closely with the MSME clusters to understand their needs and requirements and get OEMs/ buyers involved in the program. The TCM will strengthen market linkages of TC with the MSMEs in the cluster it serves, trade and industry associations, academia, educational institutions, applied research institutions, service providers, other government support institutions, workers and skill seekers. Existing research institutions which

could be potential collaborators for specific technologies etc. The TCM would work towards the following key objectives:

- Increase of business opportunity for MSMEs through new market linkages.
- Increase competitiveness of supply chains of large firms by enhancing the quality, reliability and productivity of MSME suppliers.
- Increase the number of MSMEs utilizing the services of TCs resulting in increase in revenues of TCs
- Enhance competitiveness of the cluster business environment:
 - Increase access by MSMEs to a network of business development services (BDS) which address needs not in the domain of TC expertise
 - Increase access by MSMEs to network of financial service providers
 - Increase awareness of opportunities in the public sector to contribute to a more competitive business environment.
- Establish closer cooperation of key innovation stakeholders to enhance product and process innovation. This would include linking the research agendas of applied research and education institutes/organizations to industry and market requirements and promoting joint research and development projects.
- Facilitate closer cooperation amongst skills development and labour market stakeholders to increase the number of workers/ trainees from TCs finding long term employment to improve their livelihood.
- Establish a business model which ensures financial self-sustainability of the TCM as before the end of the TCSP funding window.

All investment decisions (technological and other) and work prioritization in TCs must be intrinsically connected with the market place and efficiently translate market needs to products and services that (satisfy these needs), and will be enabled by technology and enriched by global knowledge and expertise of the various stakeholders including the TCM, empowered by global networks and people.

10.10 Technology Information Centre

Access to information is important. People need information to develop their potential through education and training, to succeed in business, to enrich their technological knowledge. Information is a key contributor for the development of new technology or a product.

The Technology Information Centre (TIC) will provide access to latest books, journals, engineering standards etc. to the MSMEs and students at an affordable cost. This will help the MSMEs in enhancing their knowledge and using latest standards for the development of products. Apart from books, journals etc., the TIC would also have Audio Visual rooms where students can go and learn about latest courses available. The TIC will have audio visual courses as per the requirement of industry in

catchment area. The courses will cover areas like principles of electric drives, product design, product validation etc.⁴⁶

10.11 Agricultural/Rural & Traditional Enterprises (DART) Department & Plug and Play

One of the key objectives of the business plan is to extend the services of the TC to the majority of micro entrepreneurs. The TC needs to take various initiatives to reach out to the entrepreneurs residing at the bottom of the pyramid essentially agricultural, rural and traditional strata of the society as they represent the maximum concentration of the micro entrepreneurs.

Following key initiatives have been identified by the TC in this area.

- ▶ Training of agricultural rural and traditional entrepreneur under Recognition of Prior Learning (RPL) in the areas of repair & maintenance of agricultural equipment, Home appliances repairing, Solar and Bio Gas plant maintenance etc.
- ▶ The Centre is planning to establish a Support Centre for Art Based Entrepreneurs particularly artisans particularly madhubani painting, makhana cluster, brass & bell metal cluster, silk handloom and textiles cluster. Technological support, training and skill development training shall be provided to these artisans.
- ▶ Support budding entrepreneur to add value to farm entrepreneur through development of new technology e.g. the TC can help start-ups in development of small size rice milling machine for which can be used by farmers or micro entrepreneurs to mill small quantity of rice at farm level.
- ▶ Digitization of drawing of farm equipment and low-cost automation wherever possible is another service which can be provided.

The TC is planning to develop a specialized course in the service area such as agriculture and farm machinery equipment, home appliances repairing, Mobile repairing, Motor cycle repairing etc. which can be conducted in the rural and semi urban area through mobile van.

Plug and Play Facility (PPF)

A pilot scheme for green-field Flatted Factory based Plug and Play Facility (PPF) in industrial clusters is proposed to be launched to enhance competitiveness of industry by providing quality infrastructure in selected industrial clusters. This is particularly to assist start-ups, expanding and diversifying units who suffer from access to industrial infrastructure and space and high Capital Cost. This will ensure optimisation of space and costs in many relevant sectors. Such quality infrastructure may be visualised as including both technical infrastructure (common facilities) as well as physical

⁴⁶ Details of Audio Visual Courses is available in Section 10.1, Table 23 – Details of Courses

infrastructure (buildings with plug and play work sheds and supporting utilities). Such facilities may be utilised by start-ups as well as expanding and diversifying units as “incubation infrastructure” for a period of 3-5 years, after which they are expected to graduate to next level and move to own premises elsewhere.

A PPF will provide complete end to end manufacturing facilities under single platform. An entrepreneur, who wants to start a new business or expand the existing business, may approach to these PPFs and may start manufacturing with minimal investment on land, plant & machinery and other facilities which are considered as one of the biggest hindrance in starting/expanding a business.

Plug and Play Facilities will target start-ups, expanding and diversifying units who suffer from access to industrial infrastructure and space. Plug and Play Facilities will considerably reduce the start-up investment costs, procedural obstacles and risks for SMEs at a phase in their development where the bank loans are major stumbling block in realising their business plans.

Some of the expected outcomes which can be envisaged at this stage are as follows:

- ▶ Innovating product, process, technology, energy efficiency etc.
- ▶ Reducing start up investment costs and risks for MSMEs at a phase in their development where they are still too risky for bank loans.
- ▶ Establishing safety, health and environmentally strong practices in these clusters to encourage MSMEs at large
- ▶ Facilitating development of industrial clusters allowing for economies of scale
- ▶ Encouraging setup of a manufacturing facility (Handholding support for manufacturing Space, Registrations etc).
- ▶ Supporting in improving access to markets, skills, finance and technology
- ▶ Mentoring Start-up/ MSMEs by engaging with academia and industry
- ▶ Reducing inefficiency in provision of public goods and market information

This will result in enterprise development at an accelerated pace allowing tremendous economies of scale.

Below is the snapshot of courses and facilities which will be provided as part of this centre.

Sector	Description of Facilities	Investment
Agri / Food Processing Sector	▶ Facility for aseptic packaging for processed food products (Up to 1 Litre capacity is preferred). ▶ Freeze drying facility for processing of agriculture and horticulture products i.e. vegetables and fruits	INR 3.0 Cr
Agricultural Implements Manufacturing Sector	▶ Facility for sheet Bending ▶ Laser/water jet profile cutting	INR 3.5 Cr
Traditional Enterprises & Rural Artisans	▶ Facility for investment casting for manufacturing handicraft items made out of non-ferrous metals to cater the needs of traditional enterprises and rural artisans	INR 2.5 Cr
Total		INR 9 Cr

10.12 Entrepreneurship Development Cell

Promoting emerging technological and knowledge-based innovative ventures that seek to nurture ideas from entrepreneurs is important for development MSMEs. Such entrepreneurial ideas not only provide a career option for students but also have a multiplier effect on employment generation. In order to encourage more and more students to become entrepreneurs, it is necessary to create awareness, motivate, educate and support the students. The development of an entrepreneur includes inculcating the entrepreneurial skills into a common person, providing the needed knowledge, developing the technical, financial, marketing and managerial skills, and building the entrepreneurial attitude among the applicants.

The Objective of EDC is to

- ▶ Act as an institutional mechanism for providing various services including information on all aspect of enterprise building to budding MSME entrepreneurs
- ▶ Create Entrepreneurial culture in the Institution and other institutions in the region and to promote entrepreneurship programmes related to women and weaker sections of the society
- ▶ Train the entrepreneurs in management of manpower, machine, material, taxes, legal aspects, finances and cash flow of a MSME

- ▶ Foster better linkages between the Parent Institution, Industries and R&D institutions in the region and other related organisations engaged in promoting Small & Medium Enterprises
- ▶ (SMEs) and Non-Government Organisations (NGOs).
- ▶ Catalyse and promote development of enterprises and promote employment opportunities in the innovative areas
- ▶ Respond effectively to the emerging challenges and opportunities both at national and international level relating to SMEs and micro enterprises

10.12.1 Entrepreneur Development Cell at Patna TC

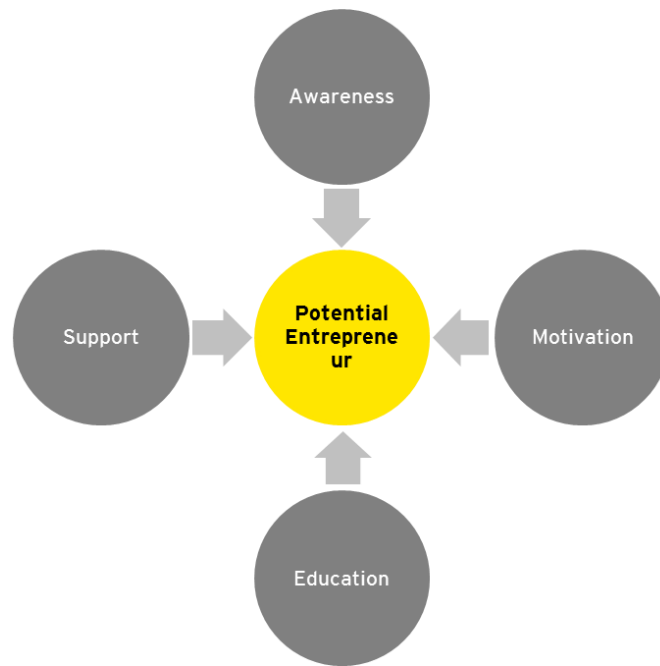
Entrepreneur cell at the TC shall consist of student and faculty (in house and visiting), adopt a systematic approach to guide students to become a leader to take global challenges and opt for self-employment.

Following activities shall be taken up by the entrepreneur cell to accomplish its vision.

- ▶ Sensitize students on entrepreneurship at induction stage & orientation to the students.
- ▶ Conduct awareness programmes in house
- ▶ Enhancing industry institute interaction through guest lectures and industry visits
- ▶ Conduct programmes on idea generation & business plan preparation
- ▶ Conduct training programmes In the field of entrepreneurial skill development
- ▶ Market assessment for the entrepreneur opportunities
- ▶ Provide guidance and facilities to first time entrepreneurs particularly in raising funds and firm registration
- ▶ Support for entrepreneurship in curricula at diploma and degree levels

Collaborate with various institutes such as Institute of Entrepreneurship Development, Bihar, Entrepreneur Development Institute of India, Ahmedabad, and Entrepreneur Development Institutions (National Institute for MSME Hyderabad, Indian Institute for Entrepreneur (IIE) Guwahati, and National Institute for Entrepreneurship and small business development Noida) etc. and organisations like Bihar Entrepreneurs Association to promote entrepreneurship. A close link will be made with leading bank and DIC/industry department to support the ecosystem.

Figure 23: Key areas of incubation support



Quality System



11. Quality system

The new TC would further aim to obtain various process certificates to enhance its competitiveness like;

Table 28: Indicative certifications of quality systems

Name of certification	Area	Details
ISO 9001	Quality Management System	▶ This would help to monitor, control, and improve quality of products and services offered by the TC ▶ It is a series of standards that define, establish, and maintain a quality assurance system for manufacturing and service industries ▶ ISO 9001 deals with the requirements that organizations wishing to meet the standard must fulfil
ISO 14000	Environmental Management System	▶ Will help to address various aspects of environmental management of the TC ▶ It provides practical tools to identify and control environmental impact and constantly improve their environmental performance ▶ These standards call for analysis of the entire life cycle of a product, from raw material to eventual disposal and focus on awareness of the processes and procedures that can affect the environment
ISO 29990	Learning services for non-formal education and training	▶ For quality professional practice, performance and enhance transparency ▶ Allows for comparison on a worldwide basis of learning services, and management standards in the field of non-formal learning
ISO 50001	Energy management systems	▶ Gives requirement for energy management systems ▶ Establishes framework for industrial plants; commercial, institutional and government facilities and entire organisations to manage energy usage
OHSAS 18001	Occupational Health and Safety standard	▶ Is an internationally-applied British Standard for occupational health and safety management systems ▶ It provides for the elements of an effective safety management system which can be integrated with other management

Name of certification	Area	Details
		systems and help organizations achieve better occupational health and safety performance and economic objectives

► The TC will essentially adopt the 5S technique for process improvement to clean and organise its workspace to improve the workflow. Further trainees will be trained and exposed to 5S process improvement technique. This would require the TC to do the following;

- **Sort:** To de-clutter the workspace and prioritise tools and materials used frequently, the TC will sort everything in the work area so that unnecessary items (tools, parts, equipment, storage bins, etc.) can be removed and either discarded or stored elsewhere.
- **Straighten:** This will involve creating storage solutions that would facilitate orderly work flow of everything in the TC by placing more frequently used items for quick and easy access.
- **Shine:** This will require efforts in the initial phase involving painting and installing better lighting to make the workspace clean and tidy. Further during ongoing activities at the TC, the work space and equipment will be cleaned and restored to their proper place at the end of each shift. Basic preventative maintenance tasks like tightening, oiling, restocking will also be part of this. The workstation would then be ready for the next user (or the next day) and the order created in the first two steps will be preserved.
- **Standardize:** The objective of the same would be to make everyone in the TC familiar about the current steps in order to follow and establish expectations. TC would conduct training, create documented procedures, work instructions, use visual guides, checklists, and/or photos for easy understanding of any changes made. Standardised ways will increase efficiency and be user friendly for TC employees and others.
- **Sustain:** Sustaining the processes would be important to ensure that focus doesn't drift away from 5S. TC would adopt strategies like daily meetings, mini-audit and ongoing continuous improvement efforts to sustain the 5s.

12. Infrastructure and facilities

The infrastructure of the proposed TC at Patna has been developed after keeping in mind the existing TRTC at Patna which is an extension Centre of Jamshedpur TC. The new TC infrastructure is based on the requirements, recommended norms, capacity data of the existing TCs capacity, discussions with key stakeholders and the experience of the team in providing professional advice on similar projects. The team has studied the applicable AICTE/ NCVT norms for development of infrastructure facilities for engineering and technology institutes and detailing out the infrastructure provisions for the proposed TC in view of the same. Also leading practices from international training institutes have also been considered. The new TC will be built on area of around 15 acres and the layout will have following blocks with required infrastructure.

- ▶ **Production Block:** The highest priority has been given to the allocation of space for installation of machines for training and production activities. Depending on the space required by the machines, the area for manufacturing and training should be demarcated which would also include other facilities like toilets, washrooms and change rooms, adequate space for their mobility, clean drinking water in their vicinity etc. This block will also have metrology section and rapid prototyping centre which can be accessed by industry directly.
- ▶ **Training Block:** This area will have classrooms, labs, conference hall, faculty rooms, technical information centre and facilities for training / seminars/ workshops etc.
- ▶ **Administrative Block:** This block will have GM and DGMS Office and secretariat. It will also house office and desk space of all management, professional staff, administrative and support staff, library and other amenities such as conference room with video conferencing facility, meeting rooms etc.
- ▶ **Utilities Block:** The utilities block comprises of areas that will house main electrical meter, VCBs, HT panel, distribution panel and power back up DG plant. The utilities block will also house water pumps, purification plant and chilling plant, water treatment plant etc. The open areas around the building will also have some utilities provision such as rain water harvesting pits and panels for the operation of external lighting. Utility will also include sewage treatment plant at an appropriate location.
- ▶ **Hostel and staff accommodation:** The hostel blocks will comprise of accommodation for the students (separate for males and females). A few staff quarters (for driver, security officer, wardens – boys and girls hostel, Maintenance staff etc.) will also be constructed to house some of the emergency staff or on need basis.
- ▶ **Open Areas:** The open areas comprise of drive way, rain water harvesting pit and landscaped areas including the facade and main entry of the TC. The size of the open area will depend on the design strategy adopted by the CMC.
- ▶ **Others:** This will include canteen, parking, security room etc.

