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RICS RESEARCH

Real Estate and Construction Professionals in India by 2020

A demand and supply assessment of specialized skill-sets in built environment

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Real Estate and Construction Professionals in India by 2020

A demand and supply assessment of specialized skill-sets in built environment

Report for Royal Institution of Chartered Surveyors

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Real value in a changing world

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1 The Built Environment Sector is a Key Contributor to the Indian Economy

Growth of Indian Economy

In the last 30 years, while India's population has doubled, its economy as measured by Gross Domestic Product (GDP) at market prices has grown by over 50 times. GDP growth rate, which till late 1970's was growing at 3.5% per annum, was observed to be about 6.0% in the 80's and early 90's and subsequently, touched 8.0-9.0% in the 2000's.

Beginning in 2003 growth of the Indian economy indicated the beginning of a cyclical upswing which continued with marked stability till the year 2008-09. At that time the Indian economy saw a significant slowdown with the GDP rate going down to 6.5% owing to global turmoil in the year 2008-09. However, owing to various economic impetuses provided by government agencies and owing to strong performance of the services sectors, real GDP at constant prices was observed to grow at the rate of 6.7% in 2009-10 and 8.3% in 2010-11. One of the important reasons for a comparatively high growth rate of the Indian economy has been the infusion of large capital by foreign investors and growing domestic consumption, reflecting a positive sentiment worldwide and bolstering India's image of being a safe and lucrative investment destination.

Rapid growth in India's GDP has been a result of policy interventions undertaken in 1990's towards improving the business climate of the country, which translated into increased investment by domestic and foreign institutional investors. Growth in GDP also led to greater flows of money which positively impacted construction starts and subsequently real estate activities. This lead-lag causal relationship between GDP and construction along with long term predictions of a fundamentally strong economic growth augurs well for the built environment sector at large.

Defining Built Environment

One of the critical aspects of this research is the consideration of the definition of "Built Environment" which often has different meanings when used in different contexts for the real estate and construction sectors. For the purposes of this research "Built Environment" constituents are defined and detailed in figure 1.1.

Role of Built Environment in Indian Economy

Built environment, comprising of construction and real estate related activities, is already one of the major contributors to the Indian economy, accounting for approx. 20% of GDP in the year 2008–09 from a mere 10% in 1991-92. The Construction industry, in particular, has observed an upsurge in growth as high as around 19.0% in 2005-06, and has continued to grow thereafter at a similar rate. The absolute contribution of the sector is likely to increase in line with GDP output levels as Indian economy continues to grow.

