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Technical/Engineering Education Quality Improvement Project III

(Proposed for World Bank Funding)

Environment Management Framework

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National Project Implementation Unit (NPIU)
The Ministry of Human Resource Development (MHRD)

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Abbreviations

AFRC	Admission and Fee Regulatory Council
AICTE	All India Council of Technical Education
AISHE	All India Survey of Higher Education
ATU	Affiliating Technical University
BoG	Board of Governors
CDF	Cumulative Distribution Function
CFI	Centrally Funded Institution
CII	Confederation of Indian Industry
CPA	Chief Project Advisor
CPS	Country Partnership Strategy
CQS	Selection on the Basis of Consultant's Qualification
DC	Direct Contracting
DGS&D	Director General of Supplies & Disposals
DHE	Department of Higher Education
DLI	Disbursement Linked Indicator
DMF	Disclosure Management Framework
EAP	Equity Assurance Plan
EEP	Eligible Expenditures Program
EIRR	Economic Internal Rate of Return
EMF	Environment Management Framework
ERP	Enterprise Resource Planning
FA	Framework Agreement
FBS	Fixed Budget Selection
FICCI	Federation of Indian Chambers of Commerce and Industry
FM	Financial Management
FY	Financial Year
GAAP	Generally Accepted Accounting Principles
GDP	Gross Domestic Product
GoI	Government of India
GPN	General Procurement Notice
GRS	Grievance Redress Service

HR	Human Resources
IBRD	International Bank of Reconstruction and Development
IC	Investment Costs
ICB	International Competitive Bidding
ICT	Information & Communication Technology
IDA	International Development Association
IDP	Institutional Development Plan
IFB	Invitation for Bids
INR	Indian Rupee
IPF	Investment Project Financing
IPR	Intellectual Property Rights
IT	Information Technology
IUFR	Interim Unaudited Financial Reports
IRC	Incremental Recurring Costs
KPI	Key Performance Indicator
LCS	Least Cost Selection
LFP	Labor Force Participation
LIB	Limited International Bidding
LIS	Low Income States
M&E	Monitoring & Evaluation
MHRD	Ministry of Human Resource Development
MIS	Management Information System
MOOC	Massive Open Online Course
MoU	Memorandum of Understanding
NAAC	National Assessment and Accreditation Council
NASSCOM	National Association of Software and Services Companies
NBA	National Board of Accreditation
NCB	National Competitive Bidding
NPV	Net Present Value
NPD	National Project Director
NPIU	National Project Implementation Unit
NSC	National Steering Committee
NSS	National Sample Survey
OBC	Other Backward Castes

PAD	Project Appraisal Document
PDO	Project Development Objective
PG	Postgraduate
PIP	Project Implementation Plan
PMSS	Procurement Management Support System
PSAG	Private Sector Advisory Group
QBS	Quality Based Selection
QCBS	Quality & Cost Based Selection
R&D	Research & Development
RBF	Results Based Financing
REOI	Request for Expression of Interest
RUSA	Rashtriya Uchchatar Shiksha Abhiyan
SBD	Standard Bidding Document
SC	Scheduled Castes
SDR	Special Drawing Rights
SPFU	State Project Facilitation Unit
SRFP	Standard Request for Proposal
SSC	State Steering Committee
SSS	Single Source Selection
ST	Scheduled Tribes
TEQIP	Technical Education Quality Improvement Project
UG	Undergraduate
UGC	University Grants Commission
UN	United Nations
UNDB	United Nations Development Business
US	United States
USD	United States Dollar
UT	Union Territory
WB	The World Bank

Chapter 1

Project Background

1.1 Introduction

India is a lower middle-income country with a Gross Domestic Product (GDP) per capita of US$1,632 (2014 US$). Average GDP grew at 7.9 percent per annum between 2001 and 2011. This growth was driven primarily by engineering-intensive sectors such as information and communication technologies (ICT), construction and manufacturing. The period also saw persistent efforts by the Government of India and donors to decrease poverty levels and improve human development outcomes. From 2005-10, 53 million people were brought out of poverty, under-5 year mortality decreased from 88.1 to 58.6 per 1000 live births, primary school net enrollment increasing from 85.7% to 98.9%, secondary school gross enrollment increased from 78 to 90 percent and the number of students in tertiary education went up to 20 percent.

As of 2015, the Indian economy is poised to become one of the fastest-growing big emerging market economies in the world. GDP growth reached 7.3 percent in 2015 and is predicted to reach 7.5 percent in 2016, against a global average of 3.1 and 3.6 percent per annum respectively. India's growth, especially in the context of the Government's "Make in India" strategy and focus on domestic value addition, is again expected to be driven by engineering-intensive sectors, such as ICT, chemicals, transportation, capital goods and infrastructure.

A serious concern is the low average quality of technical skills among labor market entrants in engineering-intensive sectors in India (World Bank 2010; World Bank 2015). This is worrying because expanding high quality value-added manufacturing and services depends upon a world-class technical workforce being readily available. Further, within the next 15 years, the country will have the largest, and among the youngest, labor forces in the world, with the potential of being unemployed if they do not acquire skills needed by the economy. In addition to low average quality, a fundamental concern is the highly inequitable distribution of skills among labor market entrants, with differences stark across regions, caste and gender. Nearly 50% of India lives in 14 low income/special category states with poverty rates close to 48% — and faces the reality of poor development outcomes. In these states, skill shortages are especially worrying, as they exacerbate the problem of limited industry and investment.

1.2 Sectoral Context

Engineering education in India has grown rapidly in recent years. The intake in undergraduate engineering courses grew at 13.8% annually between 2006-07 and 2013-14. In 2006-07, a little under 7 percent were in engineering courses, while today, 22.8% are enrolled in engineering courses. The growth in engineering education has been part of an overall expansion in technical education, in which

enrolment has grown from under 20% to 48.3% over this period.[1] The private returns to technical education are substantial and significantly higher than the returns to general education (Carnoy et al, 2014). The present value of the incremental earning of technical graduates over senior secondary completers is 280% higher than that of general graduates.

Engineering education in India comes under the purview of the Ministry of Human Resources Development (MHRD) at the national level and Departments of Technical Education at the state level. The organizational structure of engineering education in India revolves around three types of apex bodies: All India Council of Technical Education (AICTE), autonomous national accreditation bodies and affiliating technical universities (ATUs). AICTE is a statutory body mandated to promote the quality of technical education in India through planned and coordinated development, and regulation and maintenance of norms and standards. Quality assurance is done through accreditation by two autonomous bodies under MHRD, the National Board of Accreditation (NBA), which undertakes program-level accreditation, and the National Assessment and Accreditation Council (NAAC), which accredits institutions as a whole.

State-level ATUs affiliate the majority of engineering colleges in India, which can be categorized under three types: government, government-aided and private unaided (henceforth private). The ATUs grant affiliation based upon inspections of technical colleges to ensure they comply with regulatory guidelines. At present, there are 15 ATUs that affiliate a total of 4171 technical colleges (AISHE, 2013-14). The majority of these colleges are engineering colleges, and the majority (84.6%) is private, accounting for 83% of undergraduate intake.[2] ATUs have large-scale reach, serving a number of functions for all their affiliated colleges (government, government-aided and private unaided), including managing admissions and examinations, setting curricula, and granting degrees. Further, 70% of students pursuing a PhD do so through an academic department of the ATU (AISHE 2013-14).

In terms of outcomes, there are three key areas of concern: employability, research and equity. A recent study conducted by FICCI and the World Bank found that employers were not satisfied with the technical skills of recent graduates. This is in line with an earlier FICCI-World Bank study which found high gaps (the difference between the importance of a skill to employers and their satisfaction with the skill) in technical skills.[3] This persistent dissatisfaction indicates the technical education sector's lack of responsiveness to the needs of employers.

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1 In India, technical education covers engineering, technology, management, architecture, town planning, pharmacy, applied arts and crafts, hotel management, and catering technology

2 Lok Sabha Un-starred Question no. 2965 for 30.07.2014 and Un-starred Question No. 3925 for 17.12.2014

3 Andreas Blom and Hiroshi Saeki, 2011. Employability and Skill Set of newly graduated engineers in India.

For a country that aims to be a knowledge superpower, India's technical research output is small. Data from the latest R&D survey[4], conducted in 2010, shows that India had amongst the lowest number of researchers in R&D per million, at 160, versus 890 in China and 710 in Brazil. In 2013-14, 2540 people completed their PhD in engineering in India; in the United States, 8963 people did the same. A number of top-ranked engineering institutes, such as the Indian Institutes of Technology and select colleges funded under TEQIP I and II undertake R&D; however, this is too little and concentrated in too few institutes to meet the needs of the economy. Further, more R&D is important for generating more PhD students to meet the shortage of faculty in engineering.

There are significant inequalities in access to engineering education, particularly across income groups, gender and region. The percentage of those in higher education who are enrolled in engineering courses rises with each quintile of household consumption expenditure, from 13% in the lowest quintile to 28.7% in the highest. Access to engineering education also varies across states. In the seven low income states (LIS)5, 17.2% of those in higher education study engineering courses, against 25.7% in other states. The situation is similar in Special Category States (SCS). Even for those who are able to enroll, the challenge is not over, with specific groups such as students from SC/ST backgrounds and female students having lower transition rates from the first year to the second year, relative to other students, leading to higher dropout rates from students in this category.

Improving these outcomes involves addressing at least four key challenges. First, there is little focus on enhancing learning outcomes; instead the focus is on compliance with input-based norms. The problem is exacerbated by the lack of autonomy in decision-making on academic, managerial, financial and administrative matters. As a result, institutes have limited authority in determining the goals and priorities of their institutes, selecting leaders, faculty appointments, student admissions, the structure and content of programs, financial management, and ultimately, improving student learning. Importantly, the absence of systematic efforts to assess and benchmark the performance of institutes in terms of student learning limits feedback to the system and individual colleges on how and where they need to improve.

The second key challenge relates to faculty vacancies and qualifications. Although the average faculty vacancy rate is low at 13.5% across all AICTE-approved institutes (as of 2014-15), this number is misleading because vacancies are often met by hiring guest lecturers on short-term (less than one year) contracts, creating a lack of stability in faculty and medium-term instituional planning and devleopment is not possible. Institutes located in remote areas are especially disadvantaged as vacancies cannot be filled even by guest lecturers. Faculty vacancy levels typically debar many colleges from getting NBA accreditation. Importantly, faculty morale is often low. There are few opportunities for faculty to collaborate or avail of professional

[4] UNESCO Institute of Statistics Data Centre: Science, Technology and Innovation

[5] Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, and Uttar Pradesh.

development offerings. Field visits suggest that salaries are often not paid on time and promotions can sometimes be delayed by several years.

A third major challenge relates to weak incentives and inadequate resources for research. Private colleges, which form the bulk of the sector, rarely have money to invest in research, and their affiliating universities rarely have provisions or centers to encourage collaboration across institutes. With a few exceptions, industry has generally underinvested in R&D carried out in technical education institutions due to the non-excludable nature of R&D, knowledge spillovers, financial market failures and the inherent risks of the R&D process. With little financial autonomy, faculty and the leadership of government colleges have little motivation to undertake research, since the revenue generated cannot be retained by them. The problem is exacerbated by an overall lack of opportunity for student and faculty exchange across institutes in the country and abroad.

The final challenge relates to the relatively high cost of engineering education and the absence of adequate financial support, good targeting mechanisms or credit markets for loans. The mean total out-of-pocket expenditure for those in a private engineering college is Rs 82,000 ($1262) per year, against a mean of Rs 46,000 ($708) across all higher education institutions. And these figures hold even for low-income states, where 48% of the population is in the poorest two quintiles. Further, access to financial assistance is low, particularly for those enrolled in private engineering colleges.

1.3 Program/Project Over-view

Technical Education Quality Improvement Programme (TEQIP) was envisaged as a long-term programme of about 10-12 years duration to be implemented in 2-3 phases for transformation of the Technical Education System. TEQIP is being implemented with World Bank assistance to improve the quality of technical education system in the country.

As per TEQIP design, each phase is required to be designed on the basis of lessons learnt from the implementation of an earlier phase. TEQIP-I started a reform process in 127 Institutions. The reform process needs to be sustained and scaled-up for embedding gains in the system and taking the transformation to a higher level. To continue the development activities initiated through TEQIP-I, a sequel Project was taken-up as TEQIP-II (currently under implementation).

TEQIP was conceived in pursuance of the National Policy on Education 1986 (Revised in 1992) with a Goal to scale-up and improve quality of technical education and enhance existing capacities of the institutions to become dynamic, demand driven, quality conscious, efficient and forward looking, responsive to rapid economic and technological developments occurring both at national and international levels. The broad objectives of the programme are as follows:

- To create an environment in which Engineering Institutions selected under the programme can achieve their own set of targets for excellence and sustain the same with autonomy and accountability.

- To support development plans including synergistic Networking and Services to Community and economy of competitively selected institutions for achieving higher standards.
- To improve efficiency and effectiveness of the technical education management system in the States and institutions selected under the Programme.

The Government of India-World Bank projects, TEQIP I and TEQIP II, have attempted to address these problems in a number of ways. Specific achievements include: (1) improving quality by helping institutes become autonomous and obtain accreditation; (2) Boards of Governors in colleges that help institutes balance autonomy and accountability; (3) building a performance culture where institutes receive additional funds based upon performance against a series of benchmarks that are updates every six months; (4) improvement in transition rates across all categories of students; (5) doubling of student placement activities; and (6) improved research outputs — between 2009-10 and 2014-15, the number of publications in refereed journals in engineering fileds almost doubled from 7032 to 13929 in TEQIP II institutions.[6]

TEQIP I: TEQIP (Phase-I) was implemented in 13 States and covered 127 Institutions including 18 Centrally Funded Institutions and 19 Polytechnics. It became effective in March 2003 and completed on 31st March, 2009.

TEQIP (Phase-II): Building upon the satisfactory completion of the first phase of TEQIP, its second phase (TEQIP-II) has been initiated. Around 200 engineering institutions were competitively selected to improve quality of Technical Education through institutional and systemic reforms. The second phase boosts efforts to prepare more post-graduate students to reduce the shortage of qualified faculty, and to produce more R&D in collaboration with industry.

TEQIP III: Proposed now, building upon the systems and reforms initiated under the first two phases, with specific focus on LIS.

1.3 TEQIP III

The success of TEQIP I and II has established the World Bank's role in supporting ambitious reform-driven projects in technical education in India. The Bank's engagement in TEQIP I and TEQIP II has also helped it build key networks, within project institutions as well as top-ranking Indian engineering and management institutions, which have been leveraged to initiate a range of quality and governance improvement efforts within project institutions. These networks are expected to play an important role in both helping TEQIP III achieve its objectives, and sustaining the reforms undertaken under the TEQIP series. The Bank will continue to incorporate lessons from projects in other parts of the world.

6 Recently, the Government of India launched a centrally sponsored scheme, RUSA, to cover all of higher education, including technical education which is modelled on many of the reforms piloted in TEQIP I and II. The scheme, however, does not cover private colleges and is yet to be fully operationalized.

India's 12th Five Year Plan (2012-17), based on the pillars of faster, sustainable, and inclusive growth, emphasizes increasing the supply of highly-skilled workers to drive the economy, as well as helping low-income states catch up with their more advanced neighbors. TEQIP III supports the CPS for 2013-17, specifically, the engagement areas relating to integration and inclusion.

Both engagement areas foresee an increase in high quality workers to drive and sustain economic growth in India. Further, TEQIP III will include efforts focused on improving technical education in low-income states (LIS). The project is consistent with India's 12th Five Year Plan, based on the pillars of faster, sustainable, and inclusive growth, which emphasizes increasing the supply of highly-skilled workers to drive the economy, as well as helping low-income states catch up with their more advanced neighbors.

1.4 Project Development Objective

The proposed Project Development Objective is "to improve quality and equity in selected engineering education institutions and increase the effectiveness of the engineering education system."

1.5 Project Components

The Project will support three components: (1) Improving quality and equity in engineering education in low-income and special category states; (2) System-level initiatives to strengthen sector governance and performance; and (3) Sustaining excellence in engineering education and widening impact through competitively-selected institutes in non-LIS/SCS.

Component 1: Improving quality and equity in low-income and special category states

This component will focus on improving quality and equity in engineering education in all government and government-aided colleges and technical universities, including ATUs, in seven low-income states (LIS), six special category states in the North-East of India (SCS), and Andaman and Nicobar Islands (a union territory (UT)). The LIS states, as agreed with DEA, are: Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, and Uttar Pradesh (LIS). These states have been chosen because they face multiple institutional and system-level challenges.

Improvement in the functioning of these entities is expected to enhance quality and equity in project institutes, and have a multiplier effect by providing opportunities for progress to non-project engineering institutes interested in quality and equity gains. Ultimately, these gains are expected to translate into benefits in student learning outcomes and employability, both of which will be tracked in the project.