► **Basic amenities:** Apart from the above facilities the campus will have basic amenities with provision for;

- Drinking water
- Toilets
- Dining room as a hygienic area and place away from the work environment for rest breaks and the consumption of food
- Change rooms to enable employees to change (e.g. uniforms or dirty work clothing) with privacy and security. Such facility helps to reduces employee exposure to and potential spread of contaminating substances used in work processes
- Personal storage for the secure and clean storage of personal belongings or clothing, lockable where necessary
- Immediate availability of doctors, health supervisors and ambulance and sufficient first aid kits
- Fire safety with smoke alarms to protect people against death and injury from fires. Providing fire safety awareness to employees and conduct fire drill from time to time
- Fire assembly area in case of fire or natural calamity
- Dustbins with proper colour coding in green for organic, yellow for glass, white for paper, grey for metal, blue for plastic, red for hazardous products

Table 29: Details of the proposed new TC and existing TRTC Campus infrastructure construction

Details	Nos.	Total Area (Sq. mt.)
Production Block		2950
Workshop Shed		2500
Office Area		200
Welding, Die Casting and Foundry Shed		250
DART, EDP & Plug and Play		1600
DART Centre		800
EDP & Plug and Play Facility		800
Training Block		5597.5
Training Workshop		2400
Sn. Manager/HoD Room, Training Office and Faculty, Manager Room, Reception, Counselling Room		170
Library	1	300
Multi-purpose hall for examination/drawing/reading room	1	120
Classrooms	6	450
Labs	12	792
Language Lab	1	50
Conference Room	1	50
Electrical Panel, Server Room etc.		50

Details	Nos.	Total Area (Sq. mt.)
House Keeping, Circulation (25% of above built up area)		1095.5
Toilet		120
Admin Block		487.5
Director office with secretary	1	50
Board room	1	50
Marketing	1	60
Admin including Reception, Purchase, Accounts, HR	1	80
Toilet (Male and Female)	1	50
UPS/Electrical, IT Server Room	1	30
Pantry	1	10
Examination Control Office	1	30
Housekeeping	1	30
Circulation and wall (25% of above infrastructure)		97.5
Others		420
Utilities Room - DG Set, Transformer, UPS		330
Security Room (incl toilet)	1	90
Canteen		400
Total		11,455

- **Hostel and staff accommodation:** The hostel block will comprise of accommodation for students enrolled under fulltime courses along with the hostel warden. It is proposed to develop the hostel capacity for around 350 trainees and out of which around 100 will be reserved for female trainees. The hostel building has been planned to be G + 3 structures with provision for further vertical expansion depending on future requirements. Part of the ground floor of the hostel building will be reserved for use as hostel office, other common facilities etc. The space on rest of the floors will be developed as rooms for accommodation of students. The details of proposed hostel infrastructure have been given in the following table. Additionally, eight emergency staff quarters will also be constructed to house some of the key management officials as per requirement. Initially the staff quarters block will be a G+1 structure with a provision of further expanding it vertically depending on future requirements.

Table 30: Details of proposed infrastructure for hostel and staff quarters

Hostel	Category	Floors	Trainees per Room	Number of trainees	Area per trainees (sq. mt.)	Total Area (sq. mt.)
Hostel No.1	Boys	G+3	4	250	12	3000
Hostel No.2	Girls	G+3	4	100	16	1600
Total						4,600

		Number	Area (sq mtrs)
Staff Qtrs	G+2 (60sqmt/quarter)		
	150	8	576
Total		8	576

Note: All viable options will be studied to decide on the design of the proposed block for hostel and staff quarters. The number of floors for these facility buildings and all other associated details can be further finalised with the appointment of CMC for development of the campus for TC.

As per the details of proposed infrastructure given in above two tables, the construction of the new Patna TC will include development of 16,631 {11,455+ 5,176 (staff Quarters and hostel)} square meter of built up area in total and per square meter cost of construction has been estimated to be INR 45,000. This estimated cost includes construction of boundary wall, landscaping, water, sanitation, internal roads, lighting etc.

Further, the cost for development of underground water tank, rain water harvesting system, storm water drainage network, water treatment plant, sewage treatment plant, street lighting, development of internal roads, landscaping, grey water treatment plant for entire campus and construction of boundary wall has been included. The detail for development of campus infrastructures is as follows;

Table 31: Cost for development of campus infrastructures

SN	Building Infrastructure	Cost (in INR lakh)
1.	Cost of development of build-up area @ 45,000 per sq. mt. for 16,631 sq. mt.	7,484
2.	Contingency @ 5%	374
Grand total		7,858

Further provisioning towards establishment of other associated infrastructure will be done for the planned capacity and is listed in the following table:

Table 32: Details of other infrastructure

SN	Other Infrastructure	Nos.	Budgeted Cost (INR lakhs)	Total Cost (INR lakhs)
1	Office & Storage Furniture	60	0.5	30
2	Hostel Furniture	160	0.25	40
3	Canteen and Hostel Dining hall furniture	20	0.6	12
4	Kitchen equipment	1	20	20

SN	Other Infrastructure	Nos.	Budgeted Cost (INR lakhs)	Total Cost (INR lakhs)
5	Other Office equipment	50	1	50
6	Laptop	20	0.6	12
7	Desktop	40	0.5	20
8	Photocopier cum printer	4	2	8
9	Vehicle	2	12.5	25
10	Pre-Operative Expenses		258	258
11	Others (Miscellaneous)	1	50	50
12	Sub Total			525
13	Contingency 5%			26.25
Total				551.25

Above all, the development of campus infrastructure will be done keeping the following guidelines in mind;

► **Campus Layout/ Plan:** Campus layout is crucial for successful performance of the TC. At least 30% green area will be maintained and landscaping will be done to improve aesthetics of the surrounding while maintaining habitats conducive to natural fauna. Also, efforts will be made to conserve existing vegetation and other rich biodiversity in the premises as well as vicinity. Apart from this, there will be the following considerations while planning the campus layout:

- **Site drainage:** Existing drainage pattern of the available site will be studied and the drainage system required for the TC will be constructed in line with the drainage pattern. Storm water drain will be constructed separately so as avoid mixing of the fresh and the waste water.
- **Heat island effect:** Site will be planned properly to mitigate the heat island effect (Thermal gradient difference between developed and undeveloped areas) by following measures:
 - At least 40% of the non-roof impervious surfaces on the site (including parking lots and walkways) will be shaded
 - Pavements and walkways should be painted in light colour (solar reflectance index > 0.5)
- **Boundary:** The campus will be provided with boundary wall in all the directions to avoid encroachment, theft and safety.
- Trees will be planted in large numbers to provide natural shade in the open areas. This helps to reduce the temperature on campus in comparison to the vicinity
- Efforts will be made to utilize natural light to the maximum possible extent and provision should be made for natural ventilation

- Green building codes may be adopted while designing the building layout so as to ensure following environmental safeguards;
 - Renewable energy in terms of solar water heater, solar panels, solar street light may be used
 - LED/CFL lights will be used within the premises to reduce the energy consumption
 - Provisioning of water treatment and recycling facility to reduce water consumption
 - Water harvesting arrangement to recharge the ground water and/or reduce dependency on ground water
 - Provisioning of waste management including practices to minimize waste generation, etc.
- Criteria mentioned in the National building code will be followed so as to ensure that all the safety precaution like escape routes/emergency exits, setting of machinery providing appropriate working space, etc. is maintained
- Hazardous material like asbestos sheets should be avoided in any part of the structure
- Substitutes to natural resources will be encouraged in appropriate ratio so as to decrease natural resource consumption while maintaining the required strength (example: Fly ash may be used in small percentage instead of cement for construction, composite material may be used construction of doors instead of wood, etc.
- Provision of toilets for both men and women will be made in appropriate number so as to ensure comfortable and hygienic working conditions
- Energy efficient products like 5 star rated air conditioner, refrigerator, energy efficient motors, etc. will be used in the TC's
- ▶ **Detailed building plan preparation:** The building design is crucial for sustainable performance of the TCs. A number of factors including energy efficiency, materials of construction, natural light and ventilation, insulating, etc. must be kept in mind in order to maintain eco-friendly operations. Also, adherence to aspects related to safety like, resistant to earthquakes, proper evacuations, etc. will ensure successful operations of the TC.
- ▶ **Construction management:** Construction at the site involves a number of activities. These activities may lead to certain EHS impact on the existing natural settings and therefore, appropriate mitigation measures will be required to be put in place so as to minimize or avoid this impact. A snapshot of the issues with the basic principles to be kept in mind during construction is given in the EHS section of this DPR.

13. Expenditure pattern

13.1 Capital expenditure

Summary of the Capital Expenditure is provided as below:

Table 33: Capital expenditure

Capex(Inc. Contingency @5%)	Cost (INR Lakhs)
Production Machinery and equipment	2,555
Training machines and equipment	3,437
Other infrastructure including pre-operative expenses	551
Incubation centre machines and equipment	105
Building and construction	7,858
Total Capex including contingency	14,506

13.1.1 Plant and machinery

Total expenditure on machines envisaged for the setting up of new TC at Patna is as under:

Table 34: Plant & Machinery⁴⁷

Capex	INR Lakhs
Production Machinery and equipment	2,433
Training machines and equipment	3,373
Contingency @ 5%	291
Total for Plant and Machinery	6,097

The capital cost estimate for the proposed project has been prepared jointly by O/o DC-MSME and EY team based on inputs from the following:

- ▶ Market opportunity assessment by EY team
- ▶ Stakeholders discussion in Patna
- ▶ Inputs from existing technology centres such as IDTR Jamshedpur extension centre at Patna
- ▶ Validation of technology needs by detailed discussions and site visits to key manufacturing organisations
- ▶ Site visits and discussions with local industry and industry associations.

⁴⁷ Details about plant machinery are in Chapter 10, section 10.1 and 10.2

- ▶ Inputs from Office of DC MSME
- ▶ Inputs as per the World Bank Environment and Safety requirements

13.1.2 Building cost

Patna has around 15 acres of land available for setting up of the facility of the new TC⁴⁸.

Table 35: Building cost⁴⁹

SN	Building Infrastructure	Cost (in INR lakhs)
1.	Cost of development of build-up area @ 45,000 per sq. mt. for 16,631 sq. mt.	7,484
2.	Contingency @ 5%	374
Grand total		7,858

13.2 Operating expenditure

The operating expenditure for the TC has been classified into variable operating expenditure and fixed operating expenditure.

13.2.1 Variable operating expenditure

Variable operating expenditure has four key heads. Expenditure under each head has been identified for the key income streams:

a) Raw materials

- ▶ Raw materials for finished goods
- ▶ Raw materials for training

b) Consumable tools

- ▶ Consumable tools for finished goods
- ▶ Consumable tools for training

c) Consumable stores

- ▶ Consumable stores for finished goods
- ▶ Consumable stores for training

d) Utilities (electricity and water)

- ▶ Utilities for finished goods
- ▶ Utilities for training

⁴⁸ Joint Director. Department of Industries Patna

⁴⁹ Details about infrastructure and other areas are in Chapter 11

Table 36: variable cost assumptions

Description	Unit	Norms
Variable operating cost		
Raw material		
RM for Finished goods	% of FG	20.6%
RM for Training	% of Trg	1.0%
Consumable tools - FG	% of FG	2.5%
Consumable tools - Trg	% of Trg	1.0%
Consumable stores - FG	% of FG	2.0%
Consumable stores - Trg	% of Trg	0.6%
Utilities		
Electricity & water		
FG	% of FG	6.5%
JW	% of JW	6.5%
Training	% of Trg	4.9%

13.2.2 Fixed Operating expenditure

Fixed operating expenditure has four key heads. Expenditure under each head has been identified for the key income streams:

a) Salary and wages/ establishment expenses

The salary expenses include salary for employees of proposed TC at Patna There will be 60 employees on regular contract and ~ 140 will be on temporary contract/honorarium visiting.

b) Repairs and maintenance (R&M)

Cost of repair and maintenance has been calculated for

▶ **Plant and machinery installed**

R&M for plant and machinery has been taken as a percentage of the gross block in an operating year.

▶ **Buildings**

R&M for plant and machinery has been taken as a percentage of the gross block in an operating year,

c) Training expenses

Training expenses primarily comprise of expenses incurred for external faculty visiting to the TC from time to time as part of Short term and Long term trainings. These expenses typically include faculty fees, hotel and transportation.

d) Other production and administration expenses

These include expenditure on heads like transportation/entry tax/ freight, Vehicle expenses, Printing and stationery, traveling and conveyance, audit, consultancy, advertisement, publicity, marketing, telephone, internet, bank charges, miscellaneous expenses. Expenditure under each head has been identified for the key income streams- Finished goods and Training

e) Insurance of new plant and machinery

Insurance expense for new plant and machinery includes the insurance cost for the new machinery to be installed. The same has been calculated as a percentage of the gross block of new machines.

Table 37: Fixed Operating Cost assumptions

Description	Unit	Norms
Fixed Operating Cost		
Salaries & Wages	Detailed assumptions given in a separate table	
R&M (Plant & Mach)	% of Plant	1.0%
R&M (Building)	% of Building	1.7%
Training Expenses		10%
Other Prdnn. & Admin. Exps	%of income	8%
Insurance cost (New P&M)	% of P&M	0.5%
Marketing expenses (1st year)	Rs. Lakhs p.a	25
Marketing expenses (2 year onward)	Rs. Lakhs p.a	15

► **Manpower and salary cost**

Manpower numbers have been designed in line with the expansion plan of the TC and ramp up of the production, training and consultancy. Manpower salary numbers are in line with the salary structure of existing TCs

Table 38: Manpower and salary assumptions

Top Management	Designation	Monthly salary (INR)	Nos.											
	GM	1,53,861	1	1	1	1	1	1	1	1	1	1	1	1
	DGM	1,29,327						1	1	1	1	1	1	1
Sub Total			1	1	1	1	1	2	2	2	2	2	2	2
Management and Support staff														
Administration and accounting	Manager Admin. and Accounting	69,204	1	1	1	1	1	1	1	1	1	1	1	1
	Sr. Officer HR	62,371						1	1	1	1	1	1	1
	Officer Procurement	35,744			1	1	1	1	1	1	1	1	1	1
	Officer Store	35,744		1	1	2	2	2	2	2	2	2	2	2
	Officer Admin	35,744		1	1	1	1	1	1	1	1	1	1	1
Design and consultancy	Senior manager	86,857		1	1	1	1	1	1	1	1	1	1	1
	Manager	82,777			2	2	3	3	3	3	3	3	3	3
	Sr. Engg.	64,806			2	3	3	3	3	3	3	3	3	3
Production	Senior Manager	86,857		1	1	1	1	1	1	1	1	1	1	1
	Manager Prod./Planning	82,777			1	1	2	2	2	2	2	2	2	2

Top Management	Designation	Monthly salary (INR)	Nos.											
	Manager Metrology	82,777			1	1	1	1	1	1	1	1	1	1
	Manager H/T	82,777			1	1	1	1	1	1	1	1	1	1
	Manager Maintenance	82,777		1	1	1	1	1	1	1	1	1	1	1
	Sr. engg. Maintenance	64,806					1	1	1	1	1	1	1	1
	Sr. Engg. Production	64,806		3	3	3	3	3	3	3	3	3	3	3
	Engg. / Foreman	34,240		2	4	6	6	6	6	6	6	6	6	6
	Senior Technician	29,512		1	2	2	2	2	2	2	2	2	2	2
	Senior Technician Maintenance (Mech + Elect)	29,512		1	1	2	2	2	2	2	2	2	2	2
Training	Senior Manager	86,857		1	1	1	1	1	1	1	1	1	1	1
	Manager Mechanical	82,777			1	1	1	1	1	1	1	1	1	1
	Manager Electronics	82,777			1	1	1	1	1	1	1	1	1	1
	Manager Short term	82,777						1	1	1	1	1	1	1

Top Management	Designation	Monthly salary (INR)	Nos.											
	Sr. Engg.	64,806		1	5	6	6	6	6	6	6	6	6	6
	Engg.	34,240		1	4	8	10	10	10	10	10	10	10	10
	Senior Technician	29,512		1	2	2	2	2	2	2	2	2	2	2
Sales and marketing	Manager Marketing	82,777	1	1	1	1	1	1	1	1	1	1	1	1
	Officer Sales	35,744			1	1	1	1	1	1	1	1	1	1
Incubation Centre	Manager IC	82,777		1	1	1	1	1	1	1	1	1	1	1
	Officer IC	35,744			1	1	1	1	1	1	1	1	1	1
Total (Mgt & Support staff)			2	19	42	50	56	58	58	58	58	58	58	58
Number of Employees on Temporary Contract														
	Training	15,000	-	3	21	34	55	68	85	100	114	128	128	128
	Contractual Employees (Production)	10,000			4	10	10	10	12	12	12	12	12	12
Employees on Temporary Contract				3	25	44	65	78	97	112	126	140	140	140

Financial Analysis



14. Financial analysis

14.1 Key assumptions

Project construction and commencement of operations

The project construction is expected to start in the financial year 2019-20. It is assumed that, the construction period and installation of machines shall be completed in 15 months. Full-scale operations will commence at the end of the construction period of 15 months.