Figure 1.1 Built Environment Sector

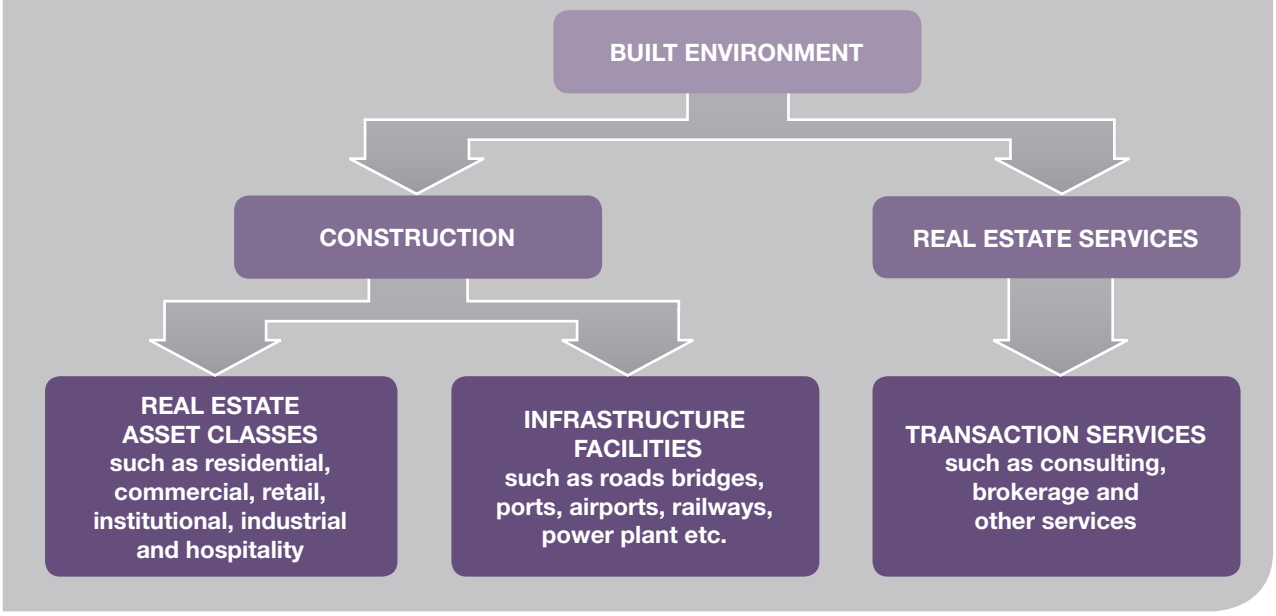
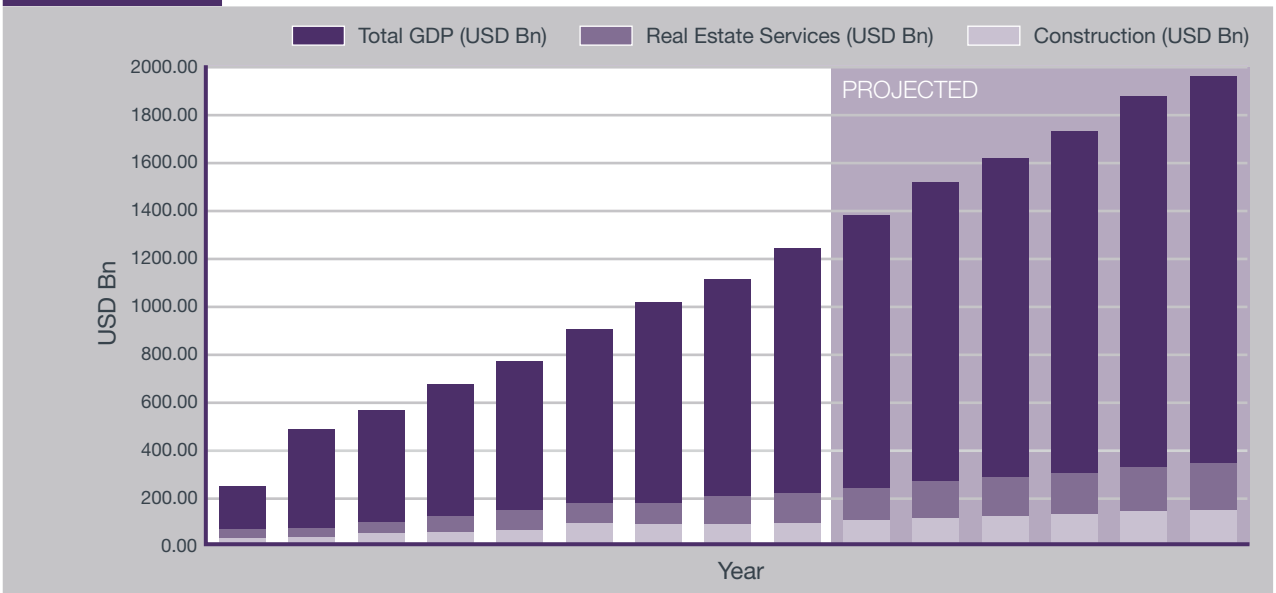


Figure 1.2 Built Environment Contribution to Indian GDP



	2001 -02	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16
India GDP (USD Bn)	242	500	574	660	756	876	1,009	1,162	1,240	1,346	1,455	1,580	1,723	1,889	2,080
Construction (USD Bn)	28	31	40	51	61	72	85	100	98	107	115	125	136	149	164
Real Estate Services (USD Bn)	30	34	44	59	69	82	99	120	118	128	138	150	163	179	197
Built Environment (USD Bn)	58	65	84	101	130	154	184	220	216	234	253	275	300	328	362
Built environment (% of GDP)	**23.9%**	**12.9%**	**14.7%**	**16.7%**	**17.2%**	**17.5%**	**18.2%**	**18.9%**	**Est. 17.4%**	**Est. 17.4%**	**Est. 17.4%**	**Est. 17.4%**	**Est. 17.4%**	**Est. 17.4%**	**Est. 17.4%**

2 Increasing population is leading to enormous demand for real estate space and infrastructure investment

Increase in Population and Urbanisation

Census of India population statistics indicates a population base of 1.04 billion in the year 2001. This rose to 1.15 billion in year 2008 – 09[A], which forms approx. 17.5% of the world population. Historical population figures indicate an average annual rise of approx. 1.50% in India's population from 2001 to 2008. Based on similar growth rate, the country's population is estimated to be approx. 1.28 billion in 2015 which may rise to approx. 1.38 billion by 2020.