Sub-component 1.1: Institutional Development Grants to Government and Government-aided Institutes

Approximately 70 government and government-aided colleges, new National Institutes of Technology (NIT) and technical universities (non-affiliating) in Component 1 will receive funds in two cycles, based upon whether enabling mechanisms required for project success are in place. These mechanisms are: (1) At least one batch of BTech students should have graduated with at least 50 percent of students clearing the final exams; (2) at least 50% of sanctioned faculty positions filled with permanent faculty; (3) permanent Principal appointed, with at most one additional charge consuming no more than two business days per month; (4) at least three branches of programs offered; (5) Board of Governors as per UGC norms (or AICTE norms if college is non-autonomous); (6) authority from the relevant state government to retain and use Internal Revenue Generation funds; and (7) agreement to implement the reforms as stated in the PIP. Institutes with these mechanisms in place will receive project funds in Cycle 1 as determined by their plans for improvement articulated in Institutional Development Plans (IDP). The ultimate goal of these plans should be either improving the learning outcomes and employability of undergraduates and/or the research pursued under post-graduate programs. Each institute will receive specialized support from NPIU, SPFU and mentors in framing their IDPs, which will resemble NBA's self-assessment reports, asking institutes to specify key needs, activities, timeline for activities and measures of success. All IDPs will be based upon iterative consultations with a wide range of stakeholders, including faculty, institute administrators, students, parents and industry. Autonomous colleges under this sub-component will receive INR 10 crores, and non-autonomous colleges will receive INR 8.5 crores (which will be increased to INR 10 crores if they attain autonomy).

Activities under this sub-component will focus on addressing fundamental system-level challenges. First, the sub-component will promote the recruitment and retention of competent faculty. It will support states in filling sanctioned posts through hiring of faculty as per AICTE norms on qualifications and pay, by partially funding the cost of such faculty during the project period. Such funding will be based on an understanding with state governments that well-performing faculty hired using project funds will be retained post project, all else unchanged, and any of these faculty retained in the final year of the project will be paid exclusively from state funds. Second, the project will fund refurbishment and minor civil works up to a maximum of 60 percent of an institute's basic fund allocation. Additionally, government and government-aided institutes are expected to undertake the following activities: Faculty and staff training; investing in cutting-edge hardware and software; increasing capacity for postgraduate education; establishing teaching and research programs in cutting-edge technology areas; improving non-cognitive skills of students; improving transition rates of all categories of students; student career counselling and placement; increasing interaction with industry, sponsored research, consultancy and other revenue generating activities; instituting academic reforms including program flexibility; joint publications, researches and consultancies; and establishing a mentoring system based upon a head mentor for the state and

institute-level mentors as well as linkages with a mentor institute. The mentor institute could be within-state or out-of-state, depending on the priorities and preferences of the mentee institute. For instance, if the mentee institute has already established a relationship with an IIT, then the project will encourage such partnerships.

Cycle 2 institutes will receive "seed persons" and non-financial assistance from MHRD to motivate and facilitate these institutes to achieve the above-mentioned enabling mechanisms in addition to seed money. Seed persons are expert mentors who can work with the state government and the colleges to identify a path to achieving the enabling mechanisms, and to help with the preparation of the IDPs. Institutes that have built the seven enabling mechanisms listed above by October 2018 will receive project funds to be used in accordance with their IDPs. The activities to be funded under the IDPs will be the same as for Cycle 1 institutes. Institutions which do not meet the enabling conditions by October 2018 will not receive any money under the project. In addition, seed money will be used for specific activities as specified in the PIP with the objective of motivating faculty and students to work toward improvement of their institute, and to provide some immediate support to students' learning. These will include: training of staff in financial management and procurement processes; campus Wi-Fi; e-library; campus environment plan and smart classrooms. These funds will be managed by MHRD/NPIU.

Colleges under Sub-component 1.1 will receive focused mentorship support at several levels. First, high-performing TEQIP mentors, as identified in TEQIP I and II and/or proposed by AICTE or NBA, with experience in state engineering colleges, will be appointed to advise individual state engineering colleges. In each state, a well-reputed academic nominee will serve as lead mentor for the state and coordinate the work of the other mentors in the state. Lead mentors will also guide the SPFU and Departments of Technical Education in LIS and SCS. Engagements with mentors will entail 3-4 days visits at least 4 times a year and frequent conversations through phone call, video conferences including Skype. A brief summary of the conclusions and actions proposed by the mentors will be shared with the college after each of the visits (and a copy sent to the NPIU). With regard to institutional mentorship activities, Component 2 colleges, especially those that have participated in previous phases of TEQIP, will also be expected to provide institutional mentorship to one college in LIS and SCS. The institutional partnership activities would be determined mutually between the two institutions but could entail faculty and student exchange, joint conferences, and management coaching with close contacts between the members of the two BoGs, the two principals, and the deans.

Sub-component 1.1 colleges will be encouraged to develop themselves through performance-linked funding throughout the project period. Institutions will get a small initial amount and additional resources, based upon their efforts and performance. All institutes will sign MOUs which will set out annual (or semi-annual) performance benchmarks to be met, in order for funding to be released. A number of benchmarks will be common to all institutions, while some are expected to be based on each institution's baselines. Common benchmarks could include: (1) achieve autonomy from UGC within specified time; (2) Increase in % of programs with 2-year

and 5-year accreditation from NBA; (3) faculty vacancy rate reduction; (4) increase in % of faculty with PhDs; (5) timeliness of states' releases. Additional resources will be available for well-performing institutions, while poorly-performing institutions will be mentored intensively, but receive reduced funding from the project if they fail to make serious efforts to improve.

Sub-component 1.2: Widening Impact through ATUs in LIS and SCS

Component 1.2 will provide financial support to 5-7 ATUs in LIS and SCS. ATUs in India have the advantage of reaching hundreds of engineering colleges in their jurisdiction, but they also suffer from the following challenges: (1) unsustainable organizational structure with large numbers of colleges affiliated to one university; (2) ad hoc and inadequate staff and faculty; (3) loose regulatory system governing the opening of new colleges, with AICTE shifting the burden of visits to ATUs; and (4) complex governance structure; multiple controls (including non-academic and political) with unclear stakeholder relationships. These problems are especially acute in LIS and SCS ATUs. In Abdul J Kalam Technical University in Uttar Pradesh, for instance, there are only three permanent faculty, while over 800 technical colleges are affiliated to it. In contrast, Visvesvaraya Technological University in Karnataka, has nearly 100 permanent faculty, and approximately 400 technical colleges affiliated to it.

This sub-component will pilot reforms with ATUs in the following areas to address the above challenges: academic reforms; learning assessment and examination reforms; student placement; and improving data management and administration. Project ATUs are expected to assist all affiliated colleges through opportunities for accessing modern teaching and research facilities (access to IT-facilities, e-learning courses and laboratories). For instance, ATUs could administer merit-based research grants for faculty and students that encourages interdisciplinary and inter-collegial/departmental collaborations. The goal of these pilot interventions will be to demonstrate mechanisms through which ATUs can improve the performance of all the colleges affiliated to them — government, government-aided and private unaided — and thereby catalyze profound changes in the engineering education system. This will benefit a much larger number of students and prospective labor market entrants than possible through direct funding of colleges.

ATUs will participate in the project based upon certain enabling mechanisms being in place. These include: (1) permanent Vice-Chancellor, Registrar and Head of Examinations appointed, with minor additional charge (at most two business days per month); (2) at least 50% of sanctioned faculty positions filled with permanent faculty; (3) audit reports completed for past five years, with observations responded to; and (4) statutes permitting the ATU to grant autonomy following application by a college to UGC (and administrative procedures in place). All project ATUs will contribute matching funds (equal to the project contribution) and prepare an Action Plan, to be evaluated by the National Steering Committee.

ATUs will sign MOUs which will set out annual (or semi-annual) performance benchmarks to be met, in order for funding to be released. Some benchmarks will be common to all ATUs; some based on ATUs' baselines. Common benchmarks are expected to include: (1) Accreditation from NAAC with at least B grade; (2) Faculty vacancy rate reduction; (3) Timeliness of declaring examination results; (4) Publication of comparative statistics on college performance; (5) Increase in number of autonomous colleges; (6) Measure of teaching skills of faculty; (7) Examination reform; and (8) timeliness of States' releases also a benchmark to be met. Additional resources will be available for well-performing institutions.

Technical assistance will be available to the respective Departments of Technical Education and State Project Facilitation Units (SPFU) to build their capacity to support institutional development and technical education reform in institutes and at the state level. Commitment from the state finance department, technical education department and ATU will be sought through a state-level steering committee with representatives from these bodies and the lead mentor. Technical assistance will also include technical assistance to 2-3 AFRCs to design and implement outcome-focused formulas for determining the fees charged by private colleges and designing systems for making all deliberations on the issue transparent. AICTE will provide mentorship support to all colleges in SCS that are in the North East, given its experience implementing the North East Quality Improvement Program (NEQIP).

Component 2: System-level initiatives to strengthen sector governance and performance

This component will provide technical assistance to MHRD and key apex bodies in engineering education, including AICTE and NBA, to strengthen the overall system of engineering education. Technical assistance to MHRD will include designing an assessment system to track student learning at different points of the undergraduate program. The assessment system will track key academic skills in engineering, such as proficiency in mathematics, physics and computer science, as well as higher order thinking skills. Higher order thinking skills such as critical thinking are believed to play a central role in logical thinking, decision making, and problem solving. The skills to be tested could include the ability to (a) evaluate evidence and its use; (b) analyze and evaluate arguments; (c) understand implications and consequences; (d) develop sound and valid arguments; and (e) understand causation and explanation. In addition to this, students' non-cognitive and behavioural skills will also be tracked. These assessments of students will be supplemented by surveys of students, faculty and administrators to gain deeper insight into how institutes address specific problems related to student learning. All assessments will be designed to provide feedback to institutes on how and where to improve, without putting undue pressure on students.

This Component will also provide technical assistance to AICTE to: undertake tasks to mentor colleges, especially in the North East; design MOOCs for faculty and students; create benchmarks for institutes; promote industry collaboration in research and placement; and streamline data management across all institutes. With benchmarks, AICTE can define what well-performing, high functioning institutions

look like, and do it for different types of institutions. In India, though there are different types of institutions (colleges, universities, deemed universities, affiliating institutions, institutions of national importance, etc), there are not different standards for each. It is important to recognize that not all institutions will have the same goals, and that there is a need for different types of institutions for different types of students and labor market needs. If AICTE can develop graded descriptions for each type of "ideal" institution, then those who wish to achieve more can do something about it, rather than just being told that they have a specific ranking or rating and feeling powerless to change it. Regarding streamlining data management, AICTE's e-governance cell will lead an effort to harmonize the definition of key variables tracked by AICTE, the All India Survey of Higher Education (AISHE), NBA and TEQIP. This activity will include: establishing common data definitions and protocols for verification; and designing a common platform for uploading and downloading data on engineering colleges for both restricted use and public use purposes, without having to burden individual institutes with data requests.

Technical assistance will also be available to NBA to help strengthen its analytical and institutional capacity, and thereby use planning, information and data to manage the organization in a more efficient way. One proposal would be to work on an institutional plan for NBA with vision, goals and targets. Another proposal would be to develop a much more user friendly and transparent database for the accredited engineering institutions. Currently it is very cumbersome to find easily accessible statistics on the current accreditation status of institutions and there are no aggregated and trend data on engineering program accreditation. NBA is also expected to have an important role in supporting engineering institutes in LIS and SCS to embark on the process of obtaining accreditation through targeted capacity building initiatives. Finally, technical assistance will be available for activities undertaken with the Indian Institutes of Technology and Indian Institutes of Management to improve the quality of teaching, learning and management in all project institutes, with a special strategy for LIS and SCS.

Finally, this component will seek to build the capacity of technical education policy planners, administrators and implementers at the central, state, and institutional levels. In particular, capacity building is intended to support the effective implementation of reforms required in the Components 1 and 3, innovative management initiatives in States, and knowledge sharing workshops between TEQIP institutions and non-TEQIP institutions.

Additionally, the sub-component will build systems to provide reasonable timely, sufficient, precise, and reliable information to improve and assess the performance of the selected institutions. The information would allow institutions, state directorates, MHRD, and the National Project Implementation Unit (NPIU) for TEQIP to improve evidence-based policymaking and administration. Five activities are planned: (i) Web-based ERP/Management Information System (MIS); (ii) stakeholder surveys and studies, such as students, faculty and employers; (iii) technical audits; (iv) project support and review mechanisms, and (v) project management.

Component 3: Sustaining excellence in engineering education and widening impact through competitively selected institutes in non-LIS/SCS

This Component will provide grants to support around 200 competitively selected state government and government-aided engineering institutes. This component builds on the positive experience of this approach under the TEQIP I and II projects.

Sub-component 3.1: Incubating, Sustaining and Spreading Excellence through Competitively-selected Government and Government-aided Institutes

As in Sub-component 1.1, the grants will be provided to enable institutions to meet the objectives set out in the institution's IDP, with the ultimate goal of either improving the learning outcomes and employability of undergraduates and/or the research pursued under post-graduate programs. In so doing, IDPs will be expected to contain a detailed outline of how the institute plans to (a) incubate innovations; (b) strengthen and sustain well-performing activities; and (c) mentor other colleges, especially in the LIS and SCS. Within this broad framework, institutions will have the flexibility to decide the inputs they require to meet their expected outcomes, subject to a short list of prescribed items (such as faculty salaries) and prescribed limits on civil works construction.

Each institution receiving a grant will sign a Memorandum of Understanding (MOU) with MHRD and the respective state government. This MOU will set out the expected outcomes, some indicators for which will be included in the MOUs of all institutions (though the baselines and targets will vary) and some indicators which will be specific to each institution. For example, common indicators might be progress towards accrediting all courses, enhancing faculty qualifications, and improving transition and employment rates of students. Institution-specific indicators might be increasing the number of PhDs in a particular department, creating a Centre of Excellence in a multi-disciplinary topic area, building smart classrooms, publishing academic papers, or establishing a wifi-campus with 24/7 broadband connectivity.

Autonomous colleges under this component will receive INR 12.5 crores, and non-autonomous colleges will receive INR 10 crores (which will be increased to INR 12.5 crores if they attain autonomy). Financial releases to institutions will be based on performance against the indicators mentioned above. While all institutions will be given an indicative amount of their grant so they may develop a realistic IDP (2 crores, equivalent to $150,000), further releases will depend only upon satisfactory performance against the pre-agreed indicators. Depending on the availability of overall funding under the project, it will also be possible for some institutions to receive more than 12.5 crores should their performance be sufficiently high.

The main steps for the selection of institutions will be as follows:

1. Request to participate from institutions, with written evidence of meeting the eligibility criteria. The respective states will prepare a list of those institutions which have applied and have met the eligibility criteria and publish it on its website. Eligibility criteria will be both at the level of the institution (for example, have academic autonomy from the University Grants Commission, have a

minimum percentage of faculty positions filled, have a full-time Principal, and have a functioning Board of Governors) and at the level of the State Government (for example, delegated sufficient administrative and financial autonomy to colleges through an executive order and appointed an academic as Chair of each institution's Board of Governors). These eligibility criteria must be met for the duration of the Project.

2. Preparation of Institutional Development Plans (IDPs) by eligible institutions, using a prescribed format. IDPs will need to be approved by an institution's Board of Governors and supported by the relevant State Government.

3. Evaluation of IDPs and selection of the best proposals by a national panel of experts, endorsed by the National Steering Committee. IDPs will be evaluated for how well they articulate a plan of action to meet the institute's objectives within the framework of (i) incubating innovations; (ii) strengthening and sustaining excellence; and (iii) mentoring.

4. Agreement of performance indicators with selected institutions and signing of MOUs.

There are expected to be two rounds of applications. The first round will consist of those institutions currently under TEQIP II, which have performed satisfactorily in the three rounds of benchmarking prior to project closure. The second round will consist of all remaining institutions. This will ensure that the reforms undertaken and the capacity built in TEQIP II can be utilized and extended under TEQIP III. It is also expected that TEQIP II institutions will be able to complete the application process without additional capacity support for preparing IDPs. Approximately 100 institutions are expected to be taken in each round. The second round is expected to be completed within one year of the first round. Only institutions which are not in low-income states will be eligible to participate in this component.

As noted above, institutions will have the flexibility to determine what activities they judge most effective in pursuing their stated objectives, with the ultimate goal of either improving the learning outcomes and employability of undergraduates and/or the research pursued under post-graduate programs. Based on the experience of TEQIP I and II, it is expected that the following types of activities will be undertaken (though, again, not every institution will undertake every activity): revise the curriculum of one or more courses in collaboration with industry to enhance their relevance to the labor market, support student internships and projects with industry, support faculty development through short-term, subject-based and pedagogy training programs and upgrading qualifications, acquiring new learning materials and equipment, remedial courses, coaching on employability skills, patenting and other IPR related costs, costs for faculty and students participating in national and international conferences, minor civil works, and student and faculty exchange programs.

All decisions related to implementation of the activities will rest with an institution's BoGs, subject to any requirements set out in the Procurement and Financial Management Manual or the Project Implementation Plan. Any government rules or order related to the enhanced academic, administrative and financial autonomy of an

institution will apply to all the activities of a given institution, not just to those activities funded under the Project.

All institutions will be required to put aside at least [8] percent of their revenue into a Sustainability Fund, which will be used by the institutions after the project closes. Unlike TEQIP II, no Centrally-Funded Institutions (i.e., those funded directly by the Ministry of Human Resource Development, such as National Institutes for Technology) will be included in this Component. Also unlike TEQIP II, there is only one window, though the activities covered under the one window include all those which were covered under Components 1.1 and 1.2 in TEQIP II (including the Centres of Excellence).