Table 39: Key assumptions

Start of Project	1-May-19
Construction period (Months)	15
Commencement of operation, date	1-Sept-20
Number of years, useful life of machines and equipment (as per depreciation rules)	10
Maximum days of operation in a year	300

14.1.1 Income assumptions

► Training revenue assumptions

Table 40: Training revenue assumptions

N o.	Specialization	Course name	Fees in '000	Duration (months)	Batch size	No. of Batch/ year	Annual intake
1	Tool Room	Advanced Diploma in Tool & Die making	144	48	60	1	60
		ITI (NCVT) Machinist Trade	50	24	30	1	30
		ITI (NCVT) Fitter	42	24	30	1	30
		Advanced Machinist Course	35	24	60	1	60
		Post Diploma in Tool Design	60	12	30	2	60
		Post Diploma in Tool Manufacturing	60	12	30	2	60
		Post Diploma in CNC- Prog & Op	60	12	30	2	60

N o .	Specialization	Course name	Fees in '000	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Adv. Certificate Course in Tool Design & CAD/CAM	60	12	30	2	60
		Adv. Certificate Course in Tool & Die Manufacturing	60	12	30	2	60
		Certificate Course in Tool & Die Making	40	12	30	2	60
		Master Certificate Course in Tool Design	40	6	30	2	60
		Certificate Course in Machine Tool Operations (Conventional L,M,G)	60	12	30	2	60
		Master of CAD/CAM/CNC	30	6	30	2	60
2	CNC Manufacturing, CAD/CAM	CNC lathe programming and operation (Full Time)	10	2	30	6	180
		CNC lathe programming and operation (Part Time)	12	4	30	12	360
		CNC Milling Prog and Operation (Full Time)	10	2	30	6	180
		CNC Milling Prog and Operation (Part Time)	12	4	30	12	360
		CAD/CAM/CNC Engineer (Full Time)	24	4	30	3	90
		CAD/CAM/CNC Engineer (Part Time)	30	6	30	2	60
		Auto CAD	8	1	30	6	180
		ANSYS	15	1	30	6	180

N o .	Specialization	Course name	Fees in '000	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Hyperworks Suite (Hyper Mesh, Hyper Form, RADIOS)	15	1	30	6	180
		CAD Modelling with UNIGRAPHICS	8	1	30	6	180
		CAD Modelling with CREO Parametric	8	1	30	6	180
		CAD Modelling with CATIA	8	1	30	6	180
		CAD/CAM Solidworks	8	1	30	6	180
		STAAD. Pro	8	1	30	6	180
		Computer Integrated Manufacturing (CIM)	8	1	30	6	180
3	Advance Welding Courses	Basic Arc and Gas welding (Full Time)	10	3	20	4	80
		Basic Arc and Gas welding (Part Time)	12	6	20	2	40
		TIG welding (Full Time)	10	2	20	4	80
		TIG welding (Part Time)	12	4	20	2	40
		MIG welding (Full Time)	10	2	20	4	80
		MIG welding (Part Time)	12	4	20	2	40
		Flux Core Arc Welding	15	3	20	2	40
		Master Course in Advanced Welding Technologies	30	12	20	1	20
4	Foundry & Casting	Advanced course in Foundry Technology	30	18	20	1	20

N o .	Specialization	Course name	Fees in '000	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Non Destructive Training - Level 1	5	1	20	6	120
		Non Destructive Training - Level 2	5	1	20	6	120
		Certificate Course in Foundry Technology	10	6	20	2	40
5	Electronics and IT	Basic computer and Hardware (Part Time - 4 hrs)	10	2	30	12	360
		Advanced Hardware & Networking (Part Time - 4 hrs)	15	4	30	6	180
		VLSI Design	15	4	30	4	120
		Embedded System Design	15	4	30	4	120
		Electronics Maintenance	15	4	30	4	120
		Additive Manufacturing	20	2	10	6	60
		Advanced PLC Programming and SCADA	20	4	30	4	120
		Power Electronics and Industrial Drives	12	4	30	6	180
		Solar Energy System Technician	8	4	30	4	120
6	Industrial and process Automation and Others	Industrial Hydraulics	10	1	20	6	120
		Industrial Pneumatics	10	1	20	6	120
		PLC Programming	10	1	20	6	120

N o .	Specialization	Course name	Fees in '000	Duration (months)	Batch size	No. of Batch/ year	Annual intake
		Industrial Automation Technician	20	4	20	3	60
		Industrial Automation Design	25	4	20	3	60
		Certificate course in Industrial Automation with PLC, AC Drive and CNC Maintenance	34	6	20	2	40
		Certificate course in Metrology and QC	20	4	20	4	80
		Advance Certificate Course in Inspection & Quality Control	20	6	30	2	60
		Diploma in Mechatronics	120	36	20	1	20
7	Training on Testing	Mechanical: Physical Properties of metal and Non Metal product/material	15	4	20	3	60
		Metallurgical Testing	15	4	20	3	60
8	Rural Artisan and Skill Training	Courses on Rural Artisan, Craftsman & Technician Training	18	3	1	2500	2500

► **Production**

Table 41: Production assumptions

S.N.	Machine	Estimated Machine Rate/Hour*	Shift	Hours
Advanced Machines				
1	CNC Milling - 5 axis	2000	1	8
2	CNC VMC Milling - 3 axis (1200*900*500mm)	1250	2	16
3	CNC VMC Milling -3 axis (800*600*450mm)	800	2	16
4	CNC Lathe	350	2	16
5	Conventional Vertical Milling	200	1	8
6	Conventional Lathe	150	1	8
7	CNC EDM Wire Cut (500*500*400)	750	1	8
8	CNC EDM Die Sinking (500*500)	750	1	8
9	Additive Manufacturing with 3D Scanner	2000	1	8
10	Vacuum Heat Treatment Facility	400	2	16
Conventional Machines				
11	Radial drill machine	100	1	8
12	Surface Grinding (800*400)	250	1	8
13	Surface Grinding (500*200)	200	1	8
14	Cylindrical Grinding	250	1	8
Supporting Machines and Labs				
15	Hydraulic press	100	1	8
16	Mechanical Press	100	1	8
17	Injection Moulding	300	1	8
18	Metrology Lab with CMM	750	1	8
19	NABL accredited - Material Testing Facility for engineering products	2500	1	8
20	NABL accredited - Testing Facility for LED bulbs/assemblies	1500	1	8
21	NABL accredited - Testing Facility for essential oils extracted from aromatic plants	800	1	8
22	CAD-CAM Software CATIA,UG etc. and Analysis Software	500	1	8

Machine utilization	Year	
2 nd year of production	2022-23	25%
3 rd year of production	2023-24	40%
4 th year of production	2024-25	50%
5 th year of production	2025-26	60%
6 th year of production	2026-27	70%
year on year increase in machine utilization and machine hour rate 7 th year onwards	2027-28	10%

► **Consultancy revenue assumptions**

Revenue from consultancy is expected to start from 2nd year of operation i.e. 2022-23, however full-fledged revenue will start from the year 2025-2026 when the TC is fully operational and all infrastructures are in place.

Table 42: Consultancy revenue assumptions

S. No	Consulting Areas	Suggestive Rev Year 1 (INR lacs)	Suggestive Rev Year 2 (INR lacs)	Suggestive Rev Year 3 (INR lacs)	Suggestive Rev Year 4 (INR lacs)	Suggestive Rev Year 5 (INR lacs)	Suggestive Rev Year 6 (INR lacs)	Suggestive Rev Year 7 (INR lacs)	Suggestive Rev Year 8 (INR lacs)	Suggestive Rev Year 9 (INR lacs)	Suggestive Rev Year 10 (INR lacs)
1.	Design Support (incl. Product Design)	-	5,00,000	5,50,000	6,05,000	6,95,750	8,00,113	9,20,129	10,58,149	12,16,871	13,99,402
2.	Product Design Support	-	2,00,000	2,20,000	2,42,000	2,78,300	3,20,045	3,68,052	4,23,260	4,86,748	5,59,761
3.	Engineering Solutions (Development of Jigs & Fixtures for Machining, Welding, etc.)	-	2,00,000	2,60,000	3,38,000	3,88,700	4,47,005	5,14,056	5,91,164	6,79,839	7,81,815
4.	Quality System Support	-	1,00,000	1,00,000	1,50,000	1,72,500	1,98,375	2,28,131	2,62,351	3,01,704	3,46,959
5.	Project Consultancy (curriculum	-	-	1,00,000	3,00,000	3,45,000	3,96,750	4,56,263	5,24,702	6,03,407	6,93,918

	development, community colleges, trainers, etc.)										
6.	Productivity Improvement	-	-		-	-	-	-	-	-	-
7.	Other Consulting assignments	-	-	-	-	-	-	-	-	-	-
Total			10,00,000	12,30,000	16,35,000	18,80,250	21,62,288	24,86,631	28,59,625	32,88,569	37,81,854

14.1.2 Project cost and financing

The expected completion period of the project is 15 months. The training and production block is planned to be completed in 12 months. The procurements of machines will be planned according to the scheduled completion of the workshop.

Table 43: Project cost and financing

Project cost	In lakhs
Plant & Machinery	5,806
Infrastructure (including other infrastructure and pre-operative expenses)	8,009
Contingency @ 5%	691
Total	14,506

14.1.3 Other financial assumptions

Terminal value assumptions:	
Discount rate	9.25%
Growth rate in perpetuity	5.0%
Cost of equity	9.25%

Repair & maintenance (of P&M)	1.0%
Repair & maintenance (of Building)	1.7%
Post commissioning Insurance cost of new P&M (of P&M & building)	0.5%

Working Capital Assumptions		
Cash in Hand	Days	60
Accounts Receivables	Days	90
Suppliers Credit (A/P)	Days	30
Finished goods Storage	Days	30
Inventories (RM, Consumables)		
Finished goods	Days	90
Training	Days	90

Inflation (Salary etc.)	10%
-------------------------	-----

Depreciation Rates			
Asset Class		WDV	Max Depreciation
Tangible Assets			
	Plant and machinery	13.91%	95.00%
	Buildings	10.00%	95.00%

Working capital and cash flow statement

Overall net working capital requirement for the TC is expected to grow from about INR 23 lakhs in year 0 to INR 260 lakhs by year 8.

Figure 24: Net working capital requirement

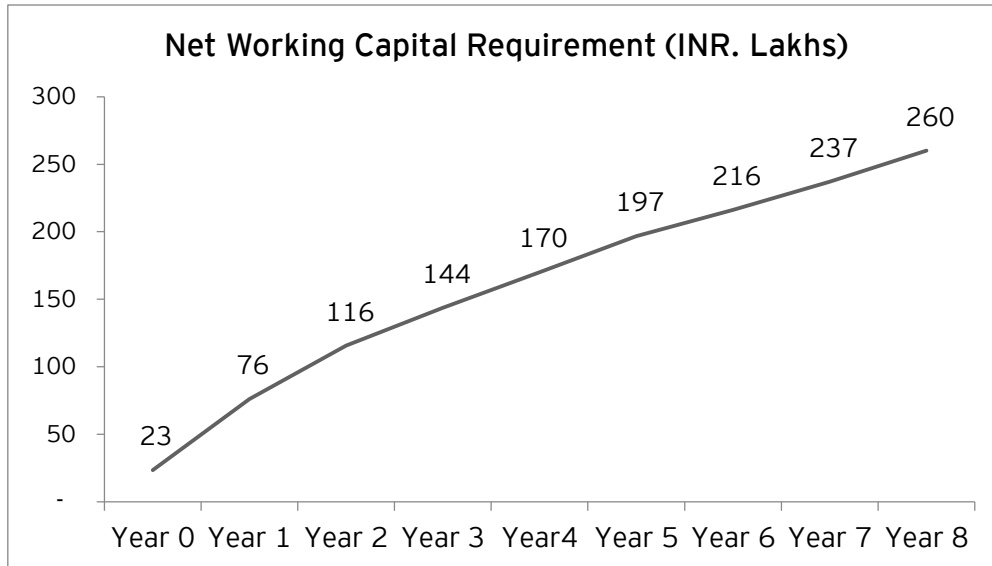


Figure 25: Cash flow closing balance

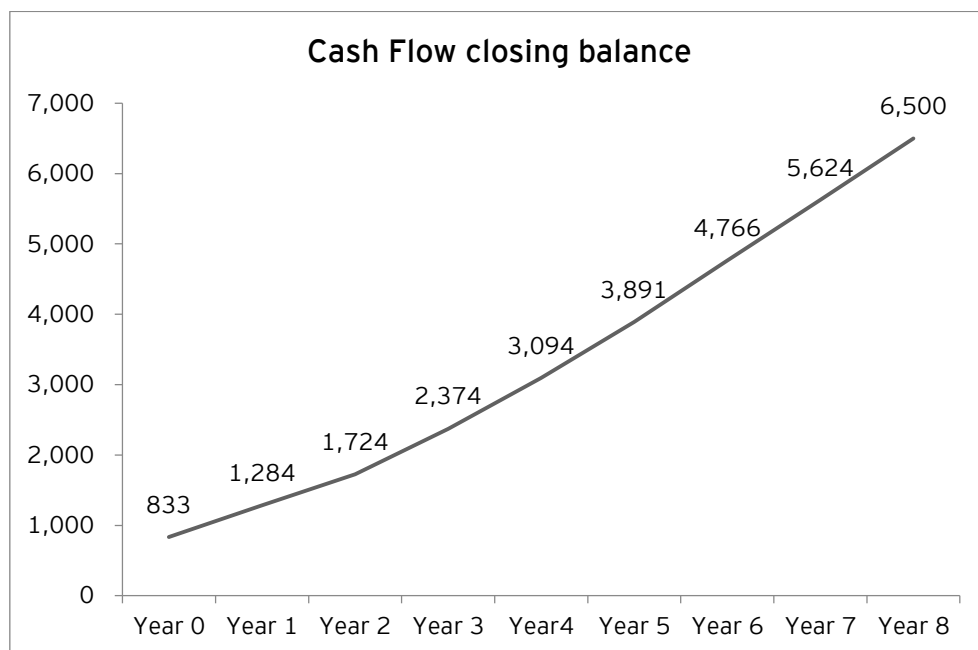


Table 44: Working capital schedule

Working Capital Schedule - With TCSP											
Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
INR Lakhs											
Raw Material Storages											
Finished goods	-	2	8	13	17	20	23	26	28	31	34
Training	1.45	3	3	4	5	6	7	7	8	8	8
Consumable tools											
Finished goods	-	0	1	2	2	2	3	3	3	4	4
Training	1.45	3	3	4	5	6	7	7	8	8	8
Consumable stores											
Finished goods	-	0	1	1	2	2	2	2	3	3	3
Training	0.83	2	2	2	3	3	4	4	4	5	5
Finished Product Storages											
Finished goods	-	3	13	21	27	32	38	41	45	50	55
Accounts Receivables	1.31	12	47	73	92	110	127	140	155	170	187
Gross Working Capital	5.04	25	79	122	153	181	210	231	254	278	305
Suppliers Credit	1.26	1	3	6	9	11	13	15	17	18	19
Net Working Capital Requirement	3.78	23	76	116	144	170	197	216	237	260	286