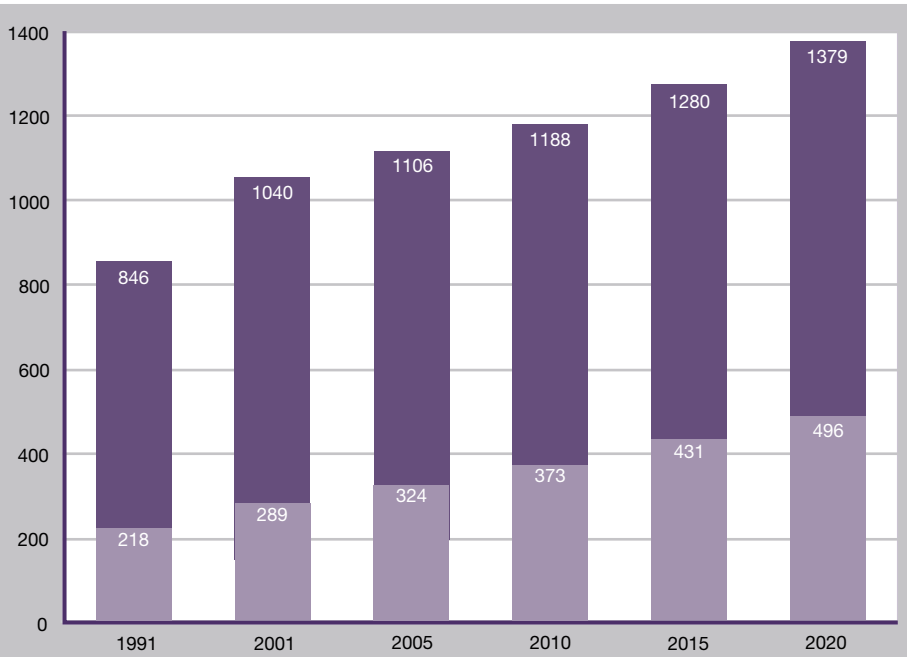
In line with this incremental increase in population of India, urban population of the country has also witnessed a robust growth at a CAGR of 2.88% over 1991 – 2011, suggesting a potential increase in share of urban population of India to grow from approx. 31.4% in year 2010 to 33.6% by year 2015, and thereon to 36.0% by 2020.

This shift to cities and urban agglomerations implies potential demand for quality real estate and extensive supporting infrastructure services in urban areas. Furthermore, it is anticipated that growth of total working population in India is likely to generate demand primarily for office spaces and industrial units.

With a fairly large and young population base the Work Force Participation Rate of India is expected to rise over the medium term. Employment trends have observed a shift post liberalization of the Indian economy. It is anticipated that the Work Force Participation Rate in 2020 may be approximately 42%, with the total number of workers being approximately 585 million. The net increase in the Indian workforce from 2010 until 2020 is estimated to be approximately 97 million.

While current employment in India is predominantly based in the agriculture sector and rural economy, a shift to services and industrial sectors is anticipated to continue in coming years. As such 27% of the total workforce is likely to be employed in the services sector by 2020 with an addition of almost 36 million jobs over a span of one decade. The average annual growth rate of workforce levels within the industrial sector is estimated to be approximately 4% with an anticipated addition of almost 51 million jobs over the same time period.

Figure 1.3 **Population Growth Trend (in millions)**



	1991	2001	2005	2010	2015	2020
Total Population	846	1,040	1,106	1,188	1,280	1,379
Urban Population	218	289	324	373	431	496
Urbanization Rate (%)	**25.7**	**27.8**	**29.3**	**31.4**	**33.6**	**36.0**

A National Accounts Statistics

Estimated Demand for Real Estate across various sectors

Based on population growth estimates, the incremental annual demand or requirement for real estate space including space for basic civic amenities in India, is estimated to be in the range of 7,324 million sq. ft (2010) and 10,145 million sq. ft (2020).

Statistics reveal that over 85% of the potential requirement would fall under residential and industrial categories. These are followed by commercial uses entailing commercial offices, retail area and hotel developments with an estimated requirement nearing 10% of overall demand.

A summary of the total incremental real estate space required in India in the year 2011 is given in the table below along with percentage contribution of each sector towards the total requirement

Table 1.1 **Summary of Annual Incremental Demand Estimated Across Sectors (2011) (millions)**

	2011	% of total
Annual population increase in India	17.79 million	
Residential demand	3,278 million sq.ft	43.3%
Retail	36 million sq.ft	0.5%
Commercial Offices	298 million sq.ft	3.9%
Industrial	3,259 million sq.ft	43.1%
Hotels	402 million sq.ft	5.3%
Healthcare Sector	93 million sq.ft	1.2%
Education Sector	202 million sq.ft	2.7%
Total estimated incremental demand for real estate	**7566 million sq.ft**	

Adding up the incremental annual requirement for real estate space, this study estimates that the total cumulative requirement for real estate over the period 2010 to 2020, is likely to touch approx. 95.3 billion sq.ft.