Sub-component 3.2: Widening Impact through ATUs in non-LIS

Approximately 2-3 eligible ATUs will be competitively chosen from non-LIS states, based upon Action Plans which will be evaluated by the National Steering Committee. The academic activities supported by the Action Plans will include closely mentoring 10-20 colleges, thereby encouraging the growth of good-performers. Additionally, academic activities for all colleges will include: promoting applications for autonomy from UGC and accreditation (NAAC, NBA); help colleges design/review curriculum + exams; faculty development; build strong leadership teams; industry linkage through career counseling, placement and research; entrepreneurship development; research hubs; short-term courses/diplomas; preparation of massive open online courses (also referred to as MOOCs), facilitating access of institutions to MOOCs, and developing credit-based systems such that students in colleges could use select e-learning courses as part of their degree programs); and greater access to digital resources.

Activities aimed to improve administration in the ATU and affiliated colleges will also be supported. These include: establishing/improving ERP/management information system for student, staff and faculty data; improving financial management and procurement; a modern HR system for efficient personnel management; and improving institutional governance

Importantly, India has begun to participate in the Washington Accord, by which countries agree equivalences of engineering degrees. Currently, only IITs and NITs and a small number of other engineering colleges are part of this Accord, but GOI would like more institutions to be able to participate and be able to compare themselves with other countries. Given this, ATUs selected under this sub-component will be expected to pilot reforms in assessment of student learning outcomes as described in Component 2.

1.6 Project Financing

The project will use an investment project financing (IPF) lending instrument using a results based financing (RBF) modality. Funding for components 1 and 3 will be results-based, and project funds would be disbursed against an eligible expenditure program (EEP) (up to a capped amount and against achievement of agreed DLIs) under selected line items in MHRD's annual budget. Component 2 would use an IPF approach with direct reimbursement of project expenditures.

Total project costs are estimated to be US$600m, of which IBRD will finance US$300 million.

Project Components	Project cost US$m	IBRD Financing US$m	% Financing
Improving quality and equity in low-income and special category states	110	55	**50**
System-level initiatives to strengthen sector governance and performance	33	17	**50**
Sustaining excellence and widening impact through competitively-selected colleges	457	228	**50**
Total	**600**	**300**	**50**

1.7 Project Beneficiaries

Project activities will benefit undergraduate and post-graduate students and faculty associated with the ATUs and their affiliated colleges as well as colleges funded directly under the project. At baseline, approximately 2,507,949 under graduate students are expected to be enrolled, of which 30% is likely to be female and 15% from SC/ST/OBC groups. By project closing, approximately, 14,550,901 UG students are expected to have been covered, of which 35%% is likely to be female and 20% from SC/ST/OBC groups. At baseline, approximately 363,789 post graduate students are expected to be enrolled, of which 30% is likely to be female and 15% from SC/ST/OBC groups. By project closing, approximately, 2110,672 PG students are expected to have been covered, of which 35% is likely to be female and 20% from SC/ST groups. At baseline, approximately 255,174 faculty are expected to be employed of which 30% is likely to be female and 6.7% from SC/ST/OBC groups. By project closing, approximately, 1,354,494 faculty are expected to have been covered, of which 35%% is likely to be female and 20% from SC/ST/OBC groups.[7]

7 These estimates are based upon 5 ATUs and 200 affiliated colleges (40% of institutions are assumed to be LIS, and the ATUs chosen for the LIS are UPTU and RGPV). All the data is from AISHE, except percentage of females and SC/ST in UG and PG, which is from the NSS 71st round.

Chapter 2

Need for Environmental Management Framework

2.1 Limited EA / Diagnostic Review

A Diagnostic Review or Limited Environment Assessment (EA) study was conducted and completed in November 2015. This exercise was intended towards facilitating GoI in overcoming some of the challenges/deficiencies with regard to environment, health and safety aspects in Technical/Engineering Education Institutes in an incremental manner (building on efforts from TEQIP I and II, also World Bank Funded Project supporting similar institutions at the national level - currently the second project is under implementation) and in introducing/implementing the concept of 'greener T/E institutes'.

This section describes the approach and methodology used for carrying out the Diagnostic Review (also referred to as the Limited Environment Assessment) for the project:

2.1.1 Approach Used

The Diagnostic Review/limited EA and the recommendations to strengthen the environmental performance of TEQIP as a program were solely driven by the objective of creating and maintaining safe, clean and sustainable surroundings in institutes, which has been recognized as a basic pre-requisite for creating an appropriate learning environment.

Accordingly, the methodology to achieve this goal involved the following:

(a) Study and review of secondary data/information related to environment, health and safety provisions/aspects.

(b) Review of the nature and extent of compliance of requirements/norms related to environment, health and safety aspects in T/E institutes.

(c) Identification of good practices, strengths, deficiencies and gaps in the existing system/s with regard to planning, implementation, enforcement and monitoring of environment, health and safety aspects in T/E institutes.

(d) Providing recommendations to help improve/strengthen the environmental performance of the programme.

2.1.2 Parameters Assessed

The review and assessment included, but was not limited to the following aspects:

a. Siting/location

b. Planning and Lay-out of the campus (including orientation of building/s; internal circulation arrangements)

c. Structural safety aspects (application and adherence to building codes; condition of buildings)

d. Building Design (building plan; space for various activities; materials used)

e. Class room design (space availability; natural light and ventilation; display arrangements)

f. Measures for Disaster Risk Management

g. Facilities for Physically Challenged

h. Water management (source)

i. Drinking water arrangements

j. Drainage arrangements

k. Sanitation arrangements and its condition

l. Energy (availability, usage and efficiency measures, if any)

m. Waste management (collection and disposal arrangements)

n. Exposure to pollution particularly dust, contaminated water and noise.

o. Fire and Electrical Safety Practices

p. Over-all operation and maintenance aspects (housekeeping; cleanliness and hygiene in the campus)

2.1.3 Methodology Adopted

1. Review of Secondary Data/Information

The environment, health and safety related information has been collated from available/provided by the Ministry of Human Resource Development. The review provided necessary insights on various environmental management measures that have been ingrained to provide a safe, healthy and environmentally sustainable institute.

The findings from the documentation review provided the foundation for diagnostic assessment study. Attempts have been made to cover the various stages associated with planning, design, construction and maintenance of T/E institutes. The key documents reviewed include the following:

- All India Council for Technical Education (AICTE)
- RUSA Framework
- AICTE Reports
- Minutes of the Joint Review Mission Meetings – TEQIP II

While documents such as AICTE and RUSA Framework gave information on the program requirements to make a technical institute environmentally sustainable and make it contribute towards the overall learning experience of the students, other documents such JRM minutes provided insights into the achievement and challenges that the states have faced during implementation, particularly with regard to infrastructure gaps, construction and operation of institutes.

The review focused mainly on how effectively environmental management has been integrated in the over-all program and sub-project level execution. It also tried to identify good practices and challenges faced within the State in implementing the EHS requirements of the program.

2. Meetings with Key Stakeholders

Discussions with key stakeholders were held at the State and College level. The discussions were mainly aimed to seek feedback and assess the implementation issues in terms of site selection, building design, execution, quality of work, institutional support and other such issues faced by the different stakeholders.

The discussion at the state/institute level provided a better sense on the implementation challenges of the program/project. On the other hand, discussions with students and faculty helped in understanding their perception of the over-all situation on the ground.

3. Site Visits to Selected Colleges/Institutes

On the basis of information collected and reviewed in the secondary form, specific aspects were reviewed on the ground. For this, site visits to selected TEQIP II institutes were made. The specific parameters that were reviewed include:

- Type of program intervention/s (i.e. new block, major repair, additional room construction, construction of other facilities etc.)
- Overall campus planning
- Building plan and design
- Site Selection
- Condition of the building/s (based on visual observations only)
- Use of cost effectiveness technologies/construction materials
- Overall finishing and detailing (in case of completed building)
- Provisions for CWSN
- Drinking water facility
- Sanitation facility
- Hygiene (in/around drinking water source, kitchen, grain storage room and sanitation facilities)
- Safety (boundary walls; railing/s, where needed)
- Electricity (connection, availability)
- O&M practices (including budget/fund availability)
- Monitoring mechanism/s

The above parameters helped in identification of key environmental concerns that can/need to be addressed in an institute to create a good environment that will be inviting and appealing to students and help avoid/reduce exposure to health and safety issues.

2.2 Need for an Environment Management Framework

The very achievement of the programme/project objectives, particularly indicators related to access and equity, depends directly on the provision of safe, clean and sustainable surroundings in education institutes to create conducive learning and teaching environment.

It is envisaged that there will be gradation/modernization/refurbishment of facilities of the educational institutions/colleges, as part of **Component 3** activities, under the project. The Planning, development and management for the up-gradation /modernization/refurbishment of educational institutions/colleges will involve fulfilment of some important environmental obligations and requirements.

Good environmental management practices are essential and integral elements of sound project preparation and implementation and therefore, an Environment Management tool would be needed for preventing or overcoming environmental issues encountered during the various stages of project – from planning, design, construction and operation. Such a tool should be prepared with an intention to strengthen the intended outcomes from the proposed project.

2.2.1 Objectives of EMF

The key objectives of the EMF are to:

- Provide a framework for integration of environmental aspects at all stages of project planning, design, execution and operation.
- Enhance positive environmental impacts of the project and avoid/minimize potential adverse impacts.
- Make environment options available to stakeholders to foster environmental actions, as needed in specific context/situations.

2.2.2 Structure of Environmental Management Framework

The EMF addresses environmental concerns through the appropriate application of process requirements, allocation of resources, assignment of responsibility and continuous evaluation of practices/procedures to facilitate continual improvement of the system. The framework describes the principles, objectives and approach to be followed for selecting, avoiding, minimizing and/or mitigating the adverse environmental impacts that are likely to arise due to the project. It outlines the indicative management measures required to effectively address or deal with the key issues that have been identified. The framework also details out the various policies, guidelines and procedures that need to be integrated during the planning, design and implementation cycle of the Bank-funded project.

The contents of the report have been structured into the following chapters:

Chapter 1: Project Background

Chapter 2: Need for Environmental Management Framework and Methodology Used for Limited EA

Chapter 3: Policy, Legal and Regulatory Framework

Chapter 4: Potential Environmental Impacts

Chapter 5: Environment Management – Approach and Key Steps to be followed

Chapter 6: Environment Management Measures

Chapter 7: Implementation/Institutional Arrangements

Chapter 3

Policy and Regulatory Framework

The Chapter provides a reminder that all activities under the proposed project must be consistent with all applicable laws, regulations, notifications that are relevant in the context of the proposed project interventions. It is the responsibility of the Project Implementing Agency to ensure that proposed activities are consistent with the regulatory/legal framework, whether international, national, state or municipal/local. Additionally, it is also to be ensured that activities are consistent with World Bank's operational policies and guidelines. This section is not a legal opinion on the applicability of the law but serves as guidance in the application of the law to the current project context.

3.1 National Policy and Regulatory Framework applicable to the Project

The Environment (Protection) Act, 1986 serves as the umbrella environment legislation in India and entrusts joint ensure effective implementation of the environment legislation and regulations. The MoEF and the pollution control boards (CPCB i.e. Central Pollution Control Board and SPCBs i.e. State Pollution Control Boards /SPCCs i.e. State Pollution control Committee's) together form the regulatory and administrative core of the sector.

Two specific legislations (popularly called the Air Act and the Water Act) empower the central and state pollution control authorities to enforce emission and effluent standards for industries discharging pollutants into air and water.

In addition, the Supreme Court of India and some High Courts of the states have led the way in the enforcement of environmental laws through citizen-led public interest litigation (PIL) that has its legal basis in the constitutional right to a healthy environment. A summary of key environmental legislations applicable to the proposed project is given below:

Assessment of Key Environmental Legislations with regard to its Applicability to the Proposed Project

Act and/or rules	Summary	Applicability
Environment Protection Act, 1986 (to be read with The Environment Protection Rules, 1986)	The Act applies to all areas where the hazardous substances are handled.	Yes
The Air (Prevention and Control of Pollution) Act, 1981 (to be read with Air (Prevention and Control of Pollution) Rules, 1983)	The Act applies to any building, structure or property used for industrial or trade purposes where pollution occurs or emitting any air pollutant into the atmosphere takes place.	Yes

Act and/or rules	Summary	Applicability
The Water (Prevention and Control of Pollution) Act, 1974 (amended 1988)	The Act applies to every outlet that includes any conduit pipe or channel, open or closed, carrying sewage or trade effluent or any other holding arrangement which causes or is likely to cause, pollution.	Yes
The Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003	The Act applies to every industry which includes any operation or process, or treatment and disposal system, which consumes water or gives rise to sewage effluent or trade effluent, but does not include any hydel power unit.	Yes
Noise Pollution (Regulation & Control) Rules 2000	The rule applies to: 1) Industrial area 2) Commercial area 3) Residential area 4) Silence zone (where an area comprising not less than 100 metres around hospitals, educational institutions and Courts may be declared as silence area/zone for the purpose of these rules).	Yes
EIA notification on Environment Clearances, 2009	It mandates that certain projects envisaged to be polluting for the environment have to seek prior approval from the Ministry of Environment and Forests to set-up the project. A list of projects along with the procedure required to be undertaken to sought the approval from Government is clearly delineated under the law.	No
Forest (Conservation) Act, 1980	The Act is applicable to any project which requires forest land for construction. Depending on the size of the tract to be cleared, clearances are required.	No

Act and/or rules	Summary	Applicability
Biological Diversity Act, 2002	The Ministry of Environment and Forests has enacted the Biological Diversity Act, 2002, following the Convention on Biological Diversity signed at Rio de Janeiro in 1992, of which India is a party. This Act is meant to "provide for the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto."	No
The Scheduled Tribes & Other Traditional Forest Dwellers (Recognition of Forest Rights), 2006	The Act recognizes and vests the forest rights and occupation in forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded, and provides for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land. The Act may be applicable in case of forest land used for TC or in the immediate vicinity.	No
Batteries (Management and handling) Rules, 2001	The Rule applies to every manufacturer, importer, re-conditioner, assembler, dealer, recycler, auctioneer, consumer and bulk consumer involved in manufacture, processing, sale, purchase and use of batteries or components.	Yes
E-waste (Management and Handling) Rules, 2011	The Rules applies to every producer, consumer or bulk consumer involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I, collection centre, dismantler and recycler of e-waste.	Yes

Act and/or rules	Summary	Applicability
Gas Cylinder Rules, 2004	The Act applies to every person who intends to fills any cylinder with compressed gas or possess, import or transport any cylinder filled with any compressed gases or any person desiring to manufacture cylinders, valves, LPG regulators attached to self-closing valves, multi-function valves and other fitting and also every person in charge of/using gas cylinders.	Yes
The Ancient Monuments and Archaeological Sites and Remains Act, 1958 & Its amendments till 1992	Under sub-rule 32 of the ancient monuments and archaeological sites and remain rules, 1959 and notification issued in 1992, area up to 100 m from the protected limits and further beyond it up to 200 m near and adjoining protected monument have been declared to be protected and regulated areas, respectively, for purpose of both mining operation and construction. Any repair, addition or alternation and construction/reconstruction within these areas need prior approval of the Archaeological Survey of India	Yes
Payment of Wages Act, 1936	The Act applies to every establishment and lays down as to by what date the wages are to be paid, when it will' be paid and what deductions can be made from the wages of the workers.	Yes
Minimum Wages Act, 1948	The Act applies to every establishment and mandates that the employer is supposed to pay not less than the Minimum Wages fixed by the State Government.	Yes
The Public Liability Insurance Act and Rules, 1991	The Act mandates companies to take public insurance for its employees	Yes

Act and/or rules	Summary	Applicability
Workmen's Compensation Act, 1923	The Act applies to every establishment and provides for compensation in case of injury by accident arising out of and during the course of employment.	Yes
Contact Labour (Regulation and Abolition) Act, 1970	The Act applies to every establishment and contractor who employs on any day of the preceding twelve months twenty or more workmen and the work performed by the workers shall be for more than one hundred and twenty days in the preceding twelve months and if work is of a seasonal character it is performed for more than sixty days in a year.	Yes
Equal Remuneration Act, 1979	The Act applies to every establishment and mandates that equal payment of wages shall be made for work of equal nature to male and female workers and not for making discrimination against female employees	Yes
Child Labour (Prohibition and Regulation) Act, 1986	The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in building and construction industry	Yes

4.2 World Bank Policy

The World Bank's 10 environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and the environment in the development process. These policies provide guidelines for the identification, preparation, and implementation of programs and projects.

The operational policy discussion pertaining to social safeguards has been described in a standalone document that has been prepared to guide the management of social issues of the project. The following paragraphs describe the Bank’s operational policies and their applicability from an environmental viewpoint.