Table 45: Cash flow statement

Cash Flow												
Years	Construction											
	Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
INR Lakhs												
Income post Depreciation	-27	272	121	-1,366	-968	-602	-384	-176	9	96	206	303
Add: Depreciation				1,640	1,448	1,279	1,131	1,000	885	783	694	614
Inflow from capital fund	2,102	12,299										
Capital fund to balance -ve cash flows, if any	30	160	300	230								
Total Cash Inflow	2,106	12,730	421	503	480	677	747	824	894	879	899	917
Investment in Assets	2,102	12,299										
Net Change in WC		4	20	53	40	28	26	27	19	21	23	25
Total Cash Outflow	2,102	12,302	20	53	40	28	26	27	19	21	23	25
Opening Balance		3	431	833	1,284	1,724	2,374	3,094	3,891	4,766	5,624	6,500
Surplus/Deficit	3	428	402	451	441	649	721	797	875	859	876	892
Closing Balance	3	431	833	1,284	1,724	2,374	3,094	3,891	4,766	5,624	6,500	7,392

14.2 Income & expenditure statement

Table 46: Income and expenditure

Income and Expenditure												
Year	Construction Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
INR Lakhs												
Income												
Training Income		474	910	1,104	1,406	1,764	1,941	2,135	2,348	2,466	2,589	2,718
Sale of Finished goods			31	134	215	268	322	376	413	455	500	550
Sale of Scrap		4.4	9	13	17	22	24	27	30	32	34	36
Consultancy Income		-	-	10	12	16	19	22	25	29	33	38
Total Income		479	950	1,261	1,650	2,071	2,306	2,559	2,816	2,981	3,156	3,343
Expenditure												
Variable Operating expenditure												
Raw materials		5	16	39	59	73	86	99	109	119	129	141
Finished goods			6	28	44	55	66	77	85	94	103	113
Training		5	9	11	14	18	20	22	24	25	26	28
Consumable tools		5	10	15	20	25	28	32	35	37	40	42
Finished goods			1	3	5	7	8	9	10	11	12	14
Training		5	10	12	15	18	20	22	25	26	27	28
Consumable stores		3	6	9	12	16	18	20	22	23	25	27
Finished goods			1	3	4	5	6	8	8	9	10	11

Income and Expenditure												
Year	Construction Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Training		3	5	6	8	10	11	12	14	14	15	16
Utilities (Electricity & water)		23	47	63	83	104	116	129	142	151	160	169
Finished goods			2	9	14	17	21	24	27	30	33	36
Training		23	45	54	69	87	95	105	115	121	127	134
Variable Operating expenditure		36	79	126	174	218	249	280	308	330	354	380
Fixed Operating Expenditure												
Salary & Wages/ Establishment expenses	27	146	336	414	488	599	698	804	921	1,054	1,160	1,276
Repairs and Maintenance			196	196	196	196	196	196	196	196	196	196
P&M			60	60	60	60	60	60	60	60	60	60
Buildings			136	136	136	136	136	136	136	136	136	136
Training Expenses			91	110	141	176	194	213	235	247	259	272
Other Production. & Admin. Expenditure			74	98	128	160	179	198	218	231	244	259
Marketing expenses		25	25	15	15	15	15	15	15	15	15	15
Insurance of new machines			29	29	29	29	29	29	29	29	29	29
Fixed Operating Expenditure	27	171	750	862	996	1,175	1,311	1,456	1,614	1,771	1,903	2,046
Total Expenditure	27	207	828	988	1,170	1,393	1,559	1,736	1,922	2,102	2,257	2,426
Income (Gross income)	(27)	272	121	273	480	677	747	824	894	879	899	917

Income and Expenditure												
Year	Construction Period		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Depreciation	-	-	-	1,640	1,448	1,279	1,131	1,000	885	783	694	614
Income post Depreciation	(27)	272	121	(1,366)	(968)	(602)	(384)	(176)	9	96	206	303

14.3 Balance sheet

Table 47: Balance sheet

Balance Sheet												
Years	Construction Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
INR Lakhs												
Liabilities												
Capital fund	2,102	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401
Capital for -ve cashflows	30	190	490	720	720	720	720	720	720	720	720	720
Reserves & Surplus	(27)	245	366	(1,000)	(1,968)	(2,570)	(2,954)	(3,130)	(3,121)	(3,025)	(2,819)	(2,516)
Total	2,106	14,836	15,257	14,121	13,153	12,551	12,167	11,991	12,000	12,096	12,302	12,605
Assets												
Fixed Assets	2,102	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401	14,401
Net Block	2,102	14,401	14,401	12,761	11,313	10,034	8,903	7,903	7,018	6,235	5,542	4,927
Cash	3	431	833	1,284	1,724	2,374	3,094	3,891	4,766	5,624	6,500	7,392
Current Assets	-	3.8	23	76	116	144	170	197	216	237	260	286
Total	2,106	14,836	15,257	14,121	13,153	12,551	12,167	11,991	12,000	12,096	12,302	12,605

14.4 Profitability

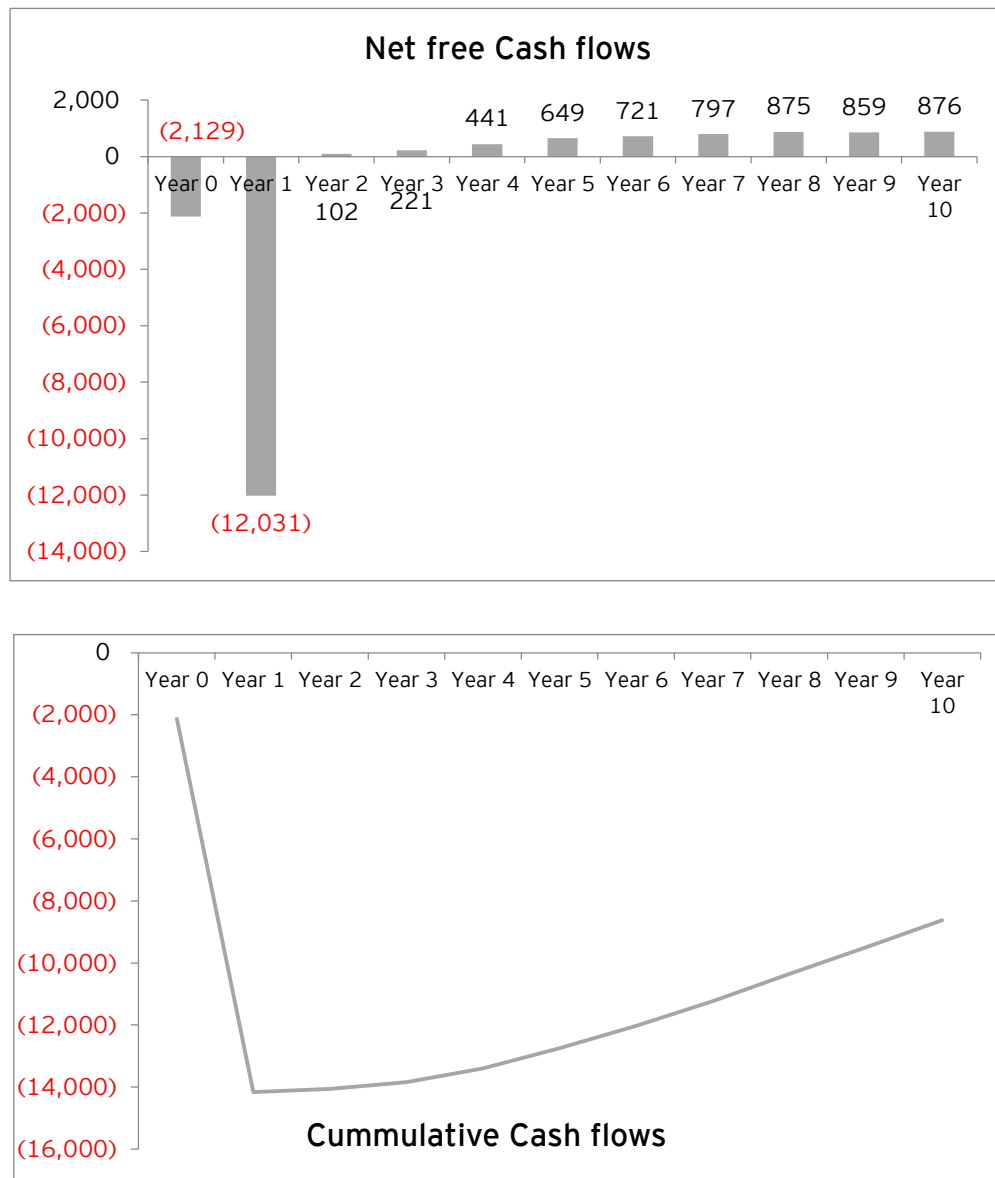
Overall project profitability has been estimated considering phased investment in plant & machinery and infrastructure. The full-fledged operations are expected to start from the year 2020-21. Hence the project IRR for a period of 15 years till 2032-33 is 7.8%.

Table 48: Profitability with investment plant & machinery

Project IRR	7.8%
Payback period	>11 years

The project is expected to generate positive net free cash flows starting after 2nd year.

Figure 26: Net free Cash flows and Cumulative Cash flows



14.5 Sensitivity analysis

Sensitivity analysis of Project IRR has been carried out with respect to the key project parameters.

- ▶ Project cost
- ▶ Revenue from Training
- ▶ Revenue from production
- ▶ Revenue from Consultancy

The project IRR is most sensitive to changes in training revenue, followed by changes in project cost, production revenue and consultancy revenue.

Training forms majority of revenue for the TC followed by production and consultancy.

5 percent increase/decrease in training revenue increases / decreases the project IRR by about 1.21%.

5 percent increase/decrease in project cost decreases/ increases the project IRR by about 0.59%

5 percent increase/decrease in production revenue increases / decreases the project IRR by about 0.20%.

Consultancy being the lowest contributor to revenue has the lowest impact on project sensitivity. 5 percent increase/decrease in production revenue increases / decreases the project IRR by about 0.02%.

Table 49: Sensitivity of IRR

		Construction period (15 Months)			Construction period (15 Months)
Increase in Project cost	-5%	8.5%	Increase in Consultancy revenue	-5%	7.8%
	0%	7.8%		0%	7.8%
	5%	7.2%		5%	7.9%
	10%	6.7%		10%	7.9%
Increase in Training revenue	-7.5%	5.6%	Increase in Production revenue	-10%	7.4%
	-5%	6.4%		-5%	7.6%
	0%	7.8%		0%	7.8%
	5%	9.2%		5%	8.0%
	10%	10.4%		10%	8.2%

Environment, Health and Safety



15. Environment, health and safety

Effective management of environmental, health, and safety (EHS) issues entails the inclusion of EHS considerations at various levels during project implementation. It is proposed that World Bank EHS guidelines will be followed to adhere to the desirable performance levels and measures while developing the TC.

15.1. Environment

15.1.1. Air emissions

The expected manufacturing processes in the proposed TC with air emissions would be sintering, metal cutting, grinding and / or forming (including forging, wire drawing, pressing, stamping, among others), quenching, annealing and other general treatments, abrasive treatments, solvent degreasing and emulsion, alkaline, and acid cleaning, welding, anodizing, chemical conversion coating, electroplating, painting and other metal finishing techniques (including polishing, hot dip coating). To counter the problems, the following techniques will be used:

- ▶ **Volatile Organic Compounds (VOC)** emissions management strategies will be used which include:
 - Installation of refrigerator coils (or additional coils) above the degreaser vapour zone
 - Application of an air flow over the top of the degreaser that should not typically exceed 40 m / minute
 - Rotation of parts before removal from the vapour degreaser, including:
 - Installation of thermostatic heating controls on solvent reservoirs and tanks
 - Installation of in-line filters to prevent particulate build- up
 - Use of solvent recovery to reduce emissions of VOC from curing ovens
 - Use of activated carbons to recover solvent vapours
 - In order to reduce emissions during welding and coating, metal surfaces would be carefully cleaned
 - Coatings would be removed from the base metal before welding preferably using mechanical cleaning (for example blasting with CO₂-pellets) instead of solvents.
- ▶ **Dust:** Dust emissions management strategies will be used which include:
 - Installation of in-line aspirators with filters or scrubbers. Electrostatic precipitators (ESP) will also be employed
 - Where possible, maintaining wetness on the metal surface in order to prevent or minimize dust production
- ▶ **Acid / Metals Content in Mists and Fumes:** Management strategies for acid / metal content in mist and fume emissions will be used which include:
 - Use of fume suppressants as additives to electroplating baths to reduce air emissions of

electroplated metals (e.g. chromium)

- Installation of in-line aspirators with filters to eliminate acid compounds
- For metals or metal oxides abatement, installation of filters capable of handling complex metals
- Welding fumes (a mixture of metals, oxides, and smoke from burning off oil) would be controlled by removing coatings from base metals

15.1.2. Wastewater and liquid wastes

Typical sources of wastewater discharged from product manufacturing process in the proposed TC would include water-based cleaning and rinsing streams, cooling water, alternative cleaners, wastewater generated from cutting, blasting, deburring and mass finishing activities and water-based metalworking fluid operations. To counter the problems, the following techniques will be used:

► Oil-based Effluents

- Effluent separation from wastewater, and special disposal will be done if recycling is not possible
- Standardization of use of oil types, and efficient scheduling of processes that require use of varying oil types
- Extension of the life of cooling liquid through use of centrifuges, introduction of periodical analyses, use of biocides and ultrafiltration, and removal of oils by disk or belt skimmers.
- Appropriate housekeeping techniques to prevent cutting oils from being contaminated with solvents will be used
- Oil quench baths would be recycled by filtering out metals
- Metal-working fluids would be recovered using collection (or drip) pans under functional machinery;
- In cold forming or other processes where oil is used, automatic oilers would be used to reduce grease accumulation. A stamping lubricant suitable for conditions leading up to thermal treatment processes would be taken into consideration.

► Solvent and Water-based Effluents

- Solvents would be carefully managed to prevent spills and fugitive emissions
- Less hazardous degreasing agents (e.g. petroleum solvents, vegetable cleaning agents, VCA, supercritical CO₂ or alkali washes) would be considered, in addition to the use of counter current solvent cleaning (two-stage: first cleaning with dirty solvent, followed by fresh solvent); Aqueous non-VOC-containing alkali washes would be used for metal cleaning whenever possible. Some of these can be regenerated by microfiltration
- Spent-degreasing solvents would be recycled on site, reusing batch stills and waste solvents
- Cold cleaning with recycled mineral spirits would be implemented before final vapour degreasing

- Acids in wastewaters would be recovered through evaporation;
- Rinse contamination would be reduced via drag-out by optimization of part operation, using surfactants and other wetting agents;
- Mechanical cleaning techniques would be used instead of chemicals where possible (e.g. a vibrating abrasion apparatus for brass rather than acid pickling; mechanical scraping instead of acid solution to remove oxides of titanium; and rotating brush machines with pumice to clean copper sheets);
- Concentrations of dissolved metal ions would be controlled and reduced (e.g. molybdenum concentration reduction through reverse osmosis / precipitation systems; use of non-chromate solutions for alkaline etch cleaning of wrought aluminum; use of sulfuric acid / hydrogen peroxide dip instead of cyanide and chromic acid dip for copper- bright dipping process)
- Acid or alkaline pickling solutions would be replaced, if possible, with alternative cleaning agents (e.g. use of caustic wire cleaner with biodegradable detergent and use of linear alcohols instead of sulfuric acid to pickle copper wire, provided that adequate safety and fire prevention is implemented)
- Flow restrictors / control meters would be installed and a foot pump (or photo sensor for automatic lines) would be used to activate rinse
- Process wastewaters would be treated and recycled, using ion exchange, reverse osmosis, electrolysis, and electro dialysis with ion exchange.