Demand for real estate space and infrastructure will lead to higher demand for manpower in the sector

Anticipated growth in real estate and infrastructure sectors is likely to generate considerable demand for human resource related to the built environment over the years. While developers, construction firms and consultancy firms are the major demand generators for this human resource, the supply side is governed by government, academia, and professional bodies to some extent.

Future huge demand for professionals in the built environment is anticipated due to an estimated annual requirement in the range of 7.3 billion sq. ft to 10.15 billion sq. ft of real estate space. This viewpoint is based on future predictions of both robust demographic growth and a rapid pace of urbanization.

In addition, the infrastructure sector has been earmarked for a major share of investments in the 11th Five Year Plan by the Indian Government. Higher levels of infrastructure investment should lead to more demand for property professionals. The expected level of infrastructure investment predicted in the Eleventh Plan is 2.36 times that of the Tenth Plan. Furthermore this is expected to almost double for the 12th Five Year Plan[B].

In light of anticipated investments proposed for infrastructure projects (such as those detailed in the 11th and 12th Five Year Plans for India), the sector is likely to observe high growth levels which are likely to necessitate quantum jumps in requirement of built environment professionals delivering these projects.

Various reports[C] and primary surveys indicate that nearly 70% of the total demand of core professionals, namely civil engineers and related professionals, architects and planners are likely to be employed in infrastructure sector, which contributes approximately 76% of the construction GDP in India. Therefore, it is assumed that the demand derived for real estate is in fact 30% of the overall total estimated demand for civil engineers and related professionals required in built environment, including infrastructure.

Table 1.2 **Total estimated demand for real estate 2010-2020 (in million sq ft)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Cumulative 2010–2020
Total estimated demand for real estate 2010 – 2020 (mn sq.ft)	7,325	7,566	7,815	8,073	8,339	8,616	8,900	9,196	9,501	9,818	9,818	95,295

B wherein total investment in infrastructure has been estimated to a tune of USD 1,000 billion
C Economic Survey 2007–08, CREDAI, NSDC on human resource and skill requirements in the building, construction industry and real estate services - Study on mapping of human resource skill gaps in India till 2022

3 Current supply in built environment comprises of nearly 50 million people, of which only 2 million are professionally qualified while remaining are workers

Figure 1.4 **Estimated Supply of Professionals and Workers in Built Environment - 2011 (All figures in '000s)**