Safeguard Policies Triggered	Yes	No	TBD
Environmental Assessment (OP 4.01)	✓		
The project interventions by and large are not likely to cause significant or serious damage to natural and physical environment. However, specific interventions (under Component 3) envisaged under the project such as construction of new blocks and/or refurbishment/repair of existing buildings/laboratories may have some potential adverse environmental impacts in the local context. Even though it is expected that the new buildings/blocks would be located within existing college campuses and/or on available government land, planning, construction and operation of buildings would require appropriate consideration and integration of environment, health and safety measures to ensure that adverse environmental impacts are minimized and properly managed. OP 4.01 has been triggered to ensure that project/program interventions are planned and designed to be environmentally sound by integrating appropriate principles and approaches into the over-all decision making process.			
Natural Habitats (OP 4.04)		✓	
No physical interventions proposed under the project are expected to affect natural habitats. No civil works will be financed under the project in designated protected areas/wilderness areas/critical natural habitats. Therefore, OP 4.04 is not being triggered for the project.			
Pest Management (OP 4.09)		✓	
OP 4.09 is not being triggered for this project as biological/environmental control methods or reliance on synthetic chemical pesticides is not envisaged. In case such a need arises, the requirement is likely to be very limited and in such a scenario, the requirements under the pest management policy of the Bank will be built-in as part of the over-all Campus Environment Management Plan to be developed for the institute in question.			
Forests (OP 4.36)		✓	
OP 4.36 is not being triggered for this project as no interventions are envisaged in forest areas and therefore no conversion/degradation of this natural resource would occur.			
Physical Cultural Resources (OP 4.11)	✓		
Implementation of the project/program is not likely to affect religious structures of local significance or other heritage/protected structures. However, since some civil works are involved, 'chance finds' at work sites is a likely impact that cannot be ruled out and will have to be managed by incorporating appropriate provisions in the bidding/contract documents.			

Safeguard Policies Triggered	Yes	No	TBD
Safety of Dams (OP 4.37)		✓	
OP 4.37 is not being triggered for this project as there is no construction of new dams or activities that are concerned with safe functioning of existing dams.			
Projects on International Waterways (OP 7.50)		✓	
OP 7.50 will not be triggered for this project as there are no interventions planned/proposed over or around an international waterway that could cause a potential conflict. There are also no activities that may affect the use or pollute such a waterway.			
Projects in Disputed Areas (OP 7.60)		✓	
OP 7.60 is not being triggered as the project is not proposed in any disputed area.			

Consultation and Disclosure Requirements (OP 17.50)

The policy requires the borrower to consult key stakeholders, including students through the various phases of the project. It requires that groups being consulted be provided on-time, comprehensible and easily accessible information before consultations. The policy also requires that the borrower to make the EA summary available in the state (in a local language) and a public places to all the stakeholders prior to appraisal.

Applicability: Consultations will be required to determine specific issues; locally viable mitigation measures for addressing environmental impacts and consensus on engineering designs especially where up gradation of colleges/institutions will be undertaken.

Chapter 4

Potential Environmental Impacts

While the project interventions, overall, will have a positive impact on the technical education/engineering sector of the targeted states, specific interventions (under Component 3) envisaged under the project such as construction of new blocks and/or refurbishment/retrofitting/major repair works of existing academic blocks/hostels/ laboratories/libraries may have some potential adverse environmental impacts in the local context. Therefore, these activities are central to the approach and design from an environmental management and safeguards perspective for the project.

4.1 Potential/Likely Environmental Impacts/Issues

The components of the current project primarily deal with improving the quality of technical education imparted in states/institutions. While most of the work done under the components would deal with improving quality of education by provision of better management and training for the existing resources and faculty, the primary component where one can expect some short-term environmental impacts will emerge from the component involving some civil works. Investments under this category would involve the construction of new blocks and refurbishment/repair of existing facilities. The associated impacts because of the construction activity will be short-term in nature and its adverse impacts can be mitigated for.

Based on the results from the assessment, following are some of the environmental issues that need to be addressed in the project. While on the whole, the nature of activities proposed under the project does not pose significant environmental risks, there are some environmental concerns associated with activities such as civil works (new block construction/expansion/repair of buildings) and pressure on already stressed facilities within the existing campus with introduction of new building blocks. In addition, issues pertaining to health and safety also need attention and are directly related to creation and maintenance of a clean and safe learning and teaching environment, which is ultimately linked to the achievement of the objectives of the project. The key issues have been categorized into the following categories:

1. Location/Site Selection Related Issues

Location is not a primary concern in this project, since it is expected that all the construction activities that would be taken up as a part of the project will be a within the existing campus. However, one needs to acknowledge that some of the college campuses might be near (or in some cases might even have them within the periphery of the campus itself) sensitive and ecologically valuable ecosystems, such as wetlands, and endangered species habitats; areas with archaeological and/or historic sites and areas where the groundwater is recognized to be contaminated.

This category also includes issues related to individual institutes, including siting of institutes on or near areas susceptible to health or other hazards – such as institutes located on the banks of a river, along watercourses used for human consumption, near industrial waste disposal sites, municipal landfills, hospital waste disposal sites, slaughter houses, hospitals without systematic bio-medical waste disposal mechanism, cattle-sheds, or any other probable source of infectious diseases.

2. Design Related Impacts

These issues pertaining to site planning/lay-out and building designs. These include aspects such as proper and adequate drainage, providing safe site slope, safe excavation, removal of trees; indoor air quality in classrooms/ventilation; daylight factor within the classrooms, laboratories and workshops; provision of safe potable water, particularly in the areas where arsenic and fluoride levels are high/unsafe; sanitation facilities and waste management, provision of toilets, hygiene in the campus and around; non-use of unsafe building materials such as asbestos and low cost chemical (lead) paints.

In case of existing buildings that require refurbishment, it is important to assess the existing condition of the building. Interventions to improve the condition of the superstructure, should be adequately assessed and addressed. Moreover, significant emphasis should be put on improving the existing conditions of the buildings to address issues of lighting, ventilation and heating/cooling. These interventions will have a direct impact on the health of the users of the facility.

3. Issues related to Disaster Preparedness

For areas of high vulnerability to natural hazards (landslide, cyclones, floods, earthquake); safe design and construction practices and emergency evacuation should be adopted.

4. Safety Issues

Fire and electrical safety and emergency response arrangements, including use fire resistant building materials and evacuation/assembly areas.

5. Issues related to Special Purpose Designs

These include provision of facilities for the physically disadvantaged, provision of rainwater harvesting, possible use of solar power.

6. Construction Related Impacts

These are issues that could be addressed effectively by good construction management, and include generation of dust and noise; generation and management of construction wastes; maintaining proper cut slopes and work site safety practices. An example of this could be the occurrence of soil erosion resulting from the clearing of land before initiating the construction activity. This can easily be mitigated for by better planning and ensuring that the construction activity starts as soon as the land is cleared.

7. Issues related to Provision and Maintenance of Facilities

These arise due to the provision, or lack of provision of the required facilities - drinking water facilities, prevention of infections, site cleanliness, health and hygiene, maintenance of site and off-site drainage, and preventing exposure to chemicals/pesticides.

4.2 Conclusion

Even though it is expected that the new blocks would be located within existing college campuses and/or on available government land, planning, construction and

operation of higher education facilities, including buildings and supporting infrastructure would require appropriate consideration and integration of environment, health and safety measures to ensure that adverse environmental impacts are minimized and properly managed.

Even when no major new construction is involved, the largely poor state of existing infrastructure (in most low income states) requires that environment management dimensions are specifically introduced and enhanced within the higher education institutes of the state. Impacts pertaining to: (a) location (environmental features of the site and surrounding land-uses); (b) design (sanitation, water supply, drainage, solid waste arrangements, waste water management, ventilation, access, energy efficiency, material usage, fire safety, storage facility and natural disaster dimension); (c) construction and worksite safety management, including occupational health and safety of construction workers, public safety issues, dust and noise, management of materials, their sources and debris/waste material; and; (d) operation/maintenance aspects of physical assets such as buildings, laboratories (such as sanitation, waste management, e-waste handling, landscaping, creation/maintenance of activity/sitting spaces, and cleanliness/hygiene in the campus and its various facilities) would require attention. Also, any refurbishment/repair/retrofitting works may require specific student and worker safety measures during construction if it involves removal of asbestos (which can be identified only when the civil works assessment is initiated).

Some specific long-term environmental impacts are associated with the operation and management of the higher education institutes itself. Appropriate water and sanitation facilities, disposal of wastes, including management of e-wastes, energy use/efficiency, disaster preparedness and dealing with issues where institutes are exposed to noise or other sources of pollution require regular attention. However, such adverse impacts are not likely to be large-scale or irreversible in nature. These can be avoided/minimized to a great extent and the positive outcomes from the project and higher education program in the state of Madhya Pradesh can be enhanced substantially by putting appropriate institutional mechanisms, procedures and capacity in place.

Beyond the regular environment, health and safety dimensions, the project also offers an opportunity to improve the over-all environmental footprint by creating 'green buildings' or 'greener facilities' by adopting practices of water efficiency, energy conservation, wastewater recycling and reuse. Considerations of environment, health and safety dimensions in operation and maintenance cycle of higher education institutions would help in ensuring the soundness and sustainability of the project/program from an environmental perspective.

In view of the project's potential impacts on the environment, the Bank's OP 4.01 on Environmental Assessment and OP 4.11 on Physical Cultural Resources have been triggered, and the project is designated as Category B. On the whole, with proper management, the project interventions are not likely to cause large scale, significant or irreversible damage to natural, physical or social environment.

Chapter 5

Environmental Management – Approach and Key Steps to be Followed

Largely, significant long-term environmental impacts are not envisaged due to the implementation of the current project. However, it is expected that there will be short-term environmental impacts that would emerge due to the refurbishment works or due to the construction of new facilities. These may include issues that may arise due to improper site selection or inadequate design measures, both of which can be avoided with good planning. Issues arising during construction can be mitigated for by providing better supervision, and improved planning.

In fact, the environment management framework provides an opportunity to the State Department of Higher education and the concerned institutions to move towards 'greener-buildings' that are resource efficient, well planned and have the least footprint on the environment.

The framework approach used for the project approaches the issue of environment management in a broad manner. While it is expected that the framework identifies all possible issues that may arise due to the implementation of this project, it is expected that an environment management plan will be made for each site that is taken up for implementation of works. The management plan so prepared should always be available at the site for reference, when executing works, as it will ensure sustainable delivery of the project objectives.

Environment management should be an integral part of the implementation and operation of an institute. This chapter details out the key requirements that should be adhered to for ensuring appropriate environmental management in each college/HE institute that will be supported through the project. However, specific requirements may vary depending on needs and context of proposed interventions and therefore these guidelines will be treated/used accordingly.

5.1 Key Requirements

Each institute should have the following measures in place so as to ensure good environment, health and safety practices in place thereby minimizing the EHS impact:

1. ***EHS Policy:*** Each college/institute should define an EHS policy and have its own Campus Environment Management Plan. This serves as a mission document for the envisaged EHS practices and performance in the future. The policy should be communicated to all in order to ensure all are on the same page and the culture of minimizing EHS impact runs throughout the system;
2. ***EHS professional:*** Each college/institute should identify/appoint an EHS officer to look after the EHS performance. The said person should be entrusted with the responsibility of:
   a) Imparting EHS training to all;
   b) Keep a track of all the applicable legislation and ensure that all the applicable license/approvals required for the operations of building is in place;

c) Conduct internal audit and take plant rounds once in a week/month to ensure that there is no deviation from the defined procedures/plans.

5.2 Key steps to be followed

5.2.1 Existing Institutes/Buildings

In case of expansion planned for the existing building, it is essential that a step wise approach may be adopted to minimize its environment impact. A focused approach to identify potential environmental issues shall be adopted at each and every stage of the expansion process from site selection to the stage of operation. This section deals with the expansion at the same site within existing college/institute.

5.2.1.1 Detailed Site Assessment

A detailed site assessment shall be carried out before deciding on the magnitude of expansion to understand the environment feasibility. This may involve gauging the availability of natural resources, raw material, impact on nearby biodiversity due to increased capacity, legislation requirement, etc. A checklist that was used to carry out the assessment is provided in Annexure.

5.2.1.2 Campus Layout/plan

Campus layout is also important for successful performance of an institute. The better and more efficient a design for the internal functions the better the performance.

In the campus at least 30% green area should be maintained and landscaping should be done to improve aesthetics of the surrounding while maintaining habitats conductive to natural fauna. Few initiatives that can be taken up are:

- **Trees:** Effort should be made to plant more trees and their regular upkeep should be done to enhance natural shade within the campus. Cutting of existing trees for expansion should be avoided to the extent possible and 10 trees should be planted for every one tree cut in the process.
- **Heat island effect:** Work may be done at site to mitigate the heat island effect (Thermal gradient difference between developed and undeveloped areas) by following measures:
  a. At least 40% of the non-roof impervious surfaces on the site (including parking lots and walkways) should be shaded
  b. Pavements and walkways should be painted in light colour (solar reflectance index > 0.5)
- **Boundary:** The campus should be provided with wall boundary in all the directions to avoid encroachment, theft and safety issues for the employees and students.

5.2.1.3 Detailed building plan preparation

The building design is also crucial to the sustainable performance of the institute. Initiatives like use of energy efficient products, increasing natural light and ventilation, insulating, etc. may be adopted to enhance positive environment impact

of the operations. Also, aspects related to safety like, resistant to earthquakes, proper evacuations, etc., may be planned to ensure successful operations of the institute.

The building design for the expansion should be responsive to the local climate. The buildings that are in hot and dry climatic region should be designed to be passive to heat gains and cardinally oriented so as to reduce the heat gain and direct heat ingress into the building though the walls and openings, a lot of shading elements on the west wall may also be adopted. Similarly, the buildings in a colder climate should be designed to increase the heat gain and also insulate it against heat losses. Emphasis should be given to ensure that development of new building should not block the natural light of the existing infrastructure.

New infrastructure in earthquake prone zones should be designed with proper attention to earthquake safety, safety codes and also escape routes in case of emergency. In case of cyclonic zones it must be taken into account for the roofs and the anchoring of the roofs against the cyclone and rainfall.

Also, efforts should be to use local materials for the construction of the expansion facility to the extent possible. Most of the locations have local sand stone or other stones and these can be easily used for the construction purposes.

Apart from this, certain points that may be adopted during the building plan preparations are:

- Efforts should 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 expansion so as to ensure following environmental safeguards:
    a. Renewable energy in terms of solar water heater, solar panels, solar street light may be used;
    b. LED lights should be used within the premises to reduce the energy consumption;
    c. Water treatment and recycling facility to reduce fresh water consumption;
    d. Rain water harvesting arrangement so as to recharge the ground water and/or reduce dependency on ground water;
    e. Proper waste management including practices to minimize waste generation, etc.
- Criteria mentioned in the National Building Code should 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 not be used in any part of the structure;
- Substitutes to natural resources should 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 shall be made in appropriate number so as to ensure comfortable and hygienic working conditions;
- Energy efficient products like 5 star rated Air conditioners, refrigerators, etc should be used in the institutes.

5.2.1.4 Construction Management

Construction at the site involves a number of activities. These activities may lead to certain EHS impacts on the existing natural settings and therefore, appropriate mitigation measures are required to be put in place so as to minimize or avoid these EHS impacts. A snapshot of the issues to be kept in mind along with mitigation measures are provided below for ready reference:

S. No.	Likely Issues	3.1. Mitigation measures
1	Generation of noise during construction	➢ The construction activities involving generation of noise should be carried out in the daytime only and should be avoided in the night; ➢ Acoustic barriers may be used in case residential area is in the immediate vicinity or classes are disturbed in the existing facility
2	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;
3	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
4	Water contamination and health risks associated with	➢ Toilet shall be earmarked for both men and women contractual workers; ➢ Adequate drinking facilities shall be provided at the construction site;

S. No.	Likely Issues	3.1. Mitigation measures
	setting labour camp for construction	➢ Temporary crèche facility may be provided in case of migrant labourers children residing in the camps to ensure safety
5	Air pollution due to movement of vehicles	➢ All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate; ➢ Sprinkling of water shall be practiced at the site
6	Land and water contamination due to vehicle movement	➢ Proper maintenance of vehicle shall be ensured out to avoid any leakage of oil or grease.
7	Safety issues due to vehicle movement at the site	➢ Vehicle speed is to be restricted to 15km/hour at site; ➢ Provision of adequate personal protective equipment like safety helmets, face masks, safety shoes, safety goggles etc. for the safety of workers
8	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; ➢ 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
9	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.
10	Issues like child labour during construction at site	➢ Provision of clause in contractor's agreement 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

5.2.1.5 Operation and Maintenance Plan preparation

In case safe operating procedure are already defined for the existing operations, the same may be used in the expanded operations if found appropriate and are not affected by the size of operation. The possible impacts from operations are defined in next chapter. The same shall be assessed and appropriate measures should be adopted to minimize or eliminate the impact.

5.2.2 Establishment/setting-up of New Building Block/s

5.2.2.1 Screening

Screening is the process by which the appropriate level and type of EA is determined for a given project on the basis of its likely environmental impacts. The two main objectives of environmental and social screening are to:

1. Enhance the environmental and social sustainability of a proposed project. This aspect of screening focuses on the environmental and social *benefits* of a project.
2. 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.

The screening process aims to quickly identify those projects where no potential environmental and social issues exist, so that only those with potential environmental and social implications will undergo a more detailed screening process. As a consequence, the outcome of the screening process will be a categorization of the project into one or more of the following categories:

Category 1: No further action is needed, either because no significant environmental impacts and risks were identified, or because sufficient environmental review has already been conducted and environmental management recommendations have been incorporated into the project;

Category 2: Environmental sustainability elements need to be integrated into project design because there are possible environmental and social benefits, impacts, 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.

Category 3: Further environmental and social review and management is needed because potential environmental and social impacts 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 impacts 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.

The methodology for screening includes Desk study, site visit and study of available literature.