► **Surface Treatment / Finishing Wastewater:**

- Strong agents and toxic surfactants would be substituted by less hazardous alternatives;
- Anodizing and alkaline silking baths would be regenerated by recuperation of metallic (e.g. aluminum) salts through use of hydrolysis of sodium aluminate;
- Stocks of finishing material would be limited with short shelf lives;
- Painting jobs (light to dark) and the selection of spraying techniques would minimize wastewater production (e.g. use of a spray gun for particular applications, use of an electrostatic finishing system instead of conventional air spray);
- The use of chlorinated solvents would be avoided and substituted (including carbon tetrachloride, methylene chloride, 1,1,1- trichloroethane, and perchloroethylene) with non-toxic or less toxic solvents as cleaning agents;
- Chromic acid and trisodium phosphate would be substituted by less toxic and non-fuming cleaners (e.g. sulfuric acid and hydrogen peroxide), and cyanide cleaners would be substituted by ammonia;
- Less toxic bath components would be used (e.g. zinc in place of cadmium in alkaline / saline solutions; nitric or hydrochloric acids in place of cyanide in certain plating baths; zinc chloride in place of zinc cyanide);

- Drain boards, drip guards, drip bars, and dedicated drag out tanks would be installed, after process baths.

► **Metals in Wastewater:**

- The management of water consumption is crucial, as it also reduces the usage of raw materials and their loss to the environment. Good process control and drag-out reduction are key factors to reduce the consumption of hazardous raw materials;
- Wastewaters with recoverable metals would be separated from other wastewater streams. Metals would be recovered from solution (e.g. using electrolytic cells or hydroxide precipitation);
- Used metal pickling baths would be sent to a continuous electrolysis process for regeneration and metal recovery;
- Metals from bright dipping solutions would be recovered using suitable processes (e.g. ion exchange system for copper, or segregating phosphates from treatment of aluminum based alloys);
- Solutions containing cyanide salts (e.g. for hardening processes) would be replaced with solutions using a fluidized bath of nitrogen and corundum;
- Hexavalent chromium would be substituted for plating. If this is not possible closed loops and covered vats would serve to minimize emissions.

- **Process Wastewater Treatment:** Since general manufacturing operations, including metals, plastics and rubber products use a myriad of raw materials, chemicals and processes, wastewater treatment will require the use of unit operations specific to the manufacturing process in use. Techniques for treating industrial process wastewater in this sector include source segregation and pre-treatment of concentrated wastewater streams. Typical wastewater treatment steps include:

- Greasing of traps, skimmers, dissolved air floatation or oil water separators for separation of oils and floatable solids
- Filtration for separation of filterable solids
- Flow and load equalization
- Sedimentation for suspended solids reduction using clarifiers
- Biological treatment, typically aerobic treatment, for reduction of soluble organic matter (BOD)
- Biological nutrient removal for reduction in nitrogen and phosphorus
- Chlorination of effluent when disinfection is required
- Dewatering and disposal of residuals in designated hazardous waste landfills.

15.1.3. Waste water management

Wastewater management would include water conservation, wastewater treatment, storm water management, and wastewater and water quality monitoring.

- ▶ **Industrial Wastewater:** Industrial wastewater generated from industrial operations includes process wastewater, wastewater from utility operations, runoff from process and materials staging areas, and miscellaneous activities including wastewater from laboratories, equipment maintenance shops, etc.

Process Wastewater: Adequate treatment technology will be used to achieve the desired discharge quality and to maintain consistent compliance with regulatory requirements. The design and operation of the selected wastewater treatment technologies will be done to avoid uncontrolled air emissions of volatile chemicals from wastewaters. Residuals from industrial wastewater treatment operations will be disposed in compliance with local regulatory requirements or will be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

- ▶ **Wastewater from Utilities Operations:** Utility operations such as cooling towers and demineralization systems in the TC may result in high rates of water consumption, as well as the potential release of high temperature water containing high dissolved solids, residues of biocides, residues of other cooling system anti-fouling agents, etc. Water management strategies for utility operations will be used which include:

- Adoption of water conservation opportunities for facility cooling systems
- Use of heat recovery methods (also energy efficiency improvements) or other cooling methods to reduce the temperature of heated water prior to discharge to ensure the discharge water temperature does not result in an increase greater than 3°C of ambient temperature at the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity among other considerations;
- Minimize use of antifouling and corrosion inhibiting chemicals to ensure appropriate depth of water intake and use of screens. Least hazardous alternatives would be used with regards to toxicity, biodegradability, bioavailability, and bioaccumulation potential. Dose applied would accord with local regulatory requirements and manufacturer recommendations;
- Testing for residual biocides and other pollutants of concern would be conducted to determine the need for dose adjustments or treatment of cooling water prior to discharge.

- ▶ **Storm Water Management:** Storm water includes any surface runoff and flows resulting from precipitation, drainage or other sources. Typically, storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding streambeds and banks. In order to reduce the need for storm water treatment, the following principles would be applied:

- Storm water would be separated from process and sanitary wastewater streams in order to

reduce the volume of wastewater to be treated prior to discharge

- Surface runoff from process areas or potential sources of contamination would be prevented
 - Where this approach is not practical, runoff from process and storage areas would be segregated from potentially less contaminated runoff
 - Runoff from areas without potential sources of contamination would be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate would be reduced (e.g. by using vegetated swales and retention ponds)
 - Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority would be given to manage and treat the first flush of storm water runoff where the majority of potential contaminants tend to be present;
 - When water quality criteria allows, storm water would be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
 - Oil water separators and grease traps would be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.
 - Sludge from storm water catchments or collection and treatment systems will contain elevated levels of pollutants and would be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety , and conservation and long term sustainability of water and land resources.
- **Sanitary Wastewater:** Sanitary wastewater from industrial facilities includes effluents from domestic sewage, food service, and laundry facilities serving site employees. Miscellaneous wastewater from laboratories, medical infirmaries, and water softening etc. can also be discharged to the sanitary wastewater treatment system. Sanitary wastewater management strategies will be used which include:
- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system which can only accept domestic sewage)
 - Segregation and pre-treatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems
 - If sewage from the industrial facility is to be discharged to surface water, treatment to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater would be met
 - If sewage from the industrial facility is to be discharged to either a septic system, or where land is used as part of the treatment system, treatment to meet applicable national or local standards for sanitary wastewater discharges will be done.
 - Sludge from sanitary wastewater treatment systems would be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety , and conservation and long term sustainability of water and land resources.

15.1.4. Solid waste management

The TC will establish waste management priorities at the outset of activities based on the understanding of potential Environmental, Health, and Safety (EHS) risks and impact and considering waste generation and its consequences. The TC will do the following with respect to the same;

- ▶ Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.
- ▶ Avoid or minimize the generation of waste materials, as far as practicable
- ▶ Minimize, recover and reuse waste where waste generation cannot be avoided
- ▶ Treat, destroy and dispose waste in an environmentally sound manner where waste cannot be recovered or reused

The manufacturing and related operations (e.g. wastewater treatments or fume reduction) will generate solid waste at the TC. Its management measures will include:

- ▶ Separating metal dust or scrap by type to promote recovery and recycling
- ▶ Reducing and treating slags from welding, forging, machining, and mechanical finishing, which may contain metal ions
- ▶ Proper management of metals removed from wastewaters for recovery or disposal; disposal of sludge from surface finishing processes (e.g. galvanizing, painting, hot dip)
- ▶ If reuse or recycling is not possible, the waste would be disposed of according to industrial waste management recommendations in the General EHS Guidelines

15.2. Occupational health and safety

The TC is proposed to implement all reasonable precautions to protect the health and safety of employees and students as per the World Bank norms. Although the focus will be placed during the operation of TC, much of the occupational health and safety guidance will also be followed during the construction and decommissioning activities. Preventive and protective measures will be introduced according to the following order of priority:

- ▶ Eliminating the hazard by removing the activity from the work process e.g. substitution with less hazardous chemicals, using different manufacturing processes, etc.
- ▶ Controlling the hazard at its source through use of engineering controls e.g. local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc.
- ▶ Minimizing the hazard through design of safe work systems and administrative or institutional control measures e.g. job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- ▶ Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

The application of prevention and control measures to occupational hazards will be done based on comprehensive job safety or job hazard analyses. The results of these analyses should be prioritized as part of an action plan based on the likelihood and severity of the consequence of exposure to the identified hazards. The general EHS guidelines: occupational health and safety will be followed with respect to the following;

- ▶ **General facility design and operation**
 - Integrity of workplace structures
 - Severe weather and facility shutdown
 - Workspace and exit
 - Fire precautions
 - Lavatories and showers
 - Potable water supply
 - Clean eating area
 - Lighting
 - Safe access
 - First aid
 - Air supply
 - Work environment temperature
- ▶ **Communication and training**
 - OHS Training
 - Visitor Orientation
 - New Task Employee and Contractor Training

- Labelling of Equipment
- Area Signage
- Communicate Hazard Codes
- ▶ **Physical Hazards**
 - Rotating and Moving Equipment
 - Noise
 - Vibration
 - Electrical
 - Eye Hazards
 - Welding / Hot Work
 - Industrial Vehicle Driving and Site Traffic
 - Working Environment Temperature
 - Ergonomics, Repetitive Motion, Manual Handling
 - Working at Heights
- ▶ **Chemical Hazards**
 - Air quality
 - Fire and explosions
 - Corrosive, oxidizing, and reactive chemicals
 - Asbestos Containing Materials (ACM)
- ▶ **Biological and radiological hazards:** Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. Radiation exposure can lead to potential discomfort, injury or serious illness to workers. Appropriate strategies as per the guideline will be taken for Prevention and control of such hazards.
- ▶ **Personal protective equipment (PPE)** to provide additional protection to workers exposed to workplace hazards in conjunction with other facility controls and safety systems.

15.2.1. Monitoring

Occupational health and safety monitoring programs would be undertaken to verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant occupational, health, and safety hazards, and the implementation of prevention and control strategies. The monitoring program would include;

- ▶ Safety inspection, testing and calibration
- ▶ Surveillance of the working environment
- ▶ Surveillance of workers health
- ▶ Training

15.2.2. Monitoring accidents and diseases monitoring

The TC will,

- ▶ Establish procedures and systems for reporting and recording
 - Occupational accidents and diseases
 - Dangerous occurrences and incidents
- ▶ Enable and encourage employees to report management all
 - Occupational injuries and near misses
 - Suspected cases of occupational disease
 - Dangerous occurrences and incidents
- ▶ Investigate of all reported incidences with the assistance of a person knowledgeable/ competent in occupational safety.

15.3. Addressing potential EHS issues

The key possible issues with respect to Environment, Health and Safety (EHS) for establishment of the new TC at Patna during the construction phase, operation and maintenance phase and tool manufacturing are as follows;

15.3.1. Construction phase

The activities and anticipated EHS issues during the construction phase are highlighted in the following sections:

Table 50: Activities and anticipated EHS issues during construction phase

Activity	Associated impact	Recommendation for mitigation
Clearing of land (before initiating the construction work, clearing of the shrubs and bushes shall be carried out)	Soil erosion	▶ It would be ensured that the construction activity immediately follows the clearing of land to avoid soil erosion.
Excavation, drilling and levelling for the construction of foundation and base of building and roads	Air pollution	▶ Water sprinkling at regular intervals during excavation and drilling activities would be practiced to avoid generation of dust. ▶ The excavated soil would not be stored in the direction of the wind and covers to be provided for loose construction material. ▶ Activities like digging and filling will be avoided in conditions of very high wind. ▶ Construction machinery will be properly maintained to minimize exhaust emissions of CO. SPM and Hydrocarbons.
	Soil erosion/ Loss of Top soil	▶ Effort would be made to use the overburden within premises for landscaping. ▶ During levelling, gradation across the land (If any) would be reduced to the extent possible.
	Noise pollution	▶ Regular maintenance of plant equipment will be carried out.

Activity	Associated impact	Recommendation for mitigation
		▶ Noise prone activities will be undertaken during day time and shall be avoided, to the extent possible, during night time. ▶ Personal protective equipment will be provided for workers performing drilling at site.
	Occupational health hazards	▶ Provision of adequate personal protective equipment like safety helmets, face masks, safety shoes, safety goggles etc. for the safety of workers. ▶ The excavated area would be provided with a visible boundary (Usually created using a tape and sticks) to ensure safety at site. ▶ Training will be imparted to workers on occupational safety and technical aspects of job undertaken by them.
	Disposal of debris and other wastes	▶ The waste and debris would be disposed of at an identified place preferably wasteland and appropriate approval should be taken for the same from land owner or revenue authorities. ▶ The disposal site would be at least 1000 meters away from the areas including notified forest land, water bodies and productive lands.
Establishing labour camp (Provision of civic amenities for construction labour and movement of truck drivers for transporting construction material shall be provided at the site. The labour camps at the project site will be temporary in nature)	Health Risks	▶ Provision of separate mobile toilet facilities for men and women will be made. ▶ The domestic effluent will be properly disposed of in soak pits. ▶ Contractor will provide garbage bins to all workers' accommodation for dumping wastes regularly in a hygienic manner in the area. ▶ First aid box would be provided at every construction campsite and under the charge of a qualified person to provide first aid. Availability of such person should be ensured at all time. The first aid box would contain the following in case of less than 50 workers at the site; i) Twelve small sterilized dressings. ii) Six medium size sterilized dressings.

Activity	Associated impact	Recommendation for mitigation
		iii) Six large size sterilized dressings. iv) Six large size sterilized burn dressings. v) Six (1/2 oz.) packets sterilized cotton wool. vi) One (2 oz.) bottle containing a 2 per cent alcoholic solution of iodine. vii) One (2 oz.) bottle containing sal-volatile having the dose and mode of administration indicated on the label. viii) One roll of adhesive plaster. ix) One snake-bite lancet. x) One (1 oz) bottle of potassium permanganate crystals. xi) One pair of scissors. xii) One copy of the first-aid leaflet approved by the Chief Inspector of Factories.
	Chances of spread of sexually transmittable diseases like AIDS	▶ Awareness programmes will be conducted regularly for workers on AIDS, and other health related issues. ▶ Health check-up facilities for employees and contract workers.
	Water pollution	▶ Separate mobile toilet facilities will be made available for male and female workers. The domestic effluent will be properly disposed of in soak pits. ▶ Adequate drinking water facilities, sanitary facilities and drainage in the temporary sheds of the construction workers would be provided to avoid the surface water pollution.
	Land contamination	▶ Basic sanitary facilities will be provided for the workers staying at the labour camp and at the project site. ▶ Dustbins will be provided at the camp by the contractor.
Movement of vehicles (Vehicle movement shall	Air pollution	▶ All the vehicles entering the site will be asked to have updated PUC (Pollution under control) certificate. ▶ Vehicle speed will be restricted to 15km/hour at site.