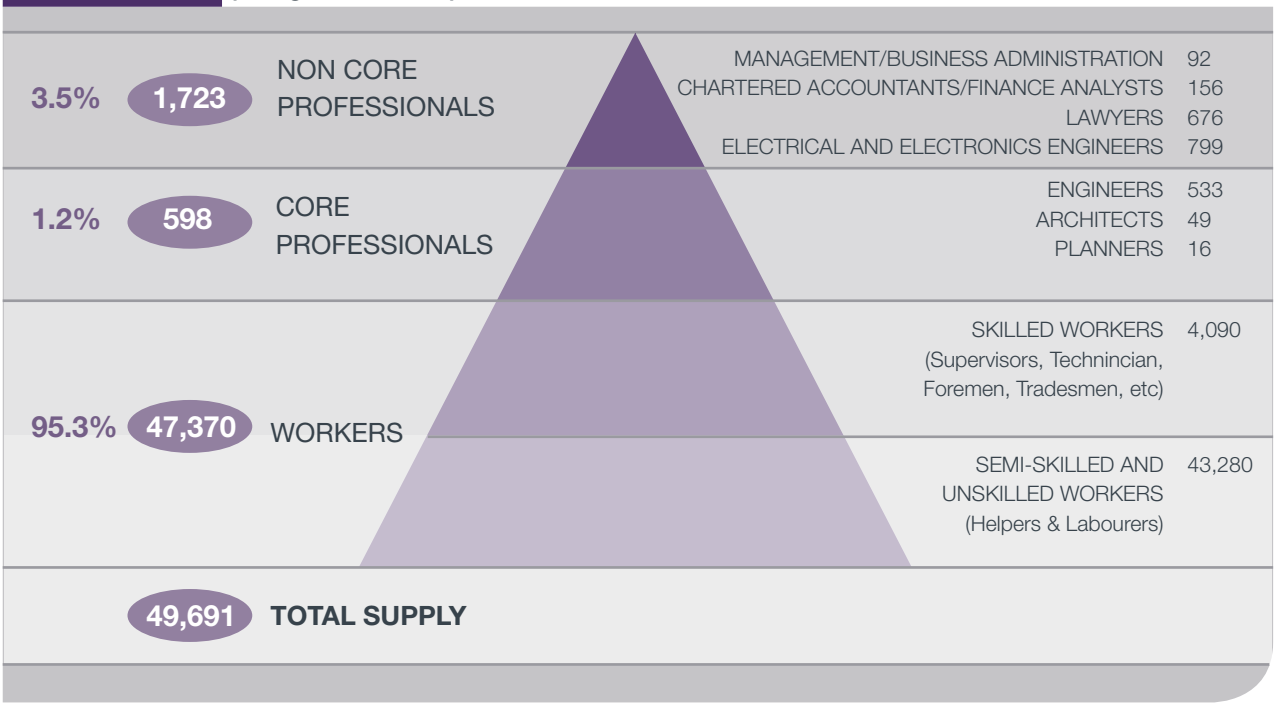


Figure 1.4 highlights some broad categories of those job classifications involved within the built environment in India. These categories are subsequently studied in further detail in this research as it seeks to quantify the extent of the future demand and supply for these job categories and the work skills they provide in India.

While assessing the supply of various professionals likely to be enrolled in real estate and infrastructure industry, it is assumed that the capacity or number of seats in various programs will remain constant as of 2009. Moreover, a drop out rate, including non-working professionals, to a tune of 10% has also been factored in the annual supply figures while making these future projections for various professionals.

4 The existing supply of core professions of architecture, engineering and planning is miniscule as compared to the soaring demand

Table 1.3 **Demand and Supply of Core Professionals (in 000's)**

	2010	2015	2020
Total demand	4,382	4,731	5,113
Total Supply	569	725	883
Total Shortage	3,813	4,006	4,230
SHORTAGE	87%	85%	83%

This research analyses the supply trend of core professionals in the built environment namely civil engineers, architects and planners in light of demand for same. The study highlights a potentially huge shortage or demand-supply gap in terms of numbers and expertise for the core professionals

Table 1.3 demonstrates the total demand and supply position of the core professions of civil engineering, architecture and planning as in the years 2010, 2015 and 2020.

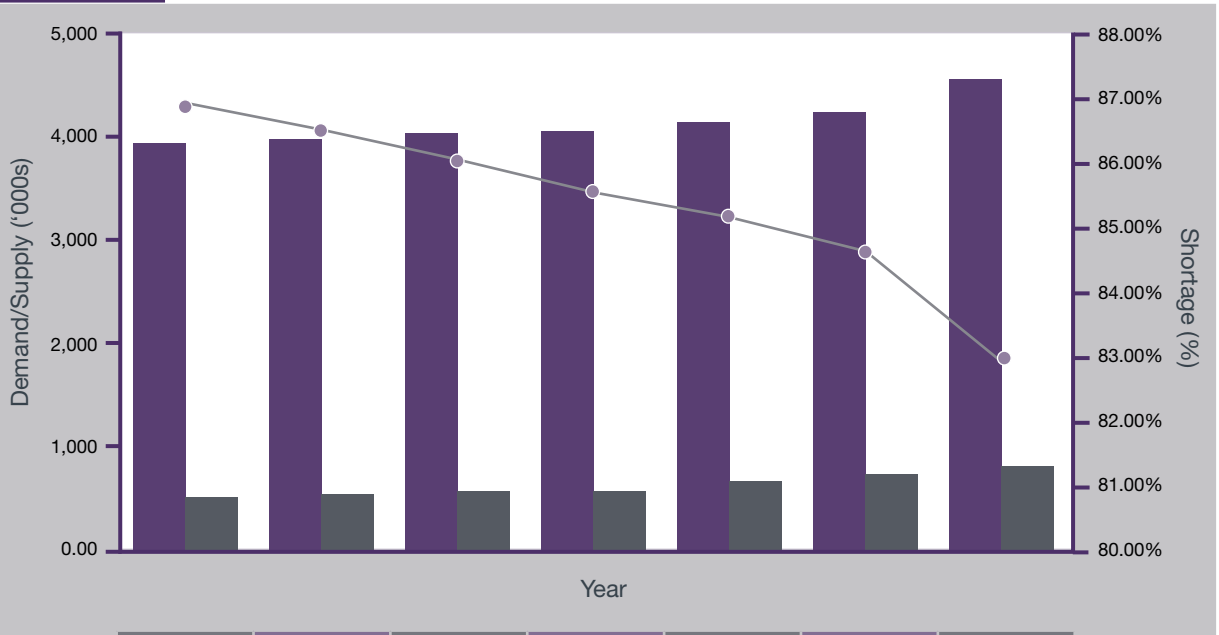
Civil Engineers And Related

Over the period 2010-20, on an average, approx 4.27 million civil engineers are required every year to meet the real estate (approx. 1.27 million civil engineers) and infrastructure (approx. 3 million civil engineers) requirements of the country.