- ✓ ***Desk study*** involves collection and review of the secondary data available in the public domain. This may involve the seismic activity of the area where new TC is proposed, soil type, land use pattern, etc. This will enable one to decide the methodology and level of Environment assessment and distributing the responsibility amongst the team members.
- ✓ **Site visit/s** is/are conducted to collect first hand data/information about the new site. This enables a cross check of the secondary data available during the desk review and assessing the likely environmental aspects and health and safety hazards. Also, this involves interaction with different stakeholder in the region to gauge any possibility of conflict related to TC.
- ✓ Also, **publically available literature** review on the issues in the envisaged industrial sectors should be kept in mind. This may further help in a robust screening of the possible EHS impacts of upcoming TC and may provide opportunity to MSME to have measures in place to mitigate the same.

A checklist to conduct screening exercise is enclosed for reference as Annexure 3. The same must be used before finalizing the site for development of new TC.

5.2.2.2 Use of screening results for site selection

Based on the results of the screening exercise decision must be taken on the site selection of the new tool room. In case, the EHS impacts observed from the envisaged TC on the site and its nearby areas is high following actions shall be adopted:

- ➢ First preference shall be given to look for an alternative and feasible option to setup the institute;
- ➢ In case of non-availability of alternate site location, appropriate measures shall be identified and delineated in the Environment Management Plan for the institute.

5.2.2.3 Detailed Site Assessment

A detailed site assessment shall be carried out before deciding on the magnitude of expansion to understand the environment feasibility. This may involve gauging the availability of natural resources, raw material, impact on nearby biodiversity due to the establishment of tool room, legislation requirement, etc.

The output of the detailed site assessment shall provide a holistic view of the existing environment settings and the mitigation/preventive measures required to be adopted so as to minimize the EHS impact of the tool room.

5.2.2.4 Campus Layout/Plan

Campus layout is also important crucial for successful performance of a tool room. The better and more efficient a design for the internal functions the better the performance.

In the campus at least 30% green area should be maintained and landscaping should be done to improve aesthetics of the surrounding while maintaining habitats

conductive to natural fauna. Also, efforts should be made to conserved existing vegetation and other rich biodiversity in the premises as well as vicinity.

Apart from this, a number of points shall be kept in mind while planning the campus layout. Some of the key aspects are given below:

- **Trees:** Maximum effort should be made to retain the existing trees in the available area. The campus should be designed in such a way that there is no need of cutting any tree in the area. In case, a tree is cut at the site appropriate approvals shall be taken from the authorities and about 10 trees shall be planted within the campus to compensate the loss. Also, a continuous monitoring should be done to ensure maximum survival rate of the planted trees;
- **Site drainage:** Existing drainage pattern of the available site should be studied and the drainage system required for the TC should be constructed in line with the same. The storm water drain should be constructed separately so as avoid mixing of the fresh and the waste water;
- **Heat island effect:** Site need to 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) should be shaded
  - 50% of parking area can be provided underground
  - Pavements and walkways should be painted in light colour (solar reflectance index > 0.5)
- **Boundary:** The campus should be provided with a wall boundary in all the directions to avoid encroachment, theft and also to provide safety to the employees and students.

5.2.2.5 Detailed Building Plan Preparation

The building design is also crucial to the sustainable performance of the TCs. A number of factors including energy efficiency, materials of construction, natural light and ventilation, insulating, etc. should be kept in mind in order to maintain eco-friendly operations. Also, aspects related to safety like, resistant to earthquakes, proper evacuations, etc., ensure successful operations of the TC.

The building design should be responsive to the local climate. The buildings that are in hot and dry climatic should be designed to be passive to heat gains and cardinally oriented so as to reduce the heat gain and direct heat ingress into the building though the walls and openings, a lot of shading elements on the west wall may also be adopted. Similarly, the buildings in a colder climate should be designed to increase the heat gain and also insulate it against heat losses. The other buildings that are in earthquake zones should be designed with proper attention to earthquake safety, safety codes and also escape routes in case of emergency. In case of cyclonic zones it must be taken into account for the roofs and the anchoring of the roofs against the cyclone.

Also, efforts should be to use local materials for the construction of the facility to the extent possible. Most of the locations have local sand stone or other stones and these can be easily used for the construction purposes.

Apart from this, certain points that may be adopted during the building plan preparations are:

- Trees should be planted in large numbers to provide natural shade in the open areas. This also helps to reduce the temperature in the campus in comparison to the vicinity;
- Efforts should 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 lights should be used within the premises to reduce the energy consumption;
  - Water treatment and recycling facility to reduce water consumption;
  - Water harvesting arrangement so as to recharge the ground water and/or reduce dependency on ground water;
  - Proper waste management including practices to minimize waste generation, etc.
- Criteria mentioned in the National building code should 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 not be used in any part of the structure;
- Substitutes to natural resources should 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 shall 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. should be used in the institute.

5.2.2.6 Construction Management

Construction at the site involves a number of activities. These activities may lead to certain EHS impacts on the existing natural settings and therefore, appropriate mitigation measures are required to be put in place so as to minimize or avoid these

EHS impacts. A snapshot of the issues with the basic principles that should be kept in mind during the construction activity is as follows:

S.No	Likely Issues	Mitigation measures
1	Generation of noise during construction	➢ The construction activities involving generation of noise should be carried out in the daytime only and should be avoided in the night; ➢ Acoustic barriers may be used in case residential area is in the immediate vicinity
2	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; ➢ For larger sites, sedimentation basin and contour trenching should be provided so as to avoid loss of top soil
3	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
4	Water contamination and health risks associated with setting labour camp for construction	➢ Provision of separate mobile toilet facilities for men and women shall be made; ➢ The domestic effluent shall be properly disposed of in soak pits; ➢ Garbage bins shall be provided to all workers' accommodation for dumping wastes regularly in a hygienic manner; ➢ Awareness programmes to be conducted regularly for workers on AIDS, and other health related issues; ➢ Adequate drinking facilities shall be provided at the construction site;

S.No	Likely Issues	Mitigation measures
		➢ Temporary crèche facility may be provided in case of migrant labour children residing in the camps to ensure safety
5	Air pollution due to movement of vehicles	➢ All the vehicles entering the site to be asked to have updated PUC (Pollution Under Control) certificate; ➢ Maintenance of vehicles shall be carried out regularly ➢ Sprinkling of water shall be practiced at the site
6	Land and water contamination due to vehicle movement	➢ Proper maintenance of vehicle shall be carried out to avoid any leakage of oil or grease.
7	Safety issues due to vehicle movement at the site	➢ Vehicle speed is to be restricted to 15km/hour at site; ➢ Necessary safety trainings shall be provided to the drivers of construction vehicles for speed restrictions and do's and don'ts to be followed during movement of construction vehicles; ➢ Provision of adequate personal protective equipment like safety helmets, face masks, safety shoes, safety goggles etc. for the safety of workers
8	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; ➢ Proper maintenance of the D.G set should be carried out on regular basis; ➢ Acoustic enclosures are to be provided with the D.G sets to minimize the noise levels
9	Land and water contamination and safety risks due to use and storage of diesel at site	➢ A covered area shall be defined for storage of HSD with concrete flooring; ➢ The diesel storage area shall not be proximity of the labour camps; ➢ Inflammable substance shall not be allowed at the project site.
10	Land and water contamination due to waste	➢ Waste shall be stored at designated place after segregation on the basis of category (hazardous and non-hazardous);

S.No	Likely Issues	Mitigation measures
	generated at site	➢ Hazardous waste shall be disposed of to the authorized vendors only; ➢ A waste management plan shall be chalked out to properly dispose the debris generated from the site.
11	Issues like child labour during construction at site	➢ Provision of clause in contractor's agreement 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

5.2.2.7 Operation and Maintenance Plan preparation

The success of the expansion activities and new developments will depend on continuous monitoring and required follow-up actions. The monitoring of environment parameters must be undertaken on at least quarterly basis.

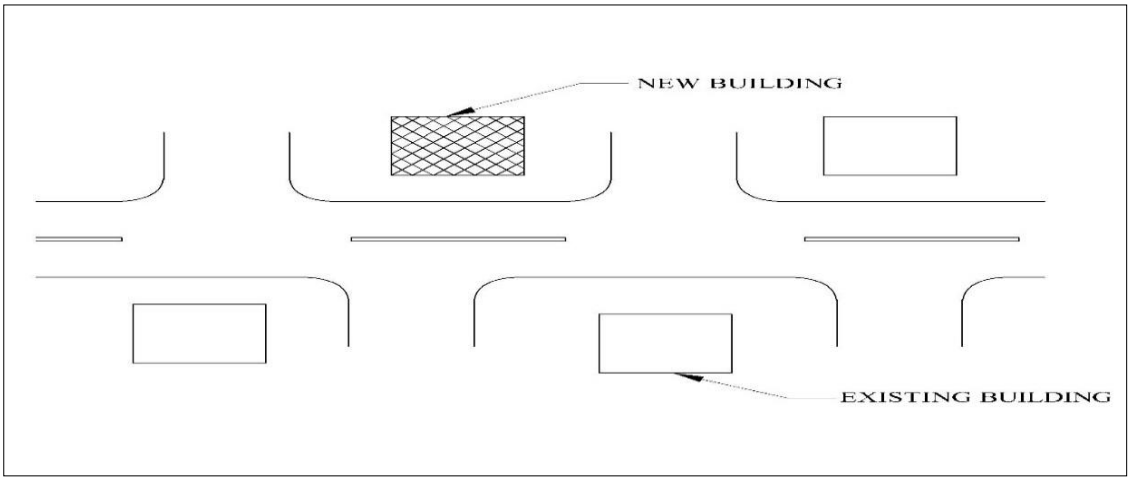
Chapter 6

Environmental Management - Mitigation Measures

This chapter enumerates the various elements/aspects/measures that are critical for building and ensuring a safe and sustainable environment on campus while implementing the proposed investment. Compliance with the proposed measures shall also help the institute in achieving the prescribed norms/standards.

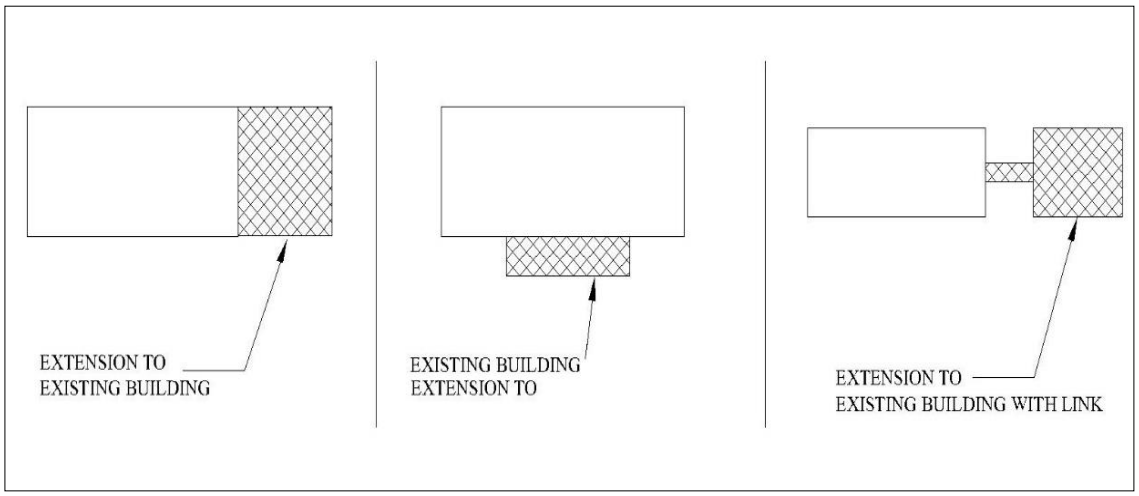
6.1 Types of Civil Works Envisaged under the Project

a. New Buildings: These will generally be an independent new building/s constructed with in the existing campus.



Sketch Showing New Building within a Existing Campus

b. Extension to Existing Buildings: Under this category, an additional area will be constructed in continuation of an existing building, both physically and functionally.



Sketches Showing Possible Extensions to Existing Building

c. Repair works: These are the works associated with repair of dilapidated and / or non-functional components of the existing building. These may include replacement of leaking pipes or broken toilet fittings and repair of damaged flooring or plaster.

d. Refurbishment works: Under this category, the works that are usually executed relate to changing the existing function of a room / space to a new proposed function. For example: Provision of electrical, water supply and/or waste disposal arrangements in an existing room which is proposed to be used as a laboratory.

6.2 Environment Management

The section here lists out the various elements/aspects/measures that will help in creating and maintaining good and safer campus environment. The list provided under the various sub-heads is a comprehensive one to ensure that various possibilities that often exist in a national level project can be addressed effectively.

Pre-Construction Activities

The project will permit new buildings and extensions to existing buildings only on land that is owned and fully in the possession of the Institution, the State Government or the Central Government. Further, this land must not be occupied by any person/s, including squatters or encroachers, who may be using it for residential, commercial/livelihood or any other purposes. The availability of land free from any encroachers and/or squatters must be ensured before a site a selected for construction.

The Land Site Assessment process needs to be completed and a Certificate must be prepared. Documentation on the process followed and the certificate prepared need to be archived and made available to Joint Review Missions, comprising of World Bank and NPIU officials. It must be ensured that the ownership of the land is clearly with the Institute on which the civil works are proposed.

As far as possible, the selected sites should be free from encumbrances. However, any encumbrances on the selected site/land such as trees, electrical and water utilities, hand pumps, water taps, parking sheds and temples/shrines (or any other) will be clearly identified and documented using the format provided in Annexure 1. The documentation will cover details of type, number, size/area of the impacted structure, species (in case of trees), as applicable. Relocation/replacement of such structures and utilities needs to be planned and executed prior to initiation of civil works. The cost estimates for such pre-construction activities will be shown under a separate head in the civil works estimates.

Building Design and Related Aspects

During the design of the building/s or extension of existing blocks, ensure the following:

- Water Supply arrangement/s, as per applicable norms

- Sanitation arrangement/s, as per applicable norms including separate arrangements for men, women and physically challenged
- Waste water discharge or disposal arrangement/s
- Adequate storm water discharge arrangement
- Floor height and window area, as per NBC norms.
- Promote wood substitutes and use of materials like fly ash and unleaded paint.
- Adoption of relevant construction code/s, applicable for earthquake, cyclone, flood and/or landslides.

Clear and comprehensive drawings for various utility services such as wiring, water supply, waste collection and disposal, plumbing, drainage and sewage disposal diagrams will be made.

Additionally, the following should be considered and provided in the design:

- Building or block orientation, keeping in mind the solar and wind direction and also the existing lay-out (as explained in the earlier sections to the extent possible).
- Natural Light and Ventilation in Classrooms, Laboratories, Canteen and Toilets
- Barrier free access for the physically challenged.
- Appropriate shading devices (*chajjas* and louvers)
- Signage inside and outside the building
- Display/notice boards for display of information in the classrooms and at other required locations.
- Fire and electrical safety arrangements
- Provision of alarms or hooters to alert building occupiers in case of emergency.
- Clear demarcation of escape routes and assembly points for emergency situations.
- Provision of parking (segregated for two and four wheelers)
- Preserve existing trees, to the extent possible.

Many of these measures can be given effect even when there is no new construction involved.

Campus Maintenance and Related Aspects

All institutes participating in the project (even in cases where no new construction is proposed) need to ensure over-all cleanliness and hygiene in the campus. This includes:

- Adequate provision of waste collection bins including arrangements for segregation of solid wastes and their regular disposal.

- Separate collection and disposal of toxic, inflammable wastes, specifically from laboratories.
- Hygiene in kitchen, mess, canteen and toilets
- Proper storage of materials (whether in kitchen/mess, workshops and stores)
- Provision and maintenance of first aid boxes.
- Posters with safety and cleanliness messages, as applicable.

Environment Augmentative Measures

The following environment augmentative measures should be encouraged in the institutes:

- Rain water harvesting.
- Promotion of energy efficient lighting.
- Provision of acoustic measures.
- Use of heat reflecting glass.
- Promotion of water conservation measures.
- Promoting use of solar energy.
- Minimization of paved area: Eg: Loose aggregate and paving stones can be used for pedestrian movement areas in place of a hard concrete surface.
- Appropriate use of colors for buildings and walkways. Eg: Colors that absorb less heat can be chosen.
- Vermi-composting for bio-degradable waste.
- Landscaping (such as of roads, parking areas, water bodies, entry and exit gates, boundary walls, open spaces and footpaths)
- Tree plantation (including use of drip irrigation system to reduce wastage of water)
- Use of locally available materials, as possible.

Environment and Safety Management Measures for the Construction Stage

The institute will ensure that the implementing agency (such as CPWD or State PWD) and/or its contractor fully abide by the required legal requirements, including adherence to labour laws. Some key environment and safety requirements that need to be enforced and monitored include the following:

- Provision and enforcement of Personal Protective Equipment (PPE), as relevant to the needs of the work.
- Ensuring proper safety precautions during erection, use and dismantling of temporary structures such as scaffoldings.
- Ensuring proper barricading and delineation of worksites.

- Ensuring that the required electrical, fire and mechanical safety practices are followed during various construction operations.
- Ensuring provision of safe access and working platforms for workers and supervisors.
- Display of information on Minimum Wages.
- Provision of accommodation for workers as per norms.
- Provision of proper potable water supply arrangements for workers.
- Provision of sanitation arrangements (toilets, urinals, bathrooms) for workers (including separate ones for women workers, as required).
- Provision of first aid and emergency response arrangement.
- Minimization of wastage including reuse and recycle of materials, as possible.
- Proper stacking and disposal of waste materials (including proper segregation, storage and disposal of any toxic and hazardous wastes).
- Use of acoustic generators for construction work.
- Ensure proper and safe storing/stacking of construction material.
- Provide for silt control measures, if there are any streams/water bodies in the vicinity.
- Proper planning and sequencing of construction activities to reduce/minimize disturbance to students.