Activity	Associated impact	Recommendation for mitigation
prevail at the site to transfer the material and workers at site. Apart from this, third party vehicles delivering the material and equipment shall also be there.)		▶ Trucks/dumpers will be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil. ▶ Maintenance of vehicles will be carried out regularly. ▶ Sprinkling of water will be practiced at the site.
	Soil contamination	▶ Proper maintenance of vehicle will be carried out to avoid any leakage of oil or grease.
	Water contamination	▶ Proper maintenance of vehicle will be carried out to avoid any leakage of oil or grease.
	Safety risks	▶ Vehicle speed will be restricted to 15km/hour at site. ▶ Necessary safety trainings will be provided to the drivers of construction vehicles for speed restrictions and dos' and don'ts will be followed during movement of construction vehicles.
Use of D.G set (D.G sets shall be used at site to provide electricity to labour camps in the night time. Also, in case of non-availability of power from grid, D.G sets shall be used to provide electricity at the site for construction activity)	Air pollution	▶ D.G will be optimally used with proper orientation and adequate stack height. ▶ Stack monitoring will be carried out on regular basis. ▶ Proper maintenance of the DG will be carried out on regular basis.
	Noise pollution	▶ Acoustic enclosures will be provided with the D.G sets to minimize the noise levels.
Storage of diesel (Diesel shall be stored on-site so as to ensure availability for D.G sets)	Soil contamination	▶ A covered area will be defined for storage of HSD with concrete flooring
	Safety risks	▶ The diesel storage area will not be in proximity of the labour camps. ▶ Inflammable substance will not be allowed at the project site.

Activity	Associated impact	Recommendation for mitigation
Handling of waste (During construction phase there may be generation of both hazardous and non-hazardous waste which needs to be carefully handled to ensure environment safeguard)	Land contamination and Water contamination	▶ Waste will be stored at designated place after segregation on the basis of category (hazardous and non-hazardous). ▶ Hazardous waste will be disposed of to the authorized vendors only. ▶ A waste management plan will be chalked out to properly dispose the debris generated from the site.
	Safety risks	▶ Adequate PPE's will be identified and provided to the workers at site.
Installation and operation of concrete mix plants and batching plants (In case, these are installed on temporary basis at the project site)	Noise pollution	▶ Noise shielding will be used where practicable and fixed noise sources will be acoustically treated for example with silencers, acoustic louvers and enclosures. ▶ Provision of make shift noise barriers near high noise generating equipment will be made to minimize horizontal propagation of noise in case of residential area in the vicinity.
Construction labour management	Child labour and forced labour	▶ Provision of clause in contractor's agreement will be made that bans child labour and forced labour at project site. ▶ Adequate procedures to avoid or prevent hiring/entry of child labour at the project site will be undertaken; ▶ Random check will be undertaken at the site.
	Health and safety risks for children of workers	▶ Temporary crèche facility will be provided in case of migrant labourers children residing in the camps to ensure safety.
	Water wastage	▶ Emphasis will be given on optimization of water usage and supply of potable drinking water for labour camps.

Activity	Associated impact	Recommendation for mitigation
	Pressure on forest produce	▶ Fuel will be made available to construction workers so as to reduce pressure on forest produce or local fuel wood resources.

15.3.2. Operation and maintenance

There are a number of environment aspects and health and safety hazards which may arise during operations and due to negligence towards appropriate maintenance work in a TC. A snapshot of potential aspects and hazards are as follows:

Table 51: Potential hazards during O & M phase

Potential impact	Recommendation for mitigation
Deterioration of the structure over the period of time	▶ Maintenance and repair work would be carried out on regular basis to slow down/mitigate the deterioration of the structure. ▶ A structural stability certificate would be taken from a chartered engineer every 5 years. ▶ Any change in the layout of the equipment, bringing heavier machinery in place of a small one or putting more number of machinery in a particular place, would be approved by the chartered engineer to ensure that the modification in layout is not going to impact the stability of the structure.
Water contamination	▶ Cleaning of the terrace of the building would be practiced so as to ensure that the rain water collected through water harvesting is not contaminated. Alternatively, first rain harvest would be washed through the storm water drain in case of rain abundant area.
Fire risk	▶ Fire extinguishers will be checked for pressure on annual basis. ▶ Fire hydrant system would be checked once in six months to ensure it is operational. ▶ Electrical wiring in the premises would be regularly checked and repair should be undertaken wherever required.

15.3.3. Manufacturing

Table 52: Potential hazards during manufacturing phase

Activity	Associated impact	Recommendation for mitigation
Hand tool manufacturing		
Hammering during forging process	Noise pollution and hear loss over longer period of time	▶ Ear plugs/muffs would be provided to the employees and students working in the hammering process. ▶ Level of noise would be monitored on regular basis so as to ensure that the noise level is within specified limits. ▶ Hammering would not be carried out during night time. ▶ Regular audiometric test of employees would be carried out in order to understand if any person is susceptible to hearing loss and in case such situation is encountered the person would be shifted to other department and provided with medical facility.
	High vibrations	▶ Monitoring of the vibration will be conducted on regular basis.
Heat treatment	Air pollution	▶ Ventilation would be provided in work shop to avoid concentration of the fumes.
	Burn injury	▶ Employees would be provided with Apron while working in the workshop. ▶ Workplace safety training will be provided on regular basis. ▶ Eye wash and shower facility would be provided in the facility. ▶ Appropriate PPE including, gloves, safety shoes, goggles, etc. would be provided to employees and the students.
	Heat stress	▶ Heat stress monitoring of the employees will be conducted once a year to ensure safe and appropriate working conditions.
Non-maintenance of clean premises	Injury due to trips	▶ Cleaning schedule will be developed for the site. ▶ Proper demarcation of the storage area for waste material will be done according to the different type of waste material.

Activity	Associated impact	Recommendation for mitigation
Handling of waste (Hazardous and non-hazardous waste generated during day to day operations to be carefully handled to ensure environment safeguard)	Land contamination and Water contamination	▶ Waste will be stored at designated place after segregation on the basis of category (hazardous and non-hazardous). ▶ Hazardous waste will be disposed of to the authorized vendors only. ▶ A waste management plan will be chalked out to properly dispose the debris generated from the site.
	Safety risks	▶ Adequate PPE's will be identified and provided to the workers at site.
Use of D.G set (D.G sets shall be used at site to provide electricity in case of power failure)	Air pollution	▶ D.G set will be optimally used with proper orientation and adequate stack height. ▶ Stack monitoring to be carried out on regular basis. ▶ Proper maintenance of the D.G set to be carried out on regular basis.
	Noise pollution	▶ Acoustic enclosures will be provided with the D.G sets to minimize the noise levels.
Storage of diesel (Diesel shall be stored on-site so as to ensure availability for D.G sets)	Soil contamination	▶ A covered area will be defined for storage of HSD with concrete flooring.
	Safety risks	▶ Inflammable substance will not be allowed in the premises.
Specialised Tool manufacturing		
Designing of components	Depletion of natural resource (paper)	▶ Paper would be recycled for rough work.
Machining activities	Land contamination due to waste	▶ SOP would be formulated for handling and storage of waste oil and coolant.

Activity	Associated impact	Recommendation for mitigation
	oil and waste coolant	▶ A designated area would be identified to store these wastes under the shed. ▶ The hazardous waste will be disposed of to an authorised recycler and shall not be used internally for any purpose until prior permission is sought from SPCB.
	Water contamination due to waste oil and waste coolant	
	Noise pollution due to pressing and shearing activities	▶ Ear muffs / Ear plugs will be provided to officials working on these activities.
	Land contamination due to metal scrap	▶ The metal scrap would be collected appropriately and stored in a designated area before being disposed of/sold to a third party.
	Cut/injury due to metal scrap lying unmanaged	
Use of D.G sets	Noise pollution	▶ Acoustic enclosures would be provided to avoid noise pollution.
	Land contamination	▶ Diesel would be poured in D.G set using funnel. ▶ Concrete flooring would be made near the D.G set.
	Air pollution	▶ Chimney with appropriate height would be provided to minimize air pollution and compliance with the legislation.
Storage of hazardous waste like empty printer cartage, waste coolant, oil soaked cotton waste, etc.	Land and water contamination due to leakage and/or spill over	▶ The storage area of the hazardous waste will be cemented in order to avoid land contamination. ▶ Proper demarcation of storage area for hazardous waste will be done to avoid chances of spill over during handling. ▶ All the waste will be stored under a shed so as to avoid contamination and washing away of waste in nearby water stream or ground water in case of rain

Activity	Associated impact	Recommendation for mitigation
	Water contamination due to leakage and/or spill over	▶ All the waste will be stored under a shed so as to avoid contamination and washing away of waste in nearby water stream or ground water in case of rain.

The protection of public health, safety and general welfare will also be ensured through adherence to the building codes since these are related to the construction and occupancy of buildings and structures.

15.4. Provisioning of site services

The following section outlines the details of the essential measures to be designed as per regulatory requirements relating to maintenance such as;

- ▶ Fire alarm and firefighting system,
- ▶ Rain water harvesting,
- ▶ Water treatment and sewage treatment,
- ▶ Ventilation system.

15.4.1. Fire alarm and firefighting system

a) Fire alarm system

- ▶ Automatic Fire alarm system will be provided in all buildings of the campus excluding student hostels and emergency staff quarters.
- ▶ The system will have appropriate provisioning of smoke detectors and beam detectors with respect to the sensitivity and probability of fire.
- ▶ Fire alarm panels will be provided at appropriate locations with easy and convenient accessibility for manual activation of alarm in case failure of automatic system.
- ▶ A control panel will be provided at control station with a repeater panel in security cabin to activate, deactivate and reset the fire alarm system.
- ▶ The instrumentation, panels, sensors and equipment used will be of certified make confirming to relevant standards.
- ▶ Smoke detectors and beam detectors will be installed above and below false ceiling as applicable.

b) Firefighting system – overview

- ▶ Firefighting system comprising of sprinklers, yard hydrants and pumping station will be provided.
- ▶ Sprinklers system will be provided in the production area (above and below the false ceiling), training block, administrative building (all floors) and other buildings etc.
- ▶ Yard/ field hydrant system will be provided throughout campus with hydrant posts at appropriate locations having operating valve and hose reel provided in hose reel boxes as per standards.
- ▶ Staircases in all buildings will be provided with wet risers.
- ▶ The piping network will have suitable size/ diameter MS pipes welded at joints or connected with socket and threaded joints as per the regulations.
- ▶ All pipes will be painted in red colour as per the standards.
- ▶ The hydrant and sprinkler system will be connected to piping network and will be continuously charged with water at appropriate pressure as per applicable standards.
- ▶ All equipment and items used in firefighting system will conform to relevant codes of practice, standards, rules and regulations applicable.
- ▶ Fire water tank of minimum 2000 cum capacity/ one hour supply will be provided.
- ▶ The tank will be placed overhead/ above ground so that the pumps operate in negative suction and with required level of water even when they are off.

c) Pump room

- ▶ The pumping station will be located near the fire water tank to store adequate volume of water for firefighting as per rules and regulations set by local fire authority and guidelines by NBC.
- ▶ Both the sprinkler system and hydrant system will be fed with common electrically driven pump, backed with a diesel engine driven pump of adequate capacity to maintain required pressure in the pipe line.
- ▶ Electrically driven jockey pump of adequate capacity will be provided in the pumping station, which will be positioned and programmed in such a way that jockey pump starts first in case there is any loss of pressure in the fire pipe line.
- ▶ The pumps will be automatically operated and control panels with required switchgear, logic will be provided to control the pumps.
- ▶ Necessary arrangements for power supply will be done for the fire pumps.
- ▶ The power and control cables used for fire pumps will be fire rated and conforming to relevant applicable standards.

- ▶ The pumps will be placed on adequate foundations/ pedestals with adequate support to the piping.
- ▶ The pump room will be covered with canopy roof in steel structure and pre-coated sheets.
- ▶ All electrical fittings and accessories in pump room will be of weatherproof category IP55.

d) Sprinkler system

- ▶ The sprinkler pendants/ heads provided will be of appropriate category as per the hazard category and water required to extinguish fire. This will be governed by appropriate design standards and regulations of local fire authority.
- ▶ At least one test sprinkler will be provided in each area for periodic testing of the system.
- ▶ The density of sprinklers will be as per applicable regulations.

e) Hydrant system

- ▶ The hydrant system will comprise of ring main and other circuits around all buildings in the campus, thus making it possible to reach to any corner in case of fire.
- ▶ Hydrant system will have hydrant posts at appropriate locations.
- ▶ The hydrant post will have hose reel box with hose reel of appropriate length with nozzle as per applicable regulations.
- ▶ The hydrant posts and the hose reels will be easily accessible.
- ▶ Appropriate valves will be provided on the hydrant posts to operate the hydrant and connect hose reel whenever required.
- ▶ Sufficient valves will be provided in each loop of the hydrant system to enable maintenance of any portion of line without draining the firefighting system and releasing pressure in remaining portion.
- ▶ 4 way valves will be provided at appropriate places allowing connection with external fire tenders mounted on truck.
- ▶ Wet risers will be provided in every staircase of each building with suitable reel drum having rubber hose of adequate length fit with suitable nozzles.
- ▶ The hydrant network pipes will be placed above ground and only the crossings will be underground wherever required.

f) Fire water tank

- ▶ Water tank with adequate capacity will be provided to store water for firefighting purpose.
- ▶ Arrangement will be done in such a way that the water sourced will first be filled in the primary fire water tank and the excess overflow from this tank will be put in to domestic and other water tanks.
- ▶ The tank will be site assembled with FRP or other panels using appropriate technology and will be placed above ground.

15.4.2. Rain water harvesting

- ▶ The campus will be divided in to 4 or 5 areas and the storm water from the roof top of each building in each area will be collected in the specified area.
- ▶ The storm water outlets on building roofs will be checked for adequacy with respect to size considering maximum rainfall intensity in past 100 years.
- ▶ Additional outlets will be provided to the building roof, in case the existing outlets are found to be insufficient.
- ▶ The outlets will be provided with vertical down take pipes, which will be connected to the existing underground storm water lines through nearby chambers.
- ▶ Suitable locations for ground water recharge pit will be identified in each area as mentioned above.
- ▶ Considering geology, ground water tables, applicable rules and regulations and available space, ground water recharge pits with bore holes and pipes will be designed with adequate capacity.
- ▶ The ground water recharge pits will be connected to the storm water line through nearest chamber to fetch storm water (collected on roof) to the pit.
- ▶ Overflow will be provided to the ground water recharge pit at suitable level, to take off excess water back to the storm water network and discharge off.
- ▶ The ground water recharge pits will be protected with fence around to prevent ingress of people, animals etc.
- ▶ Suitable provision will be made to cut off and on the flow to the ground water recharge pits.

15.4.3. Water treatment plant

- ▶ Water treatment plant with 2 types of treatment will be provided on campus;
 - Water softening (1, 50,000 litres/Day).
 - Water purification with suitable RO and UV (25,000 Litres/Day).
- ▶ The water treated with softening plant will be used for general domestic purpose except for drinking.
- ▶ The drinking water will be treated using water purification plant with RO and UV technology.
- ▶ Adequate piping network conforming to applicable rules, regulations and standards will be provided for supply of drinking water at various locations within the facility.
- ▶ The softened water will be supplied through existing water supply network to various locations in the premises.
- ▶ The existing water supply network will be inspected for leakages, damages for appropriate repairing.
- ▶ The equipment provided for water treatment will be standard and approved/ certified by appropriate government bodies certifying such equipment.

- ▶ Arrangements for power connection including laying cables and necessary switch gears at both ends at main supply point and machine point will be provided.
- ▶ Adequate drainage will be provided for regeneration of both treatment plants, while connecting the same to primary and secondary effluent treatment.