With a cumulative supply of a meagre 533,000 civil engineers in 2011, and only 27,000 of supply estimated to be coming in to the market every year, the total supply of civil engineers would add up to 778,000 by 2020.

A sustained period of shortfall in annual supply, coupled with an increasing year on year demand, could result in a cumulative demand of nearly 40.2 million civil engineers over 2010-20, with a shortfall of approximately 39.4 million civil engineers, over the same period.

Figure 1.5 **Demand and Supply Gap Assessment – Civil Engineers and related (in'000s)**



	2010	2011	2012	2013	2014	2015	2020
Demand	3,906	3,966	4,027	4,089	4,152	4,217	4,558
Supply	509	533	560	587	615	642	778
Shortage	86.97%	86.56%	86.09%	85.64%	85.20%	84.78%	82.94%

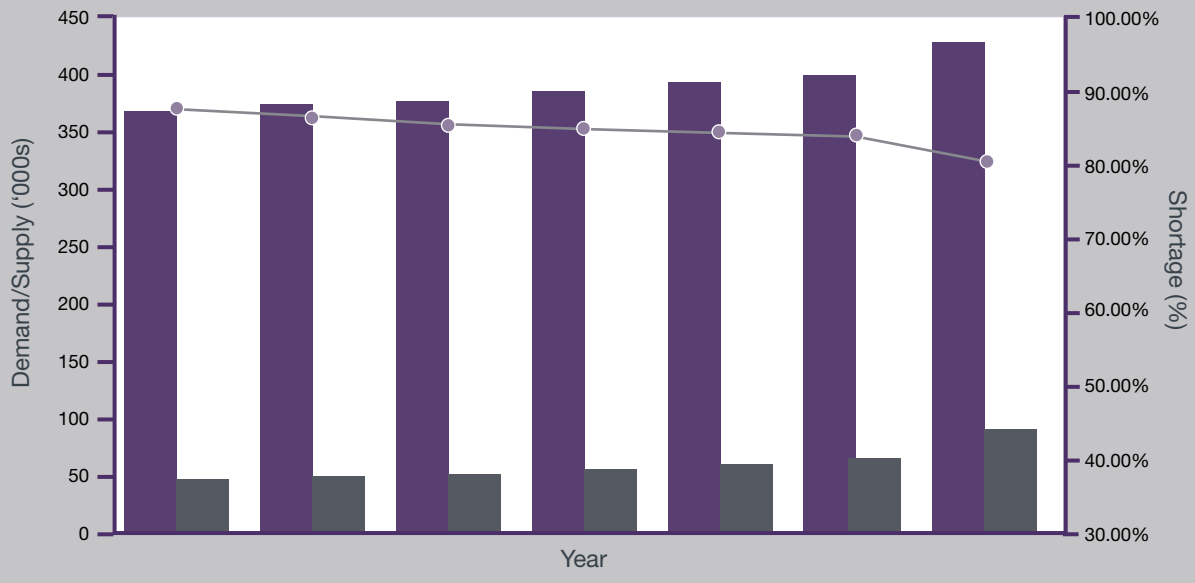
Architects

Over the period 2010-20, on an average, approx 396,000 architects are required every year to meet the real estate (approx. 119,000 architects) and infrastructure (approx. 277,000) requirements of the country.

With a cumulative supply of only 49 thousand architects in 2011, and nearly 3,800 of supply estimated to be coming in to the market every year, the total supply of architects would add up to 84,000 by 2020.

A sustained period of shortfall in annual supply, coupled with an increasing year on year demand, could result in a cumulative demand of nearly 3.73 million architects over 2010-20, with a shortfall of approximately 3.64 million architects, over the same period.