Integration of Environment Management Aspects

The key steps that will guide the integration of environment management measures into civil works are as follows:

- Step 1: A reference to the environment management elements/measures (planning or design stage related) listed in the section above needs to be made. Then, a clear list of elements that will 'apply' to the particular civil work being proposed, needs to be identified/made.
- Step 2: The identified environment management elements/measures need to be clearly reflected/marked in the Detailed Project Reports including Design Drawings.
- Step 3: The construction stage environment management requirements need to be integrated into Bidding Documents.

The civil works cum environment coordinators both at the institute and the state level will cross-check and ascertain the integration of environment management aspects into civil works. Format provided in Annexure 4 should be used for this purpose.

Chapter 7
Implementation Arrangements
and Consultation with Stakeholders

During 1991 to 2007, NPIU implemented three Technician Education Projects of Government of India assisted by the World Bank, which helped to strengthen and upgrade the Technician Education System and benefited 552 polytechnics in 27 States including UTs of Andaman & Nicobar Island and Puducherry. These three Projects have been rated as "Highly Satisfactory" on Project Management and implementation, which is the highest rating, provided by the World Bank.

Success of three Technician Education Projects encouraged the Govt. of India to seek similar financial assistance from the World Bank for a systemic transformation of the technical education system as a whole with special focus on overall Quality Improvement in engineering education.

7.1 Implementation Arrangements

7.1.1 National-Level Implementation Arrangements

National Project Implementation Unit (NPIU) is a unit of Ministry of Human Resource Development, Government of India, established in August 1990 for coordination, facilitation, monitoring and to provide guidance to the States/ Institutions in all aspects of the projects.

The composition and functions of the three bodies - the National Steering Committee (NSC), the National Project Directorate and the National Project Implementation Unit (NPIU) responsible at the central level for overall guidance, policy decisions and, project management, coordination and implementation are described below:

The Ministry of Human Resource Development (MHRD) will constitute a 16 member National Steering Committee (NSC), composed as below:

- Secretary of the Department of Higher Education in the Union Ministry of Human Resource Development, as the Chairperson,
- Secretary, NITI Aayog/or his/her nominee,
- Secretary, Department of Science & Technology/or his/her nominee,
- Financial Advisor to MHRD,
- Chairpersons of the AICTE, UGC and the NBA,
- Four Chairpersons of State Steering Committees (SSCs), nominated by the Chairperson in annual rotation, to include 2 from states in Component 1 and 2 from states in Component 2
- Three members nominated by MHRD, who must be persons with recognized expertise and interest in higher technical education,
- Three industry representatives, nominated one each by the Confederation of

Indian Industry (CII), NASSCOM, and the Federation of Indian Chambers of Commerce and Industry (FICCI), and

- The National Project Director (NPD) in the MHRD, as the Member-Secretary.

The NSC will meet bi-annually or as often as may be required. It will be assisted in its functioning by the National Project Directorate. The Chairpersons of some SSCs not represented in the NSC may also be invited to the NSC meetings. The operational costs of the NSC, including sitting fees for non-official members, will be financed by the Project through the NPIU's budget.

The NSC will provide the overall guidance and directions to TEQIP-III for maximizing gains from the Project. Further, it will review progress of the project against the indicators in the Results Framework Document, review and validate recommendations of the National Evaluation Committees for selection engineering education institutions for participation in the Project; take corrective actions with regard to the non-performing States, UTs and institutions including CFIs; and review findings from policy reform, thematic and evaluation studies. The minutes of all NSC meetings will, for ensuring transparency in selections and other decisions, be regularly published on the NPIU's website.

The National Project Directorate will be located within the Department of Higher Education (DHE) in the MHRD and headed by the National Project Director. The National Project Director (NPD) will be nominated by the MHRD in the rank of Additional Secretary/ Joint Secretary. This Directorate will consist of a Director in Department of Higher Education in MHRD and adequate support staff. Under the administrative control and guidance of the NPD, it will be responsible for organizing the meetings of the National Steering Committee, overall project fund management including central fund releases, monitoring matching fund releases by the States/UTs, and monitoring overall utilization of Project funds, facilitating smooth and efficient working of the National Project Implementation Unit (NPIU) and ensuring adequate staffing of the NPIU during the Project life. The NPD will be assisted by the NPIU.

The National Project Implementation Unit (NPIU) will be in charge of the day-to-day implementation of the project at the national level. It will be headed by a Central Project Advisor (CPA). The CPA will be suitably empowered, financially and administratively, to directly perform the following responsibilities: (i) disseminate information to States and institutions, (ii) prepare Annual work plans, (iii) organize the Selection process with the assistance of 2 National Evaluation Committees (NECs) and publish evaluation summaries on NPIU's website, (iv) arrange training for NPIU staff, (v) develop proposals for technical assistance for activities undertaken at the national level, (vi) organize meetings of working groups, mentors, and such other committees/ groups of experts as may be required from time to time, (vii) build capacity of the States/ UTs and institutions for implementation of Equity Assurance Plan (EAP), Environment Management Framework (EMF) and Disclosure Management Framework (DMF) requirements, (viii) liaise with the State Project Facilitation Units (SPFUs) to discuss project implementation progress to identify and solve emerging problems, (ix) organize professional development programs for engineering education administrators and policy implementers, (x) organize joint review missions and other

supervision and implementation support mission, as required, and (xi) carry out other related tasks as may be requested by the NPD and the National Project Directorate to achieve the objectives of the Project.

Under the guidance of the CPA, the existing NPIU will carry out its functions through the following 6 functional units:

The existing NPIU will be restructured to carry out its functions through 6 functional Units and will be headed by the Central Project Advisor (CPA):

- Institutional Development Unit
- ATU Support Unit
- Institutional Excellence Unit
    - R&D&I Unit
    - CoE Unit
- Faculty Development Unit
- Financial Management Unit
- Procurement Management Unit
- Monitoring and Evaluation Unit
    - Functional Support Unit
    - IT Support Unit
- Administration Unit

These Units may be modified by the CPA from time to time. The Institutional Development, ATU Strengthening Unit and Institutional Excellence Units will be headed by senior academicians (in the rank of Professor/Associate Professor), and experienced professionals will head the Procurement, Finance, IT Support, M&E and Administration Unit. Each Unit head will be assisted by adequate number of suitable support staff. The Project will finance the salary cost of the full-time key and support staff in the NPIU and MHRD, fee to Consultants, salaries of contractual support staff, expenditure on rent and refurbishment of hired offices, goods, minor works, assessment, surveys, institutional audits, studies, reviews, mentoring, study tours and various training workshops, travel, staff welfare and other operating costs of the NPlU and MHRD.

The Project will finance the salary and other costs of the NPIU. This includes the full-time key and support staff in the NPIU, fee to consultants, salaries of contractual support staff, expenditure on rent and refurbishment of hired offices, goods, refurbishment and renovation, study tours and fellowship programs and training workshops, travel and other operating costs of the NPlU.

The NBA and AICTE will be responsible for carrying out their activities as set out in the project description above. They will also ensure appropriate staff to follow the procurement and financial management procedures for the project.

The project will also support around 5-7 new Centrally-Funded Institutions (CFIs) in Component 1.1 for Scaling-up post-graduate education, Research, Development, and Innovation. These institutions will be financed exclusively by the Central Government. Project implementation in the CFIs will be overseen directly by the NPIU and the appropriate bureau in the MHRD, and not through a state government.

7.1.2 State-Level Project Implementation Arrangements

The project States/UTs will be directly responsible for management, coordination, implementation and monitoring of the Project at the State/UT level. The two bodies, the State Steering Committee (SSC) and the State Project Facilitation Unit (SPFU) responsible at the State level for carrying out these responsibilities are briefly described below.

The State Department responsible for higher technical education will constitute a State Steering Committee (SSC) chaired by the Principal Secretary/ Secretary responsible for higher technical education. The composition of the committee is described in the Project Implementation Plan (PIP). The SSC will meet quarterly. It will be assisted in its functioning by the SPFU. The operational costs of the SSC, including sitting fees for non-official members, will be financed by the Project through the SPFU's budget. The SSC will primarily be responsible for guiding and overseeing the work of the SPFU.

The Department of the State/UT government responsible for managing higher technical education will establish a State Project Facilitation Unit (SPFU). Under the guidance of the SSC, the SPFU will carry out overall supervision and facilitation of project implementation in the institutions of that State/UT (i.e., colleges and ATUs). It will be established at the time and with staffing as described in the PIP and agreed to in the Memorandum of Understanding signed between the MHRD and the State/UT Government. The Director of Technical Education is expected to be the Head of the State Project Facilitation Unit (SPFU). The SPFU will be located in the State Directorate dealing with Higher Technical Education. Further, it will coordinate with the NPIU, coordinate implementation of the project and monitor progress on a day-to-day basis, prepare project's annual work plans, including operations and budgets, furnish information to the State government, State Steering Committee and the NPIU as well as to the National Project Directorate, as required, ensure implementation of EAP, EMF and DMF by itself and by project institutions, and ensure compliance.

7.1.3 Institutional Level Implementation Arrangements

The Project at the institutional level will be managed by an Institutional TEQIP unit under the guidance of the Board of Governors. The Board of Governors will take all policy decisions with regard to smooth, cost effective and timely implementation of the Institutional sub-Project. It will monitor progress in the carrying out of all the proposed Project activities, resolve bottlenecks, and enable the institution to achieve targets for all key indicators. It will set in motion the implementation of all academic and non-academic institutional reforms. It holds the ultimate responsibility that the

institution complies with the agreed procedures for procurement and financial management, and other fiduciary requirements under the Project.

Each institution will form an Institutional TEQIP Unit led by the Head of the institution. This unit will be responsible for implementation of the institutional sub-project with representation from academic officials of the institution, faculty, senior administrative officers, technical and non-technical support staff and students. The head shall be assisted by a Senior Professor for coordinating the activities of the project. The Institutional TEQIP unit will operate through several committees for procurement of Goods, refurbishment and renovation, and Services; financial management; implementation of faculty development activities and programs; monitoring project implementation, achievement of targets for all indicators as proposed and keeping MIS updated; ensuring compliance with EAP, EMF and DMF requirements; ensuring implementation of institutional reforms; and organizing efficient conduct of monitoring and performance audits.

For Affiliating Technical Universities, each institution will form an Institutional TEQIP Unit led by the Vice Chancellor or Registrar, which will have the final decision-making power over activities and be responsible for implementation. It is expected that the Unit will operate through relevant committees overseeing the particular activities that the ATU will undertake. The ATU's Action Plan will include a proposed implementation committee structure, though committees for procurement and financial management are required at all institutions, and the composition of the various committees.

Colleges under sub-component 1.1 will also receive mentoring support for implementation, from individual expert mentors assigned to them and by mentoring institutions from sub-component 3.1.

7.1.4 Staffing for Environment Management

In the light of the above, the institutional arrangements for implementing the project will integrate capacity and professional expertise to plan and implement actions towards fulfilling the requirements set forth in the EMF. The MHRD/PMU will enhance its implementation capacity with hiring consultant/s to technically support, coordinate, monitor and report EMF implementation. This team will include a civil engineer and/or an architect/planner to support the EMF implementation, including the green building/campus initiatives. The states and individual institutes may hire full/part time consultants, as needed for supporting field-level design and/or implementation. Specific capacity building will be required for staff involved in building design, construction and maintenance at the institute level to ensure that the vision of creating clean, safe and green campuses is actually realized on the ground.

7.1.5 Monitoring of EMF

Safeguards Monitoring will be an integral part of the implementation and monitoring system of the project. Regular performance monitoring of EMF implementation will be carried out by the internal oversight mechanisms of the project spelt out above. The lead institutes will play a key role in flagging campus environment issues before

the PMU. EMF implementation review shall be carried out periodically for recording lessons and ensure implementation quality with necessary capacity building measures as necessary. Additionally, at the state level, there shall be an Advisor on "Campus Environment Management", having experience and expertise in environment, health and safety and building design (specifically green buildings) issues.

7.1.6 Reporting Requirements

Review Missions: Combined teams of MHRD and the World Bank will undertake joint review missions to assess project progress every six months during the project implementation period. Each progress report will document the extent to which the project is on track in achieving the PDO, progress on agreed actions, identify key implementation issues and challenges, and make recommendations for future actions. The progress report will also provide evidence underlying the achievements, document implementation progress, and report on fiduciary and safeguards aspects of the project. Based on their findings, the review missions will agree on next steps to be undertaken to improve project implementation in the ensuing six months. Thematic area experts may be invited to participate in the review missions as necessary.

Mid-Term Review: A Mid-Term review of the project will be carried out, along the lines of the joint review missions, roughly half-way through the project implementation period.

7.2 Consultation with Key Stakeholders

Consultations play a major role in identifying the potential impacts of any project. Organized with the associated stakeholders, consultations play an important role in identifying the gaps in the present arrangements, discussing various components of the proposed project and also in the getting a buy in of all the associated players. A participative approach is followed during this process.

7.2.1 Objectives

Stakeholder consultation to support the EMF, specifically aims to achieve the following objectives:

- To provide information about the project and its potential impacts to those interested in or affected by the project, and solicit their opinion in that regard
- To manage expectations and streamline misconceptions regarding the project
- To ensure participation and acceptance of the project by the project proponents/stakeholders.

7.2 Methodology

The first step in this process was:

I. Identification of key stakeholders:

- Ministry of Human Resources and Development, Govt. of India.

- Management representatives from technical colleges such as Principals/Administrative staff associated with Planning/Construction/ Maintenance of Buildings. These are important stakeholders owing to their knowledge of the local area and surrounding. Their influence on the program further increases during the operation phase since the entire responsibility of maintenance and upkeep of the institution lies with them.
- Academics from the departments of Civil Engineering and related fields. The project envisages moving to 'greener' and more sustainable designs for construction. These departments/fields will play a crucial role in this process.
- Student Representatives. These include representatives from the various student associations, welfare bodies (including women, youth and/or physically challenged) - the most important stakeholder in the process since they are directly impacted by the outcomes of the project.
- Government Agencies responsible for implementing, and monitoring the environmental policies set forth by the state/national government. These include representatives from the Environmental Planning & Coordination Organization of the state, representatives from the State Pollution Control Board and representatives from the state Environmental Impact Assessment Authority. These representatives can view the proposed framework from the legal standpoint and also give important inputs on the efficacy of it implementation.
- Representative from NGOs working on education sector programs/projects. These stakeholders understand the sector well and will be able to provide useful inputs on the existing gaps that need to be addressed in the technical education sector.

Subsequent to identification of the stakeholders, a consultation plan was drawn up. The consultation plan was based on the preliminary understanding of the issues and concerns which need to be discussed with the stakeholders identified. The stakeholder were informed about the outline of the project and also given an understanding of the purpose of consultations.

After the identification of the stakeholders, the consultations for the project have been carried out in two phases, namely:

1. **The Assessment Phase:** The consultations at this phase were more focused on understanding the present work processes. The consultation during this phase was intended to assess whether the process involved in the program can identify, assess and mitigate the potential environmental risks.
2. **The Development Phase:** During this phase of the consultation, the Environmental framework that has been drafted was discussed with all stakeholders. The specific provision in the guidelines, proposed work procedures etc. were discussed in a workshop attended by all stakeholders to get their feedback on the proposed system.

General concerns associated with the process primarily revolve around the quality of the process. The consultation process needs to be carried out in a fair and transparent manner to ensure that all stakeholders have a voice on the table and such that their

views can be captured. This would help improve the design of the proposed project and make it more robust.

8.3 Key Findings

For preparation of TEQIP-III, consultations were held with key stakeholders referred above, including students from under-graduate and post graduate courses, research scholars and faculty members. The consultations were carried out at Institute of Engineering & Technology Lucknow (in November 2015).

During the consultations, the following environmental issues were flagged:

1. Inadequate/poor of fire & electrical safety arrangements
2. Lack of safety signage and do's & don'ts in laboratories and workshops,
3. Lack of natural light and ventilation in classrooms and laboratories,
4. Unavailability of first aid and emergency response arrangements,
5. Inadequate sweeping and cleanliness in hostels and college premises,
6. Growth of undesired vegetation resulting in occurrence of snakes and mosquitoes in hostels,
7. Inadequate toilets in hostels,
8. Improper disposal of solid wastes and waste water (sewage).

It was also noted that most of the students, research scholars and even faculty members are not fully awareness about environmental, health and safety issues. During discussions, teachers/faculty members emphasized the need of awareness and capacity building program for environmental management framework under Technical Education Quality Improvement Programme III.