15.4.4. Sewage treatment plant

- ▶ Sewage Treatment plant with integral effluent treatment will be provided for primary and secondary treatment with capacity of 60 cum/day.
- ▶ The primary treatment will be through the use of septic tanks of adequate capacity, located at various places near the toilet blocks on campus.
- ▶ The septic tanks will have adequate manholes for cleaning and maintenance purpose and will also have gas vents rising above the highest level of the buildings to avoid foul smell.
- ▶ Overflow outlets of the septic tanks will be connected to secondary treatment achieved through properly designed constructed wet land system with sub-surface flow.
- ▶ The constructed wetland will consist of locally available species of wetland trees, bushes and shrubs.
- ▶ Collection tank of adequate capacity will be provided on the upstream of the constructed wetland to take care of incidental heavy flows.
- ▶ The constructed wetland will be located suitably in the premises allowing adequate sunlight for growth of plants throughout the day.
- ▶ Provision will be made to allow rejection and regeneration discharge from water treatment plant by dissolving high TDS water suitably.
- ▶ Necessary de-odour and chemical dosing will be provided at the end of wetland before the water obtained is reused.
- ▶ All equipment used and the design, arrangement will be in compliance with applicable rules and regulations as laid down by town planning authority, central pollution control board and other local authorities.

15.4.5. Ventilation system

a) Internal buildings

- ▶ The TC premises will have provision for sufficient ventilation. This will be done keeping in view the amount of space in the TC, number of people expected to occupy the space, type and amount of machines/equipment, and overall size of the space. The designing will be done keeping in view proper distribution of air for ventilation throughout all occupied spaces across the TC.
- ▶ Natural ventilation - The premises will have adequate openings, such as doors, windows and/or vent opening to clean environment. Roof vents would be placed wherever applicable

to reduce the reliance on air conditioning systems and also reduce CO₂ emission in the building.

- ▶ Mechanical ventilation – Mechanical parts would be installed to provide air to building occupants at a comfortable temperature and humidity that would be free of harmful concentrations of air pollutants.
- ▶ Provision for adequate supply of outdoor air in the indoor environment will be provided to dilute pollutants released by equipment, building materials, furnishings, products, and people. The building's ventilation system will be properly installed with filters to trap such particles.
- ▶ Air input, smoke exhaust will also be installed and maintained for proper ventilation.
- ▶ Hybrid ventilation systems are popular in industrial buildings which predominantly use natural ventilation along with mechanically driven fans to improve predictability of performance over a wider range of weather conditions. Provisioning of the same will be taken into account wherever applicable during designing the ventilation system.

b) Manufacturing/ Production area

- ▶ Precision machining and QC areas will be provided with central air conditioning.
- ▶ Air quality in production area will be checked for vital parameters such as concentration of CO₂, CO and other relevant gases during operations.
- ▶ In case the parameters above are not acceptable as per relevant standards, adequate capacity fresh air system will be designed and provided for production area to improve quality of air.
- ▶ The fresh air supply system will consist of an external air handling unit of adequate capacity with suitable grade filters on inlet side.
- ▶ The outlet of the air handling unit will be connected with duct system supplying air inside the production area at various places.
- ▶ The fresh air will be discharged in the production area by providing suitable diffusers.

c) UPS room

- ▶ Appropriately designed ventilation system will be provided to the UPS room.
- ▶ The ventilation system will mainly comprise of air conditioning units providing cold air at lower temperature and exhaust system taking out hot air coming out of the UPS.
- ▶ The system will be designed to maintain adequate temperature around the UPS equipment as per manufacturer's requirements/ specifications.
- ▶ Humidity will be controlled to the desired level as directed by the UPS manufacturer by controlling inflow of fresh air.
- ▶ Proper ventilation will be provided to battery racks with adequate number of air changes as per applicable rules and regulations.

16. Key risks and mitigation

The key risks associated with implementation of the project along with possible mitigation measures are summarized in this section. It must be noted that risks universe is dynamic and is likely to change periodically. It is recommended that frequent analysis is carried out and mitigation plans are drawn. Below are risks that may impact this project;

Table 53: Risks & mitigation

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
Project Planning	Risk of inadequate planning of time, effort and resources required to complete the project	▶ Adequate time and cost buffer to be kept to deal with contingencies. ▶ Appointment of CMC for detail design and project management during construction of the TC	✓	✓	✓
Approvals and Clearances	Risk of delay in clearances from local authorities like ▶ Plan Sanction - Town Planning Authority/ Local Body ▶ Commencement Certificate - Town Planning Authority/ Local Body ▶ Fire NOC - Provisional and Occupancy - Local Fire Authority ▶ Plinth Checking Certificate - Town Planning Authority/ Local Body	▶ Appointment of PMC firm. ▶ Timely application of approvals for relevant authorities by CMC ▶ Monitoring of status of Approvals.		✓	

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	▶ Building Completion Certificate - Town Planning Authority/ Local Body ▶ Consent to Establish and Operate - Pollution Control Board ▶ MAP Approval and Factory License - Directorate of Industrial Health and Safety ▶ Labour License - Labour Commissioner ▶ Fuel Storage - Chief Controller of Explosives ▶ Tools, Tackles, Pressure Vessels, Hoists - Competent Engineer ▶ Electrical Systems - Electrical Inspector				
Environmental risk	Loss of top soil	▶ Top soil excavated from the site should be carefully handled. It should be collected separately and stored as a heap which is appropriately covered. The heap should not be put in the direction of wind to avoid dust generation ▶ Maximum effort should be made to utilize the top soil for landscaping within the site	✓		✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	Air pollution due to digging and levelling activities	▶ Water sprinkling shall be practiced ▶ Construction machinery shall be properly maintained to minimize exhaust emissions of CO, SPM and Hydrocarbons ▶ These activities shall be avoided in very high wind and cover should be provided for loose construction material	✓		✓
	Water contamination and health risks associated with setting labour camp for construction	▶ Toilet shall be earmarked for both men and women contractual workers ▶ Adequate drinking facilities shall be provided at the construction site; ▶ Temporary crèche facility may be provided in case of migrant labourers children residing in the camps to ensure safety	✓		✓
	Land and water contamination due to waste generated at site	▶ Waste shall be stored at designated place after segregation on the basis of category (hazardous and non-hazardous) ▶ Hazardous waste shall be disposed of to the authorized vendors only	✓		✓
	Air pollution due to use of D.G set.	▶ D.G set to be optimally used with proper orientation and adequate stack height ▶ Stack monitoring carried out on regular basis	✓		

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
		▶ Proper maintenance of the DG Set should be carried out on regular basis ▶ Acoustic enclosures are to be provided with the D.G sets to minimize the noise levels			
Construction	Delay in construction due to cost overrun, management of building contractors.	▶ Appoint a PMC for a design and build contract for managing construction. ▶ Strict timeline will be made and agreed with PMC. ▶ Regular M&E, Built in mechanism for penalty for delays and incentive for timely completion, ensuring timely payment based on milestones.	✓	✓	
Deviation in project scope	Change in project scope ▶ initiated by MoMSME, ▶ Machinery supplier constraints ▶ Product discontinuation	▶ Clear buy in on project plan and execution planning. ▶ Identification of Machinery suppliers based on the top current suppliers and technology available.	✓	✓	✓
Maintaining World Class Construction quality	Construction quality may not be up to the mark.	▶ Appointment of third party Government quality assurance agency.	✓		✓
On-boarding of Key players	Delay in on boarding of key project stakeholders • Technology Cluster Manager	▶ Clearly defined scope and incentives for stakeholders.		✓	✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	Construction Management Consultant Quality Assurance	Timely contracts with the project stakeholders.			
Procurement of machinery	Delay in procurement of machines and goods due to high Lead time and time taken for clearances	- Machines and equipment chosen should be standard and popular models available in market. Early release of order confirmation and advance if any. - Appointment of efficient and pre-approved Clearing & Handling Agency (CHA) to ensure timely clearances and transportation of machines.		✓	
	Variation in Equipment required and finally procured. Too stringent specs may lead to high price and low competition, loose specs may lead to low price but low quality	Neutral specifications to be drafted based on thorough research on TC requirements and current models available.	✓	✓	
Trained resource availability	Availability of trained manpower for operation of new machines	Machine specific training programmes to be conducted for training of key personnel and knowledge sharing.			✓
Market	- Change in product mix - Change in customer mix - Change in technology - Change in product pricing - Competition from Govt./Public tool rooms	- Expansion of product base. - Increase in customer base. - Develop a backup plan for retiring of obsolete machines.	✓		✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	▶ Lack of cluster development in the target region				
Policy	Change in Government Policy/ Schemes for ▶ Training ▶ key sectors E.g. Change in Government space programme, increase in imports may affect orders from major clients	▶ Increase existing customer base. ▶ Diversify into new sectors.	✓		✓
Taxation	Change in service tax policy on training may adversely affect training revenue	▶ Institute should keep abreast with policy changes and the same should be considered while designing the course and fee structure.	✓		
Human resource	▶ Labour availability ▶ Retention of key employees (Flight of key talented people can make it difficult to achieve centre's growth plans)	▶ Planning for holidays and lean periods. ▶ Good incentive scheme and career development plans.	✓		✓
Management risk	Lack of capable management to run the TC	▶ Leadership training. ▶ Succession planning.			✓
Maintenance risk/ spares - Availability of spares & services	Delay in availability of spares and service support at a reasonable cost	▶ Procure models that are likely to continue for at least next 5 yrs. to ensure better availability of spares and services.	✓		

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
Performance of key stakeholders	Poor performance of Outsourced agencies like TCM and PMC	▶ Establishment of KPIs ▶ Periodic review of performance. Suitable penalty clauses to be added in the ToRs.			✓
Weather	Delay in construction due to monsoon season	▶ Planning for lean periods and periods of low construction activity.	✓	✓	

17. Conclusion

The proposed TC at Patna will focus on General Engineering. The proposed TC will aim to support and strengthen MSMEs and help them improve competitiveness through training, production support and advocacy. Training, Tool manufacturing and consultancy / advisory streams would be the prominent activities to be undertaken by the TC. Besides providing training to students, the TC will also provide support to other training institutions. It shall provide services like curriculum development, initial setup support, certification services and training of trainers to these institutions. The TC will also have a documentation centre which consist of latest publication standards, engineering standards and other technical books. TC shall also support MSME clusters in technology and engineering solutions and for improvement of their quality systems and productivity. The TC will make a concerted effort in reaching out to MSMEs for these works. For improvement in productivity, TC would initiate design clinics, training in lean manufacturing and project based consultancy. The TC would further put greater emphasis to equip itself to provide consultancy services to MSMEs in the field of product design and development, tool design, manufacturing and innovations in process and productivity.

TC will contribute towards skilling youth to make them employable in industry by designing courses relevant to them. The focus areas for the proposed TC are in line with objectives of the program. This will be further be complemented by the proposed initiatives like;

- ▶ TC shall work as a key skill development centre. It shall not only provide advanced training in manufacturing technology but also work as a key facilitator for existing ITIs and polytechnic institutions in the catchment area. It will provide curriculum development support, training for trainers, mentoring to new institutions, and testing and certification services to increase competitiveness of ITIs and Polytechnic institutions.
- ▶ The new TC will take steps to form consortium with MSMEs including TCs to jointly cater to the focus sectors. Once formed, the TC would further formalise and institutionalise the consortium. The TC should provide handholding/ support and special machining & testing facility to members of this consortium and prepare a road map for the next 3-5 years to ensure that these MSME can develop the required expertise and become more competitive.
- ▶ The TC will form Productivity and Quality club for cluster of engineering industry and support them for a period of 12 months in which each cluster club of about 10 MSMEs will be assigned a mentor (Sr. Engineer Production/ Design/ Training and above). The mentor will make periodic visits to the MSMEs. He will plan and handhold in the execution of the plan at the MSMEs so as to have a visible improvement at the end of 12 months period. Membership can be for a nominal fee. Quality club and Productivity club may be formed separate and the KPI of mentors will be decided based on the results achieved by MSME units.

- ▶ The TC aims to introduce welding training workshop that will be equipped with cutting-edge technologies, in use by the industry. This workshop will enable training and up-skilling manpower in the fabrication techniques which would help the PSUs and large manufacturing companies in meeting the requirement of qualified and certified welders for their operations.

All these initiatives of the TC would not only strengthen the expertise of MSMEs in manufacturing but also help to develop a sustainable ecosystem for MSMEs in the region in the long run. On the same line, even investments have been proposed keeping the focus area and adherence to EHS guidelines in mind.

Above all, TCSP program will enable TC to showcase the best practices not only in the adoption of new technologies and skilling the youth but also managing all the associated environmental and social aspects.

[illegible]

18. Annexure

18.1. Minute of stakeholders meetings at Patna

Date	23 February 2018	
Time	1100 - 1300 hrs	
Location	Conference Room - TRTC Patna, extension centre of Jamshedpur	
	Name	Designation/Organization
Chaired By	Ravi Bhushan Prasad Sinha	Joint Director Industry, Directorate of Industries, GOB
State Govt.	Ravi Bhushan Prasad Sinha	Joint Director Industry, Directorate of Industries, GOB
	Sanjay Bhartiya	Vice President, Bihar Industries Association
	Umesh Kumar	GM, DIC Patna
MoMSME	D.K. Singh	Advisor, TRTC Patna (Jamshedpur Extension Centre)
	S. K. Verma	Asst. Director, MSME-DI, Patna
	G.K. Sinha	Asst. Director, MSME-DI Patna
	K.K. Singh	TRTC, Patna
	Vinod Kumar	TRTC, Patna
Others	Amit Mukherji	Secretary General, Bihar Chamber of Commerce & Industries
	Dr. P.C. Padhi	Director & Head, CIPET
	Rama Shankar Singh	Admin. Asst., CIPET
	Rubal Singh	IOCL, Barauni Refinery
	Sri Srivastava	HR Leader, GE Transport
	Dr. Somnath Sarangi	Associate Professor, IIT Patna
	Dr. Rabendra Pd. Singh	Gen. Secretary, Laghu Udyog Bharati, Hajipur Industries Association

	Dinesh Prasad	DICCI, Bihar Chapter, Bhagalpur
	Sujit Kumar	
	Ajay Kumar Sharma	Laghu Udyog Bharati
	Balraj Kapoor	President, Patliputra Industries Association
	Bharat Lal Gupta	Director, Ambe Industrial Enterprises Pvt. Ltd., Patliputra Industrial Estate
	Sunil Kumar	Principal & Chief state Co-ordinator, ATDC Patna
	Shyam Kisna Prasad	Maa Mundeshwari Cycle Udyog Pvt Ltd, Aurangabad
	Rajesh Kumar	Durga Engineering Works, Nalanda
	Sanjeev Kumar Mishra	Campus In charge, Footwear Design & Development Institute (FDDI), Patna
	Om Prakash Rai	Hero Cycles Ltd, Bihta
	Suman Shekhar	Chandra Readymade Garments, Patliputra Industries Limited
EY Personnel	Dinesh Pradhan	Sr. Advisor
	Dr. Milind Mujumdar	Team Leader
	Samrendra Singh	Senior Consultant
	Tashi Singh	Consultant
Agenda	Stakeholder workshop in Patna ▶ Overview of MSME Sector in Patna region ▶ Challenges faced by MSMEs ▶ Potential for full-fledged TC at Patna ▶ Emerging business opportunities for Indian MSME ▶ Overview of ecosystem and the need of MSME players in the region.	