Figure 1.6 **Demand and Supply Gap Assessment – Architects (in '000s)**



	2010	2011	2012	2013	2014	2015	2020
Demand	366	372	378	383	389	395	427
Supply	45	49	54	57	61	65	84
Shortage	87.58%	86.69%	85.80%	85.04%	84.29%	83.57%	80.37%

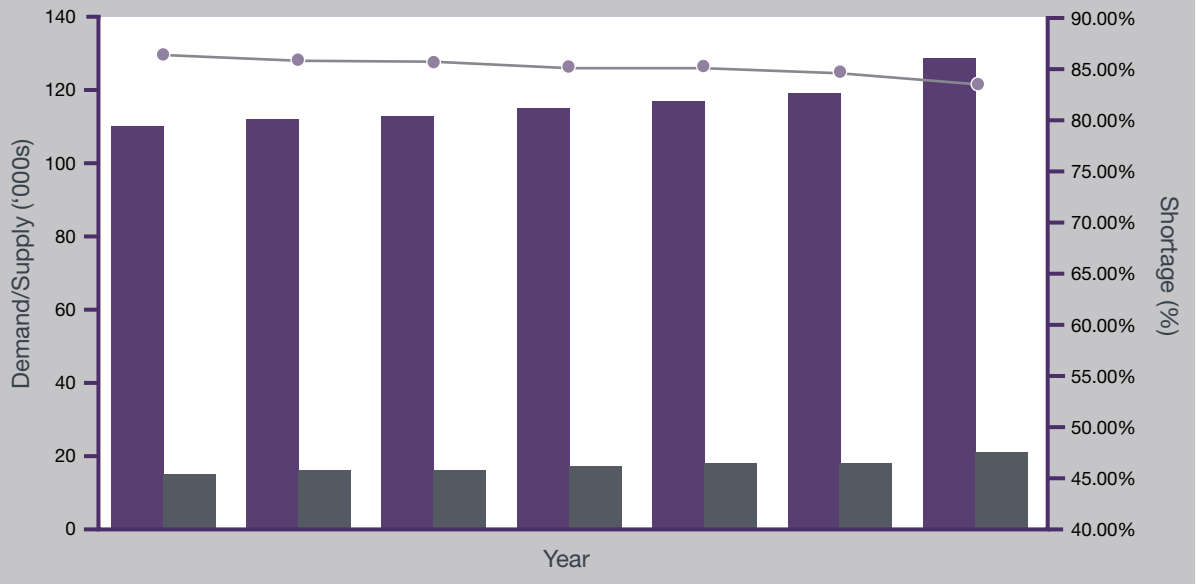
Planners

Over the period 2010-20, on an average, approx 119,000 planners are required every year to meet the real estate (approx. 36,000 planners) and infrastructure (approx. 83,000 planners) requirements of the country.

With a cumulative supply of only 16,000 planners in 2011, and nearly 616 of supply estimated to be coming in to the market every year, the total supply of planners would add up to 21,000 by 2020.

A sustained period of shortfall in annual supply, coupled with an increasing year on year demand, could result in a cumulative demand of nearly 1.3 million planners over 2010-20, with a shortfall of approximately 1.1 million planners, over the same period.

Figure 1.7 **Demand and Supply Gap Assessment – Planners (in'000s)**



	2010	2011	2012	2013	2014	2015	2020
Demand	110	112	113	115	117	119	128
Supply	15	16	16	17	18	18	21
Shortage	86.20%	85.89%	85.59%	85.28%	84.97%	84.68%	83.43%

5 The estimated supply of non core professionals in the built environment sector is nearly three times the supply of core professionals. However without sector specific training, they fall short of the desired skill sets

This research highlights that the built environment is drawing on the skills of professionals from other non-core fields.

The non core professionals, in contrast to core professionals, are not directly involved in development of the built environment. However, they provide various critical inputs such as sale and marketing management, financial analysis, legal advice, and electrical works, among others. These professionals are classified as non core due to the diversity of their skill base that allows them to work in various economic activities apart from those related to built environment.

Professions considered under this category include Management Professionals, Chartered Accountants, Lawyers and Engineers from non-core fields (electrical and electronics engineering).

Given that these are non-core professions, it is not possible to quantify the demand for these professionals owing to their floating nature between industries. However, this research tries to establish the current supply of these professionals, using some well researched assumptions.

Based on supply estimates and discussion with industry experts, it is observed that the supply of non core professionals is over 70% of the total supply of professionals in built environment.

For the year 2011, the supply of non core professionals at 1,723,000, is nearly three times that of the core professionals supply of 598,000. Furthermore, is estimated to grow at a higher rate of approximately 7.2% per annum, as compared to that of core professionals at approximately 4.5% per annum, over the period 2010-2020.