7.3 Lessons Learned from TEQIP II and Reflected in the Project Design

1. **Performance-based funding leads to excellence:** Under TEQIP II, institutions received additional funds based upon satisfactory performance on indicators that were revised every six months. While only 33.5 percent met the benchmark satisfactorily in 2013, most recently, 87.5 percent of institutes met these benchmarks, demonstrating the importance of performance-based funding for achieving results. Under TEQIP III, performance-based measures will continue in the relationship between MHRD and project institutes and also be incorporated for the first time into the relationship between Government of India and the World Bank.
2. **Modelling excellence is important:** Both TEQIP I and II focused on excellence through intensive engagement with a limited number of competitively selected institutes. As a result, 65% of TEQIP institutes are already autonomous and nearly 77% of the remaining have applied to UGC for autonomy after completing all the necessary work. Similarly, TEQIP institutes receive much higher ratings when applying for accreditation. Finally, experience from previous phases of TEQIP shows that reforms in technical education can lead to substantial increases in R&D activity. The improvements in R&D have come mainly from high-performing government institutes.

These activities will be continued in TEQIP III, where high-performing government and government-aided institutes in non-LIS will be funded on a competitive basis and upon achievement of pre-specified results.

3. **Equity goals require focused efforts on transition rates and an LIS strategy:** By focusing on transition rates of students from first to second year, disaggregated by gender and caste, TEQIP II has helped institutes design activities to help students from rural backgrounds, SC/ST students and female students improve their transition rates. In TEQIP III, these activities will be continued, drawing upon the latest insight from behavioral studies on interventions that help disadvantaged students manage the social and cultural change of studying in a college. In TEQIP I and II, the majority of colleges in LIS states were unable to perform satisfactorily due to limited stakeholder commitment to reform. TEQIP III's design addresses this through a sub-component focused exclusively on LIS states, with modifications in implementation arrangements to meet the needs of these states.
4. **Systemic reform in engineering education should include private institutes:** Both TEQIP I and II included a relatively small number of private institutes (10-15%). While these interventions allowed the selected colleges to model excellence, in a sector with nearly 3100 private colleges, this had limited impact. Recognizing this, TEQIP III will aim to reach all private colleges in approximately ten states through working with ATUs and AFRCs in these states. Further, activities targeted at apex national bodies such as AICTE and NBA are also expected to help improve the quality of education in private colleges.
5. **Institutional development depends on strong governance.** The most successful colleges under TEQIP I and II have been those with Boards of Governors (BoG) with sufficient independence from the state government and with the right expertise. These colleges have been able to chart their own development path. Exercising autonomy and showing results makes it harder for state governments to take back control and micro-manage institutions. Equally state governments have an important role to support institutional governance, by appointing permanent principals and effective members of the BoGs, and by extending the experience of TEQIP institutions to non-TEQIP institutions.

Annexures

Annexure 1

Format for Site Assessment – Documentation of Encumbrances

- Name of the Institute:
- Name of the Work:

Note

Information in form of number/units and whether it will be relocated/reconstructed or shifted or compensated or any other information relevant should be provided in the remarks column.

S. No.	Type of Encumbrance	Remarks
a.		
b.		
c.		
d.		
e.		

Annexure 2

Environment Management Measures

Checklists for Design, Construction and Operation Stages

CHECKLIST FOR DESIGN STAGE

1. Building/Block Design and Related Aspects

S. No.	Aspect	Yes/No	Remarks
f.	Have the relevant construction code/s, applicable for earthquake, cyclone, flood and/or landslides, been adopted during building/ block design?		
g.	Have adequate fire safety measures been put into place?		
h.	Has the water supply arrangement been made as per norms?		
i.	Is the provision of potable water arrangement sufficient?		
j.	Has the sanitation arrangement been made as per norms?		
k.	Are there specific arrangements for the physically challenged in the toilets/urinals?		
l.	Does the building/block provide for barrier free access for the physically challenged?		
m.	Is there any unhygienic area within the campus? Eg: Open clogged drains carrying waste water		
n.	Is there any water logging in the campus?		
o.	Have adequate numbers of dust bins/garbage collection facilities been provided?		
p.	Were any trees cut for the construction of new building/block?		

S. No.	Aspect	Yes/No	Remarks
q.	Has signage (internal as well as external) been provided?		
r.	Have sufficient number of display/notice boards been provided?		
s.	Is there any provision for alarm/s or hooter/s ?		
t.	Is there a proper and sufficient provision for parking?		
u.	Is there any proposal to undertake tree plantation?		
v.	Is there any landscaping proposal?		

2. Environment Augmentative Measures

S. No.	Aspect	Yes/No	Remarks
a.	Are wood substitutes being proposed?		
b.	Is the use of fly ash (brick, block or in any other form) being proposed?		
c.	Is rain water harvesting arrangement proposed?		
d.	Is energy efficient lighting being provided?		
e.	Is there any requirement to provide for acoustic measures?		
	If yes, have such provisions been made in the design?		
f.	Are there any provision/measures to support water conservation?		

S. No.	Aspect	Yes/No	Remarks
g.	Does the proposed colour scheme take into account heat absorption factor?		
h.	Is there any initiative on vermi-composting?		
i.	Is there any proposition to use locally available material?		

CHECKLIST FOR CONSTRUCTION STAGE

S. No.	Aspect	Yes/No	Remarks
a.	Is the required Personal Protective Equipment (PPE) (as relevant to the needs of the work) being provided to the workers?		
	Is the PPE being used by engineers and supervisors?		
	Is the PPE being used by the labour?		
b.	Have any enforcement mechanism/s been put into place towards ensuring use of PPE provide?		
c.	Are proper safety precautions/practices being taken during erection and use of temporary structures such as scaffoldings?		
d.	Are proper safety precautions/practices in place for working platforms and ladders?		
e.	Does the worksite have restricted access?		
f.	Is/are the worksite/s barricading properly?		
g.	Have proper precautions been taken to ensure fire safety during construction?		
h.	Are the required measures in place to ensure electrical safety during construction?		
i.	Is there a mechanism in place to check the		

S. No.	Aspect	Yes/No	Remarks
	safety of various mechanical equipment and machinery that is being used for construction?		
j.	Has the information on Minimum Wages been displayed in the local language?		
k.	Is the worker accommodation in line with legal provisions?		
l.	Is there a proper potable water supply arrangement for workers?		
m.	Has proper sanitation arrangement (toilets, urinals, bathrooms) for workers (including separate ones for women workers, as required) been made?		
n.	Has the contractor made first aid and emergency response arrangement on the worksite?		
o.	Has the storage/stacking of materials been appropriately (safely) done?		
p.	Are there adequate and proper waste collection and disposal arrangements on the worksite?		
q.	Are acoustic generators being used for construction?		
r.	Is the construction work causing any inconvenience to any of the campus residents/users?		
s.	Has the worksite been cleared off all debris, wastes and left over materials?		
t.	Has the worksite or area used temporarily during construction been restored?		

CHECKLIST FOR POST-CONSTRUCTION/OPERATION STAGE

S. No.	Aspect	Yes/No	Remarks
a.	Are the required numbers of first aid boxes available?		
	Is the provision in the first aid boxes as per the norms?		
b.	Are the following utilities/services/facilities functioning properly and are these being maintained properly?		
	Water Supply Arrangements		
	Potable Water Arrangement		
	Sanitation Arrangements		
	Solid Waste Collection and Disposal Arrangements		
	Waste water collection and disposal system		
	Storm water collection and disposal system		
c.	Are the landscaping works being maintained properly?		
d.	Is the survival rate of plantation more than 80 percent?		
e.	Is there a clear demarcation of escape routes and assembly points for emergency situations?		
f.	Are the fire safety arrangements being regularly checked regularly?		
g.	Is the follow-up action (such as refilling of fire extinguishers) action on fire safety issues being taken in time?		
h.	Are the hooters/alarms in working order?		
i.	Does the institute conduct/arrange safety drills from time to time?		

Note

Information in form of number/units, norms/standards used, reasons, remarks on applicability (for example, one can say 'not applicable' in situations where acoustic measures are not required or in a case where already a rain water harvesting system is in place, one could say 'it already exists')) or any other information relevant should be provided in the remarks column.

Annexure 3

Guidelines for Environment Friendly Colleges/Institutes

The following guidance is being provided to help create safe and sustainable technical education buildings and enhance environmental friendliness of school buildings:

a. Sustainable College/institute Design

Innovative Design is strongly committed to designing college/institutes that not only embrace the concept of sustainability but are, in themselves, teaching tools for sustainability. Studies have shown that college/institutes incorporating passive solar features, such as daylighting, use less energy, student grades have improved, and attendance is higher.

The college/institute should incorporate environmentally friendly design principles, including:

- Building orientation to increase day lighting and reduce fluorescent lighting
- High-efficiency electric lighting
- Light and motion detectors to monitor energy usage (if viable)
- Solar panels to heat water for the college/institute
- Minimize impervious surface in the landscape
- Rainwater collection to water college/institute lawns
- Native landscaping to reduce water use
- Eco-garden to demonstrate water conservation and aquatic plants and animals (if viable)
- Outdoor teaching spaces
- Use of regionally produced products
- Low-toxic or non-toxic building materials
- Weather station to demonstrate energy and water conservation systems
- Minimized construction waste, and recycling of construction materials, and
- Restoring waterways and vegetation in and around site.

b. Site Selection and Preservation

It is appreciated that from a design perspective, designers are not commonly presented with a choice of sites for a new building to be constructed upon. However, in those situations where a choice is offered it is necessary to consider, again at the earliest possible stage, the wider issues in design terms.

The site may be vulnerable due to possibility of flooding, pollution or vehicular accidents. To ensure safety of students, the following guidance may be of help:

- The site should be at least 5 ft above the 100 years High Flood Level of the nearest water body.
- The site should not be located within 1 km from any industrial estate or any major hazard category industry as per Ministry of Environment and Forest classification.
- The site should not be within 1 km at the downwind side of any red category industry as per the Central Pollution Control Board classification. Wind direction should be taken as annual average wind direction provided by nearest weather station.
- The site should not be abutting National Highways. If unavoidable, then the access to the site should not be directly from the highway.
- The site should not be on or within a distance of 500 m from a municipal/ hazardous waste dumping ground.
- The site should not be on or within a distance of 500 m from a contaminated area declared by State of Central Pollution Control Board.

It is preferable to choose site which is near to:

- Bus stops
- Developed area with where local governmental body is providing water supply, sewage and solid waste facility

c. Use of site features/site planning and landscape design

The design must make use of existing site features. The site features can be appreciated in the form of existing trees, slope, boulders, water body/channel or even presence of good view of natural landscape. As far as possible, such features should be preserved and used as part of design.

- Develop the site in an environmentally sensitive manner.
- Understand and maximize natural site conditions.
- Design the site for easy pedestrian, bicycle, mass transit, and handicap accessibility.
- Provide site protection during construction.

d. Energy Efficient Building Envelope

- Design shall address all radiant energy flows as well as conductive heat gain and loss.
- Select the optimum glazing for each location on the building.
- Provide proper window treatments to maximize winter solar gain and minimize summer overheating.

e. Construction Material

Major amount of energy is consumed by building construction material in manufacturing and transportation.

Use of Recycled Material: Recycling construction material or use of material with recycled content will reduce demand for new material. Maximum use of fly ash can be a major environmental achievement. As per the Fly Ash Notification September 1999 and amended as on August 23rd 2003 fly ash should be used as building construction material, if the project is located with 100km of Thermal Power Station. This can be achieved through following measures:

- RC (reinforced concrete) (including ready-mix concrete) to make use of fly ash by using PPC (Portland pozzolona cement) containing fly ash. A minimum of 15 percent replacement of cement with fly ash in PPC (by weight of the cement used) in the over-all RC for meeting the equivalent strength requirements.
- Use fly ash in Plaster/masonry mortar by employing PPC. Use plaster and/or masonry mortar, which utilizes a minimum 30 percent of fly ash in PPC, in 100 percent wall/ceiling finishes and wall construction, meeting the required structural properties.

Other recycled material can be incorporated in the building by adopting the following measures:

- Use of recycled steel for reinforcement.
- Use of construction waste generated during construction for levelling and land filling instead of soil or murom.
- Use of furnace slag in concrete.
- Use of rejected or thrown away furniture.

In case of retrofitting existing building, emphasis should be on preserving all the structural members in their original form and use the shell of the building, as far as possible, to house the new activities.

Local Material: To reduce the energy consumption in material transport, use of local material is essential. Any material, which is processed within 500 km from the construction site should be considered as local material. As mentioned earlier if there is conflict between relatively maintenance free material to be procured from distance against high maintenance required material available locally, the decision maker should choose material with less maintenance requirement. Use of precast beams, slabs and panels greatly reduces construction waste and hence demand for new material.

Wood: Use of material obtained from rapidly growing trees and shrubs will also reduce pressure on new material. Trees or shrubs that complete their life cycle within 10 years should be considered as rapidly renewable material. Example of such building material is composite panel doors with wheat or cork core.

Wood whenever used in the building must have certificate from Forest Department. The wood should be directly procured from Auction conducted by Forest Department or the chain of custody should be ensured to ascertain that the wood is coming from officially cut wood provided by Forest Department.

f. Indoor Air Quality / VOC free materials

Volatile Organic Compound (VOC) Emissions caused by paints, varnishes, sealants are harmful for occupiers. The building must use paints that emit low or zero VOC. The VOC limits are specified in the table below.

Material and VOC Limits

Type of Material	VOC Limit
Paints	
Non Flat Paints	150 gram/litre
Flat (Mat) Paints	50 gram/litre
Anti Corrosive/ Anti Rust Paint	250 gram/litre
Varnish	350 gram/litre
Adhesives	
Wood Flooring Adhesives	100 gram/litre
Tile Adhesives	65 gram/litre
Wood Adhesives	30 gram/litre

- Consider physical, biological, and chemical sources of potentially harmful contaminants and select environmentally friendly alternatives.
- Consider material placement, encapsulation, and the incorporation of barriers as means to insure good indoor air quality.
- Incorporate standards for air ventilation strategies.
- Implement pollutant sensors and air quality monitoring equipment that controls fresh air make-up.
- Use natural ventilation strategies where practical.

g. Lighting

Sufficient lighting is essential in every college/institute building for tasks like reading, writing, art and crafts etc. Insufficient lighting may increase stress on eyes and irritation. The lighting can be divided as Natural Lighting and Artificial Lighting according to its source.

Natural Lighting: In a college/institute building, lighting is most important aspect of design. Use of natural light is most preferable as it is free and provides better

colour recognition. At least 75% of the floor area of each classroom should achieve at least 2% day light factor.

Day light factor can be calculated using various free software that can simulate the natural lighting. For manual calculation following method should be adopted.

$$\text{Daylight Factor} = \frac{\text{Window Area [SF]}}{\text{Floor Area [SF]}} \times \text{Window Geometry} \times \frac{\text{Actual Visible transmittance}}{\text{Minimum Visible transmittance}} \times \text{Height Factor}$$

- Window Area: Area of glass in the window
- Floor Area: Carpet area of the room
- Actual Visible transmittance: Transmittance of glass used for window

For other factors see the following figure. Other considerations include the following:

- Incorporate day lighting as a significant lighting strategy for all main teaching and learning spaces.
- Orient buildings to maximize southern exposure and minimize east-west walls.
- Reduce cost by integrating day lighting components into overall design.
- Account for benefits of day lighting by reducing cooling equipment and electrical lighting.
- In general, the internal colour should by a light shade which will reflect available light

Energy Benefits of Day Lighting

- Drastically reduces energy costs by up to 64%
- Saves on the up-front expense of cooling and electrical equipment, thereby keeping costs within budget
- Cuts the expenses associated with long-term mechanical and lighting equipment maintenance
- Produces superior lighting conditions; and
- Improves health and increases attendance.

Artificial Lighting / Energy Efficient Lighting and Electrical Systems: Artificial lighting should be mostly used as support to natural lighting at day hours in most of the classrooms. Artificial lighting will be absolutely necessary in case of laboratories, library, stores and function halls. While selecting lighting bulbs, the following factors should be considered:

- The lighting should be designed using software that can simulate indoor lighting conditions using manufacturer's data about luminaries. Such software is freely available on internet.
- Compact Fluorescent Lamps are easily available and provide great efficiency in lighting small spaces. These lamps or T5 tube lights should be used in class rooms.

- To light large areas like play ground or function halls, high pressure sodium vapour lamps should be used. These lamps are the most energy efficient lamps and have long working life.
- Lighting grid should match the working platform grid in laboratories.
- Employ lighting systems that are compatible with the day lighting strategy and use full-spectrum lighting in well-utilized, non-day lit spaces.
- Utilize controls that reduce lighting levels in stages according to the amount of natural daylight in each space.
- Use high-efficiency products that require low maintenance.
- Control key components of lighting, mechanical, and electrical systems with energy management system.

h. Ventilation

Indoor air quality is adversely affected by presence of indoor air pollutants and air changes. In a college/institute building, indoor air pollution can come from following sources: paints, varnishes, solvents that emit volatile organic compounds and carbon dioxide from human breathing. Generally used cleaning agents and cooking also contributes to indoor air pollution. To eliminate the threat of indoor air pollution, good ventilation is essential.

To ensure good ventilation following points should be considered:

- In most of the college/institute building the class rooms are built along a corridor in a row. This arrangement minimizes use of space but eliminates the possibility of cross ventilation. If the college/institute design is single storied then following arrangement can be used to achieve cross ventilation without compromising the use of single corridor by two rows of classrooms. See figure given here.
- At least 3 m. distance should be there between two external surfaces (say, walls) which are facing each other.
- Preferably, the room should have openings on two different walls to ensure cross ventilation.
- After the building construction is complete, including internal colouring and furniture work, the building should not be used for 10 days. During this time, all the doors and windows should be kept open so that all accumulated indoor pollution during construction can be flushed out.
- Laboratories must achieve desired ventilation through exhaust fans.
- If the college/institute building is single storey, wherever possible wall mounted fans should be used instead of ceiling fans. The ceiling of a single storied building absorbs heat of sun radiation and the ceiling fan circulates hot air into the room. A wall mounted fan circulates comparatively cooler air and adds to the comfort of the user.
- Employ energy efficient mechanical system.