	▶ Up-coming projects and investment related to general engineering in the region
Key Points Discussed	Meeting was chaired by Shri. Ravi Bhushan Prasad Sinha, Joint Director Industry, Directorate of Industries, GOB. Following inputs were given by the members participating in the stakeholder discussion: ▶ There are no iron and steel industries with regard to the TC ▶ One of the focus areas of the Bihar Government is leather and footwear industry. It was suggested that a CFC and a Test Lab be setup to cater to the leather and footwear goods. ▶ It was conveyed that there was unavailability of basic tools and tooling facility required by the footwear industry in the state of Bihar. For Moulds, Die, blasts etc., the units have to visit Agra or Kanpur to meet their requirement even for minor jobs. This leads to increase in cost of production and time wastage. ▶ GE operations in the Marhaura factory would include platform assembly, quality testing etc. The HR Leader further agreed on arranging a meeting with the Sourcing Team to help us further understand the detailed engineering requirements related to skilling/production/testing ▶ Hero Cycles suggested the setting up of a Heat Treatment System facility due to its unavailability across the state. Further for other jobs like spare development, support machinery testing and maintenance it has to be sent to Delhi or Ludhiana. Hence it was suggested to have tooling facility for repair and maintenance purpose. ▶ It was suggested to install reverse engineering facility with high precision to facilitate maintenance jobs/development of new parts for imported machinery in case of wear and tear ▶ Concerns regarding the time taken for job completion were raised with regard to the existing TRTC at Patna facility ▶ It was suggested to provide facilities for custom fabrication(steel or plastics) of spare parts and cast iron foundry setup ▶ A basic 3D printer installation was suggested for custom prototyping and fabrication. Plastic prototype testing will also suffice. ▶ It was recommended to design the TC facility beyond the ITI

	▶ It was also suggested to custom design courses and develop a joint curriculum with GE for its manpower requirement at the new locomotive factory ▶ In order to assist the existing and up-coming food processing plants, it was suggested to have a testing and certification centre in the state. Currently the processing units have to go to Hyderabad in the state of Andhra Pradesh for testing and certification of food/grain/fruit pulp samples ▶ Patna TC facilities can be used for maintenance job at NTPC power plants, IOCL Refineries etc. ▶ It was suggested that the new Patna TC should not duplicate the CIPET Hajipur facility. Further, PMU insisted on visiting CIPET Hajipur campus for a lab visit to avoid duplication during the DPR preparation of new Tool Room at Patna. ▶ It was also conveyed by the Joint Director to have one more seminar during the preparation of DPR wherein views and initial findings of DPR can be discussed with stakeholders.	
Date	▶ 24 February 2018	
Time	▶ 1800 - 1900 hrs	
Location	▶ GE Diesel Locomotive Pvt. Ltd. 404, 4 th Floor, Vasundhara Metro Mall, East Boring Canal Road, Patna, Bihar 800001	
	Name	Designation
GE Transportation	Shankarjyoti Dhar	General Manager, Supply Chain
	Alok Kumar	Site Sourcing Leader
	Sri Prakash Srivastava	HR Leader
Key Points Discussed	▶ The new manufacturing facility at Marhaura (Saran District), 81 km north of state capital Patna is under construction ▶ The operations which will be performed in the facility are: ○ Fabrication ○ Assembly ○ Painting	

	▶ First locomotive roll out planned in October 2018, target of 25 locomotives this year ▶ Since fabrication will be the major operation, the need for skilled manpower for fabrication job was expressed ▶ GE emphasised on urgent need of high quality, immensely trained, 50-60 welders ▶ There is requirement for a Measurement Lab with facility for testing and calibration of instruments which will be used in the facility ▶ Due to lack of vendors in the region, it was suggested to provide solutions for vendor establishment and development ▶ Certified Painters will be required as well for the painting job ▶ GE also expressed interest in communicating any other future requirements which arise eventually, related to engineering jobs and skilling manpower for its locomotive manufacturing facility	
Date	▶ 25 February 2018	
Time	▶ 1200 - 1330 hrs	
Location	▶ CIPET, EPIP Complex, Industrial Area, Hajipur, Bihar 844101	
	Name	Designation
CIPET Hajipur	Dr. P.C. Padhi	Director & Head , CIPET
Key Points Discussed	▶ PMU went for lab visit at CIPET Hajipur campus. Below are the observations. ▶ The institute is spread over an area of 6 acres with hostel capacity of 300 students ▶ The facilities/labs available are: ○ Plastic processing ○ Tool Room ○ Testing Lab (no calibration) ○ Certification ▶ The emphasis of the institute is more on plastic processing training; there is no separate production targets to be met ▶ Around 1500 students are trained annually including both short term and long term courses ▶ The tool and die making section comprised of CNC 5 - axis milling machine, Vertical Machining Centre, CNC Turning Centre, Wire cut EDM, Die sinking EDM machines etc. which were supported by other	

	conventional machines like lathes, milling machines etc. These machines are majorly used for training purposes ▶ It was learnt from the Head of the institute that the Tool room was under-utilised in terms of production jobs. For eg. the CNC 5 axis milling machine was majorly involved in 4-axis jobs and there was limited requirement for 5 axis machining jobs ▶ The CIPET Model is not self-sustaining, it may receive grants from the Central Government ▶ Overall the tool room was used primarily for training purposes due to dearth of industries around the region ▶ The institute does not have a full-fledged incubation centre but it consults new industries, entrepreneurs during their initial start-up phase ▶ The placements of the students is not a problem due to abundance of plastic industries, in fact there is a shortage and hence high demand for skilled manpower ▶ Since there is already an institute for plastics moulding and related jobs, the proposed TC will avoid similar courses/activities and concentrate on Tool & Die making
--	---

18.2. Minute of stakeholders meetings at Patna for DPR validation

Date	02 April 2018	
Time	12:00 - 13:00	
Location	Department of Industries, Government of Bihar, Vikas Bhawan, Patna	
	Name	Designation/Organization
State Government	Dr. S Siddharth	Principal Secretary, Department of industries, Government of Bihar
MoMSME	Ashutosh Kumar	General Manager I/C
	D.K. Singh	Advisor, TRTC Patna (Extension Center of IDTR - Jamshedpur)

EY Personnel	Dr. Milind Mujumdar	Team Leader
	Samrendra Singh	Senior Consultant
	Tashi Singh	Consultant
Agenda	Stakeholder workshop in Patna ▶ Overview of MSME Sector in Patna region ▶ Key requirements/ Challenges of Associations/MSMEs ▶ Manufacturing technologies ▶ Key skills ▶ Current trends ▶ Overview of ecosystem and the need of MSME players in the region. ▶ DPR Validation	
Key Points Discussed	The meeting was held to discuss and validate the Detailed Progress Report prepared for a new full-fledged tool room proposed at Patna. It was informed that the objective of the Department of Industries is to promote economic growth of the state by improving the manufacturing sector. It was conveyed that, since foundry and casting is the first step and the basic requirement for setting up a manufacturing unit, it is integral to train manpower in casting and foundry activities. And once there is abundant availability of local skilled manpower, it will help bridge the skill gap and initiate the establishment of manufacturing units which will in turn drive the economic growth of the state. Bihar being an agrarian economy has immense potential of manufacturing in agricultural implements, motor assembly and other electric based components. Also, raw material is easily accessible from the neighbouring states of Jharkhand and Kolkata. Further the industry has the potential to cater to the demand of the Eastern states in future. Hence, keeping in mind the above stated view, emphases was laid on establishment of a Foundry and casting unit for training manpower in Bihar.	

Date	02 April 2018	
Time	15:00 - 16:30	
Location	TRTC Patna (Extension Centre of IDTR - Jamshedpur)	
	Name	Designation/Organization
MoMSME	D.K. Singh	Advisor, TRTC Patna (Extension Centre of IDTR - Jamshedpur)
	S. K. Verma	Asst. Director, MSME-DI, Patna
	Naveen Kumar	Asst. Director, MSME-DI, Patna
	S.M. Jha	Asst. Director, MSME-DI, Patna
Others	Amit Mukherji	Secretary General, Bihar Chamber of Commerce & Industries
	Arvind Singh	V.P. and Secretary General, Patliputra Industrial Estate, & Bihar Industries Association
	Suman Shekhar	Chandra Readymade Garments, Patliputra Industries Limited
	Anant Kumar	
	Krishna Kumar Singh	
EY Personnel	Dr. Milind Mujumdar	Team Leader
	Samrendra Singh	Senior Consultant
	Tashi Singh	Consultant
Agenda	Stakeholder workshop in Patna ▶ Overview of MSME Sector in Patna region ▶ Key requirements/ Challenges of Associations/MSMEs ▶ Manufacturing technologies ▶ Key skills ▶ Current trends ▶ Emerging business opportunities for Indian MSME	

	▶ Overview of ecosystem and the need of MSME players in the region. ▶ DPR Validation
Key Points Discussed	The meeting was chaired by Shri. D.K. Singh, Advisor TRTC. The above mentioned view of the Department of Industries, emphasising on the importance of setting up a foundry and casting training facility which would produce skilled manpower and serve as an impetus for the growth of the manufacturing sector in the State was shared with the participating members. Following inputs were given by the members participating in the stakeholder discussion: ▶ In line with the objective of Department of Industries of promoting economic growth by establishing manufacturing units, it was suggested that a basic foundry and casting facility for training purposes be set up to skill manpower ▶ It was also suggested to install the following machines in the new TC at Patna: • CNC 5 axis for production • Gear cutting for training purposes • Material Testing Facility • Basic Blow moulding and injection moulding machine for training • Die Casting machine • Software training in ERP, STAAD.Pro and Solidworks

18.3. Social Screening Certificate

ANNEX 3B – ESTABLISHMENT OF NEW TECHNOLOGY CENTRE IN CLEARLY DEMARCATED, PROTECTED AND FUNCTIONING INDUSTRIAL AREA – SOCIAL SCREENING CERTIFICATE

Location and Address of the Technology Centre

NAME OF THE TECHNOLOGY CENTRE	NAME OF THE CLUSTER
Street Address: MSME TECHNOLOGY CENTER & CENTER FOR AGRICULTURE & RURAL TECHNOLOGY, SIKANDARPUR, BIHTA PATNA	Phone: Fax:
Email ID:	Website:

Person-in-charge of Technology Centre

NAME OF PERSON-IN-CHARGE	DESIGNATION
VISHWA MOHAN JHA	DIRECTOR I/C
CONTACT DETAILS Phone:0612-2262186 Fax:06122262719 Mobile:8527885023	Email ID: dedi-patna@dcmsme.gov.in

Name, Location, Address and Details of Industrial Area

NAME OF INDUSTRIAL AREA (e.g.Industrial Growth Centre, Borai)	YEAR OF ESTABLISHMENT
Mauja – Sikandarpur, Bihta	
TOTAL AREA OF LAND (IN ACRES): 299.85	TYPES OF INDUSTRIES (Tick Appropriate Ones) Manufacturing: Service: Energy: Others (Specify) : Educational Institutions

List of Industrial Units Surrounding the Allotted Plot

Sl No	NAME OF INDUSTRIAL UNITS	TYPE OF INDUSTRY
1.	Hero Cycles Ltd.	Bicycle Manufacturing
2.	HPCL	Oil Depot
3.	Ms/ Pinex Ltd.	Iron & Steel (Mini)
4.	IIT	Technical Institution
5.	NSIT	Technical Institution

Details of Plot of Land Allotted:

PLOT/SERIAL NO.	AREA OF LAND (IN ACRES)	DATE OF ALLOTMENT	DATE OF POSSESSION
NAME OF ALLOTING OFFICIAL	NAME OF ALLOTING ORGANIZATION	ALLOTMENT LETTER NUMBER	DATE OF LETTER
Mauja – Sikandarpur, Bihta, Dist. - Patna	Bihar Industrial Area Development Authority (BIADA), Govt. of Bihar	201	16.01.2018

CERTIFICATION

This is to certify that the proposed Technology Centre will be located on a plot of land allotted by a Competent Authority of the State Government and that the plot of land is located within clearly demarcated, protected and functioning Industrial Area and that the allotted land is free from any claims, use and encumbrances.

This is also to certify that copies of the following original documents are attached with this Social Screening Certificate.

1. Site Plan of the Industrial Area with clearly marked allotted plot;
2. Letter of Allotment of Land;
3. Certificate of Handing Over of Land;
4. Certificate of Non-Incumbency

SIGNATURE OF COMPETENT AUTHORITY

Name: - Vishwa Mohan Jha

Designation:- Director I/C

Date:- 14/02/2019

Place: Patna प्रभारी/ **Director I/C**
 भारत सरकार/Govt. of India
 सू.ल.म.उ.वि.सं., पटना/MSME-DI, Patna

Our offices

Ahmedabad

2nd floor, Shivalik Ishaan
Near C.N. Vidhyalaya
Ambawadi
Ahmedabad - 380 015
Tel: + 91 79 6608 3800
Fax: + 91 79 6608 3900

Bengaluru

6th, 12th & 13th floor
“UB City”, Canberra Block
No.24 Vittal Mallya Road
Bengaluru - 560 001
Tel: + 91 80 4027 5000
+ 91 80 6727 5000
+ 91 80 2224 0696
Fax: + 91 80 2210 6000

Ground Floor, ‘A’ wing
Divyasree Chambers
11, O’Shaughnessy Road
Langford Gardens
Bengaluru - 560 025
Tel: +91 80 6727 5000
Fax: +91 80 2222 9914

Chandigarh

1st Floor, SCO: 166-167
Sector 9-C, Madhya Marg
Chandigarh - 160 009
Tel: +91 172 331 7800
Fax: +91 172 331 7888

Chennai

Tidel Park, 6th & 7th Floor
A Block (Module 601,701-702)
No.4, Rajiv Gandhi Salai
Taramani, Chennai - 600 113
Tel: + 91 44 6654 8100
Fax: + 91 44 2254 0120

Delhi NCR

Golf View Corporate Tower B
Sector 42, Sector Road
Gurgaon - 122 002
Tel: + 91 124 464 4000
Fax: + 91 124 464 4050

3rd & 6th Floor, Worldmark-1
IGI Airport Hospitality District
Aerocity, New Delhi - 110 037
Tel: + 91 11 6671 8000
Fax: + 91 11 6671 9999

4th & 5th Floor, Plot No 2B

Hyderabad

Oval Office, 18, iLabs Centre
Hitech City, Madhapur
Hyderabad - 500 081
Tel: + 91 40 6736 2000
Fax: + 91 40 6736 2200

Jamshedpur

1st Floor, Shantiniketan Building
Holding No. 1, SB Shop Area
Bistupur, Jamshedpur – 831 001
Tel: +91 657 663 1000
BSNL: +91 657 223 0441

Kochi

9th Floor, ABAD Nucleus
NH-49, Maradu PO
Kochi - 682 304
Tel: + 91 484 304 4000
Fax: + 91 484 270 5393

Kolkata

22 Camac Street
3rd Floor, Block ‘C’
Kolkata - 700 016
Tel: + 91 33 6615 3400
Fax: + 91 33 2281 7750

Mumbai

14th Floor, The Ruby
29 Senapati Bapat Marg
Dadar (W), Mumbai - 400 028
Tel: + 91 22 6192 0000
Fax: + 91 22 6192 1000

5th Floor, Block B-2
Nirlon Knowledge Park
Off. Western Express Highway
Goregaon (E)
Mumbai - 400 063
Tel: + 91 22 6192 0000
Fax: + 91 22 6192 3000

Pune

C-401, 4th floor
Panchshil Tech Park
Yerwada
(Near Don Bosco School)
Pune - 411 006
Tel: + 91 20 6603 6000
Fax: + 91 20 6601 5900

Ernst & Young LLP

Assurance | Tax | Transactions | Advisory

About EY

EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information about our organization, please visit ey.com.

Ernst & Young LLP is one of the Indian client serving member firms of EYGM Limited. For more information about our organization, please visit www.ey.com/in.

Ernst & Young LLP is a Limited Liability Partnership, registered under the Limited Liability Partnership Act, 2008 in India, having its registered office at 22 Camac Street, 3rd Floor, Block C, Kolkata - 700016

© 2018 Ernst & Young LLP. Published in India.

All Rights Reserved.

ED 0515

This publication contains information in summary form and is therefore intended for general guidance only. It is not intended to be a substitute for detailed research or the exercise of professional judgment. Neither Ernst & Young LLP nor any other member of the global Ernst & Young organization can accept any responsibility for loss occasioned to any person acting or refraining from action as a result of any material in this publication.

Artwork by: JG



EY refers to the global organization, and/or one or more of the independent member firms of Ernst & Young Global Limited