- Avoid over sizing equipment.
- Utilize waste heat wherever possible.
- Use energy efficient strategies to insure good indoor air quality.

i. Water

Water conservation in a college/institute building can be achieved by adopting the following measures:

- Providing water efficient landscape.
- Trees that do not require water after first two years should be preferred in the college/institute premises.
- Minimize water consumption for irrigation through the use of native plants and xeriscape principles.
- Design landscapes with drought-resistant, native plants and grasses, and that support integrated pest management (IPM).
- The garden or trees should be irrigated with drip irrigation system
- Avoid unnecessary water waste by incorporating low-flow and water conserving fixtures.
- Use low-flow fixtures. Water efficient taps (discharging less than 12 litres/minute under 5 bar pressure) should be installed.
- The taps should be of self closing type.
- Water efficient duel flushing system should be used in all water closets.
- Harvest rainwater from the building roof and site for irrigation and toilet flushing. Rainwater harvesting can be efficient way of reducing fresh water demand.

Rain water harvesting system should be installed in the college/institute building. The system should include water collecting pipes from the roof top, valves to direct the down coming water, storage tank and ground water recharge pit/ well. The storage tank should be able store at least two days rain water in it. The capacity of the tank can be calculated in the following manner.

Max Rain Fall (as per IMD) occurred in a day in last 10 years for the regions expressed in meters X roof area in squire meters X 0.9 X 2	= Storage Capacity of tank in Cubic Meters

The system should allow for the first rainfall water to be directed to storm water drain and then subsequently should be directed into the storage tank. The overflow of the storage tank should be connected to rainwater harvesting pit or well. The overflow of the recharge pit or well should be connected to storm water drainage.

j. Energy

Reducing the electrical consumption without compromising the users comfort level is the goal of a sustainable building. The energy consumption in a college/institute building would be for lighting and mechanical ventilation. If the day-lighting and ventilation aspects are taken care of, the majority of electrical consumption requirements would be reduced. To enhance energy savings, the following measures should be implemented.

- Consider the wide range of viable passive energy technologies and integrate them into over-all design for maximum effect.
- Could use Energy modelling and simulation softwares as a decision making tool regards to the Energy Conservation Measures (ECMs) that can be implemented and are also economically viable.
- Use of electrical ballast for all lighting fixtures
- Use of China Mosaic or White Cement Tiles on the roof to reflect the heat radiated by sun.
- Use of energy efficient fans.
- Installation and use of at least 1 kW capacity hybrid system (Solar and Wind) for artificial lighting.
- Dove tailing with other GoI initiatives such as the Solar Mission.

k. Solid Waste

Solid waste generated in the college/institute building is considered as Municipal Solid Waste which is largely non-hazardous. Such waste would comprise of biodegradable material, recyclable material and inert material. Segregation at source would be essential to manage the waste efficiently. The biodegradable part of the waste should be composted within the college/institute premises. Various composting techniques are available and can be used as per the requirement of the particular case. Composting would be most suitable technique for rural college/institutes as it requires large areas but can be treated without any cost.

Vermi-composting, on the other hand requires smaller space and requires some maintenance at regular intervals. Organic Waste Converter requires least space but is costliest to maintain. Thus, technique should be selected according to space availability and cost constraints. The recyclable waste can be sold to authorised vendors and inert waste should be handed over to the local governing body.

Some part of waste generated by college/institute may be hazardous waste also. Especially waste coming from laboratories and non-functional electrical bulbs would prove dangerous, if not handled properly. Waste coming from laboratories may contain harmful chemicals and the issue with Compact Florescent Lamps are the sharp glass pieces and mercury. The designer should provide a secluded storage space for such waste which is not easily accessible to any student.

l. Barrier free Environment

The States need to create a barrier free physical environment in the college/institute on following lines:

Students with loco-motor impairment: Includes students with non ambulatory and semi ambulatory disabilities.

- Gates, approach road and steps to allow for smooth movement.
- Ramps with handrails to be provided.
- No major level differences within building.
- Toilets to be provided with adjustable seat, grab rail and ramp.

Students with visual impairment: Includes students with low vision and total blindness.

- Plan of the building should be simple.
- Design of windows and illumination levels to eliminate glare
- Reduce distance between the child and the chalk board
- Use of contrasting colours and textures to aid identification of levels, ramps, passageways, steps, doors etc.
- Minimize risk of injuries - avoid projections, sharp edges etc.
- Provision of embossed eye charts on walls

Students with hearing impairment: **S**tudents with hearing deficiency or have difficulty in comprehending words and sounds in noisy environments.

- Reduce distance between teacher and child
- Insulate walls – provision of low cost mats and panels, soft board, charts etc.
- Provision of supplementary visual information – ideograms

Students with intellectual impairment: Students with uncommon social behavior or hyperactive

- Provide for open space and greenery
- Create / in built personal space for the child
- Use of bright colours
- Provision of in built play elements

m. Safety

Safety of the pupil and teaching staff is foremost important issue, which can be addressed through some design interventions as mentioned below:

- Providing sufficient high boundary wall – open access not just to the college/institute grounds but to areas around the buildings will be a safety concern as college/institutes in rural areas may be constructed outside developed areas.
- Providing strong and good quality doors, windows, frames and locking devices;
- Making roofs difficult to access
- Providing sufficient firebreaks in wall, ceiling and roof voids;
- Improper or easily accessible storage of waste could be harmful to pupil
- Providing sufficient and proper storage. Lack of this generally results in piling of equipments, furniture or records in corridor which will hamper movement especially in the case of emergency.

n. Other Environmentally Sensitive Building Products and Systems

- Consider the life-cycle energy and environmental impacts of products, materials, and processes - prefer local, recycled, non-polluting materials.
- Use products that are made from recycled materials.
- Prefer local products, materials, and services.
- Use products/materials that do not pollute
- Use alternative fuel and solar electric service vehicles and buses.
- Discourage single car travel by providing convenient connections to mass transit, safe bicycle paths and pedestrian friendly walkways.
- Develop and implement an effective commissioning process that will help ensure proper operation of mechanical and electrical systems.
- Through the design of the building, send a clear message that sustainability matters - design the college/institute as a teaching tool for sustainability.

Annexure 4

Generic EMP for Building Construction

S.No.	Activity	Measures to be Implemented by the Contractor
1.	Work Plan for EMP implementation	The Contractor's Project Manager shall be responsible for implementation of EMP provisions and will coordinate the over-all implementation of the said plan. Along with the Work Programme, the Contractor shall submit a plan including method statement and timeline about specific actions that will be taken by him to implement the provisions laid out in the EMP.
2.	Construction/ Labour camp – location	• Construction camps shall not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. • Camp site shall not be located within 250 m from a water body including village pond. • A distance of at least 500 m shall be maintained from designated/protected natural habitats (such as National Parks, Sanctuaries, Biosphere Reserves, Reserve Forests and Ramsar Sites, if any) and Coastal Regulation Zone.
3.	Labour Camp Management	**Accommodation:** The Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. **Potable water:** The Contractor shall: a) Supply of sufficient quantity of potable water (at least 40 lpcd) in labour camp at suitable and easily accessible places and regular maintenance of such facilities. b) If any water storage tank is provided, the bottom of the tank shall be kept at least 1mt. above the surrounding ground level. **Fuel for Cooking:** The Contractor will be responsible for providing LPG Cylinder/Kerosene in labour camp to avoid cutting of trees for fuel wood from the adjoining areas.

S.No.	Activity	Measures to be Implemented by the Contractor
		Sanitation and sewage system: The Contractor shall ensure that: • The sewage system for the camp shall be designed, built and operated in such a fashion that it should not pollute the ground water or nearby surface water. • Separate toilets/bathrooms, shall be arranged for men and women • Adequate water supply is to be provided in all toilets and urinals • All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition • Night soil (human excreta) is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight. **Waste disposal:** The Contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. **Fire Safety:** Adequate fire safety precautions shall be taken and required fire safety equipment (such as fire extinguishers) shall be provided by the Contractor.
4.	First aid	The Contractor shall arrange for – • A readily available first aid unit including adequate supply of sterilized dressing materials and appliances as per the Factories Rules in work zone • Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital
5.	Labour's Safety	The Contractor shall provide: • Protective footwear and protective goggles to all workers employed on mixing cement, concrete etc. • Protective goggles and clothing to workers engaged in stone breaking activities • Earplugs to workers exposed to loud noise, and workers working in concrete mixing operation. • Adequate safety measures for workers during handling of materials at site.

S.No.	Activity	Measures to be Implemented by the Contractor
		The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract. The Contractor shall make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. The Contractor shall not employ any person below the age of **14 years** for any work and no woman shall be employed on the work of painting with products containing lead in any form. The Contractor shall also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. He shall provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint is rubbed and scraped. The Contractor shall mark 'no smoking' in high risk areas. These shall be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and shall be approved by competent authority.
6.	Labour requirements	Local people shall be given preference for unskilled and other jobs created during construction phase of the project. The contractor would notify requirement of unskilled labours in nearby/surrounding villages. In case local labours are not interested/available then a certificate/letter shall be issued by the Panchayat officials to the Contractors in this regard.
7.	Site Clearance	Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from competent authority.. The Contractor, under any circumstances shall not cut or damage trees. Trees identified under the project shall be cut only after receiving clearance from the State Forest Department or after the receipt of written permission from competent authority.

S.No.	Activity	Measures to be Implemented by the Contractor
9.	Preservation of top soil	The topsoil from all areas of cutting and all areas to be permanently covered shall be stripped to a specified depth of 15 cm and stored in stockpiles. A portion of the temporarily acquired area shall be earmarked for storing topsoil. The following precautionary measures shall be taken to preserve them till they are used: (a) Stockpile shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, the edges of the pile shall be protected by silt fencing (b) Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum to ensure that no compaction shall occur. The top soil shall be reinstated in the cyclone shelter compound after the construction is over. Residual topsoil, if there is any shall be utilized for the plantation.
10	Construction vehicles, equipment and machinery	All vehicles, equipment and machinery to be procured and brought to site for construction shall confirm to the relevant Bureau of India Standard (BIS) norms and the manufacturer's specifications. The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. Noise limits for construction equipment to be procured shall not exceed the value specified in the Environment (Protection) Rules, 1986. The equipment proposed to be used for construction and installed close to waterway/streams, must be checked and certified fit, especially with respect to the potential leakage of oil and grease. The inspection should verify that: • Equipment is clean (free of mud, dirt and oil) • Equipment is in good working order. • A drip pan is available for equipment that shall be stored on site. • Contractor has a spill kit • Operator is trained on the re-fuelling, maintenance and emergency spill procedures. • Adequate inspections shall be conducted during the construction period.

S.No.	Activity	Measures to be Implemented by the Contractor
12.	Construction water	Water for construction and for use at construction camps (including labour camps) is to be extracted with prior written permission of (a) the individual owner, in case the source is private well/tube well; (b) Gram Panchayat in case the source belongs to community; and (c) Irrigation Department in case the source is an irrigation canal or a river. The Contractor shall take all precaution to minimize the wastage of water in the construction process.
13.	Air pollution	• The Contractor shall take every precaution (water sprinkling etc.) to reduce the level of fugitive dust generating from construction site. • Water shall be sprinkled at least twice during dry day on haulage roads passing through or near settlements (including at least 100 m before the settlement). • Wind barriers or screens shall be provided in the downwind direction at air pollution causing sources like plant sites and fine material storage stock yards. • Truck carrying construction materials will be duly covered to avoid spilling. • The Contractor shall ensure that all vehicles, equipments and machineries used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of State Pollution Control Board (SPCB). • The Contractor shall submit PUC certificates for all vehicles/ equipment/machinery used for the project and maintains a record of the same during the contract period.
14.	Noise Pollution	The Contractor shall confirm the following: • All plants and equipment used in construction shall strictly conform to the CPCB noise standards. • All vehicles and equipment used in construction shall be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers

S.No.	Activity	Measures to be Implemented by the Contractor
		shall be checked and if found defective shall be replaced. • At the construction sites within 150 m of the nearest habitation, noisy construction work shall be stopped during the night time between 9.00 pm to 6.00 am.
15.	Water Pollution	***Water pollution from construction wastes*** The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. He will avoid construction works close to streams or water bodies during monsoon. All measures (including provision of temporary silt fencing to control sediment run-off) required for avoiding adverse impacts to water bodies (such as ponds, streams, canals and rivers), water sources (such as hand pumps and wells) and adjacent farmland shall be undertaken by the Contractor. ***Water pollution from fuel and lubricants*** • The Contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance sites are located at least 100 m away from any water body. The Contractor will also ensure that spillage of fuels and lubricants do not contaminate the ground. • If fuel storage and re-fuelling areas are located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such activities. • Storage of materials like fuel, chemicals and cement shall be done in a manner (with impervious layer on bottom and a covered shed on top) that does not contaminate land and ground/surface water.
16.	Solid Waste	Solid waste from the project during construction will be mainly domestic scraps & wastes from the construction camp and construction spoils from construction sites. • The small amount of construction debris will be disposed of in suitable pre-identified or existing

S.No.	Activity	Measures to be Implemented by the Contractor
		dumping areas in tune with the local condition to avoid land degradation & water logging due to indiscriminate dumping. • Dumping areas will be biologically reclaimed through top soil cover. • Regular inspection of haul roads, construction site & camp will be carried out to ensure regular and timely removal of construction debris to the dumping sites.
17.	Restoration and Rehabilitation of Sites	All work sites and areas under temporary use (including construction and labour camps, plant sites, haul roads and borrow areas) shall be restored/ rehabilitated to a better condition (if not at least to its original condition) and to the satisfaction of land owner upon completion of construction work by the Contractor. Completion of work will also include completion of rehabilitation and clean-up of the work sites including camps, plants, in and around the construction site; disposal of debris/construction wastes at pre-approved locations and; restoration of borrow areas and other sites/locations used for material sourcing.
18.	Liabilities	Any liability arising out of Contractor's agreement with landowners/ local people/gram panchayat (including those related to temporary use of land, water extraction and disposal of debris) shall be settled by the Contractor.

Annexure 5

Construction Camps and Basic Amenities for Labour

Foreseeing the involvement of women, both direct and indirect in the construction activities, IA shall ensure certain measures that are required to be taken by the construction contractor towards welfare and wellbeing of women and children during the construction phase such as:

(a) **Temporary Housing:** During the construction the families of labourers/workers should be provided with residential accommodation suitable to nuclear families.

(b) **Health Centre:** Health problems of the workers should be taken care of by providing basic health care facilities through health centres temporarily set up for the construction camp. The health centre should have at least a doctor, nurses, General Duty staff, medicines and minimum medical facilities to tackle first-aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses or critical cases. The health centre should have MCW (Mother and Child Welfare) units for treating mothers and children in the camp. Apart from this, the health centre should provide with regular vaccinations required for children.

(c) **Day Crèche Facilities:** It is expected that among the women workers there will be mothers with infants and small children. Provision of a day crèche may solve the problems of such women, who can leave behind their children in such a crèche and work for the day in the construction activities. If the construction work involves women in its day-night schedules, the provision of such a crèche should be made available on a 24-hour basis.

The crèche should be provided with at least a trained ICDS (Integrated Child Development Scheme) worker with '*Ayahs*' to look after the children. The ICDS worker, preferably women, may take care of the children in a better way and can manage to provide nutritional food (as prescribed in ICDS and provided free of cost by the government) to them. In cases of emergency, a trained ICDS worker can tackle the health problems of the children much more efficiently and effectively and can organise treatment linking the nearest health centre.

(d) **Proper Scheduling of Construction Works:** Owing to the demand of a fast construction work, it is expected that a 24 hours-long work-schedule would be in operation. Women, especially the mothers with infants, should to be exempted from night shifts as far as possible. If unavoidable, crèche facilities in the construction camps must be extended to them in the night shifts too.

(e) **Education Facilities:** The construction workers are mainly mobile groups of people. They are found to move from one place to another taking along their families with them. Thus, there is a need for educating their children at the place of their work. Wherever feasible, day crèche facilities may be extended with primary educational facilities or some kind of informal education facilities

could be created at the construction camp.

(f) **Control on Child Labour**: Minors, i.e. persons below the age of 14 years, should be restricted from getting involved in the constructional activities. It will be the responsibility of IA and social and environmental experts of DPIUs to ensure that no child labourer is engaged in the activities. Exploitation of women is very common in such camps. IA shall keep strong vigilance to ensure cessation of such exploitation.

(g) **Special Measures for Controlling STD, AIDS:** Solitary adult males usually dominate the labour force of construction camps. They play a significant role in spreading sexually transmitted diseases. In the construction camps as well as in the neighbouring areas, they are found to indulge in high-risk behaviour giving rise to STDs and AIDS.

While it is difficult to stop such activities, it is wiser to make provisions for means of controlling the spread of such diseases. IA shall conduct awareness camps for the target people, both in the construction camp and neighbouring villages as well. IA shall have to tie up SACS for awareness and IEC materials, and supply of condoms at concessional rate (or free) to the male workers may help to a large extent in this respect.