Table 1.4 **Cumulative Supply Trend of Management Professionals contributing to built environment (in '000)**

2010	2011	2012	2013	2014	2015	2020
663	676	688	701	714	726	790

Management Professionals

As the requirements of this industry are becoming more complicated and precise, the demand for management professionals is likely to increase manifold. Innovative marketing strategies can impact the success of a real estate product to a large extent. Students qualifying with these degrees often get engaged in national and international level organizations dealing with real estate developments, real estate consultancy, financial institutions, and fund managers, among others.

Working on the assumption that approximately 12% of these volumes would be contributing to the built environment, the cumulative supply of management professionals specific to construction and real estate sectors from 2010 to 2020 is shown in Table 1.4.

Table 1.5 **Cumulative Supply Trend of Chartered Accountants contributing to built environment (in '000s)**

2010	2011	2012	2013	2014	2015	2020
90	92	93	94	95	97	103

Financial Analysts

Financial analysts are largely comprised of Chartered Accountants and Business Administration professionals with specialization in Finance. In the built environment, these professionals largely contribute towards project finance and structuring, tax implications, cash-flow projections, finance structure, and valuations of assets and businesses, among others. Given that there is no major specialization that train and educate financial analysts, especially for the built environment, it is more "learning-on-the-job".

Out of the total professionals in chartered accountancy, it is assumed that approximately 10% contribute to the built environment development in India. It may be noted that quantitative assessment in this research is limited to chartered accountants. This is due to the unavailability of data related to management professions with finance specialization who are working in the built environment. Taking into account the historical data of Chartered Accountants professionals registered with the Institution of Chartered Accountants of India, the cumulative supply of Chartered accountants in the built environment sector up to 2020 is shown in Table 1.5.

Table 1.6 Cumulative Supply Trend of Lawyers contributing to built environment (in '000s)

2010	2011	2012	2013	2014	2015	2020
141	156	172	189	205	222	305

Legal Advisors

Responsibilities of a legal advisor in the field of the built environment involve the preparation and reviewing of legal reports of property or asset ownerships, acting on behalf of client in arbitration proceedings, preparation and reviewing of bid / tender documents, among others. Out of the total number of lawyers, it is assumed that approximately 5% contributes to the built environment in India. Expertise of legal advisors in real estate is largely focused on document title review, and legal due diligence, legal documentation for project finance and preparation/ drafting of lease and sale documentation. Issues such as dispute resolution, arbitration and litigation in real estate also need attention of legal advisors. There is no specialized course in law pertaining to the real estate sector. People acquire knowledge on real estate laws in a piecemeal basis from different sources. Projections of historical data indicate the cumulative supply of lawyers contributing to the built environment is demonstrated in Table 1.6.

Table 1.7 Cumulative Supply Trend of Electrical/ Electronic Engineers contributing to built environment (in '000s)

2010	2011	2012	2013	2014	2015	2020
685	799	928	1058	1188	1318	1967

Electrical/ Electronics Engineers

Out of the total number of engineers in this field, it is assumed that approximately 50% contribute to the built environment in India. The basis for this is that electrical engineers are most likely to be employed in the development-related industry, such as infrastructure, real estate developments, and construction industry. Expertise of electrical / electronics engineers in real estate is majorly restricted to design of electrical layouts and supervision at site. They are primarily responsible for electrical layout drawings and implementation of the same. In the light of number of students enrolled in engineering courses and their annual supply, the cumulative supply of electrical/ electronic engineers in the built environment sector up until 2020 is shown in Table 1.7.

Table 1.8 Broad areas of skill-set shortages

Management Professionals	Finance Analysts	Lawyers
• Demand assessment and forecast studies • Project sales and marketing • Understanding of Business models • Project evaluation and Financial feasibility analyses	• Valuations • Portfolio and Asset Management • Development Approvals and Processes (Real Estate and Infrastructure) • Sector Risk Assessment • Demand Forecasts	• Transaction Structures • Land systems and processes • Finance • Sector Risk Assessment • Development Approvals and Processes (Real Estate and Infrastructure)

It is important to note that while non-core professionals constitute a considerable proportion of the professionals involved in the built environment, skill sets possessed by these professionals are inadequate to address the requirements of the built environment in India given that is constantly evolving to meet established global standards.

Based on primary surveys conducted across a diverse set of industry practitioners and stakeholders and discussions with industry experts, certain skill-set gaps within these non core professionals have been identified.

6. New demand for specialised professions is now emerging in order to enhance professional expertise and improve productivity in this fast paced sector

This research has highlighted that unlike in other developed economies, in India the professions historically associated and linked with the built environment are generally those of engineering, architecture and planning. Whilst these are essential to serve as a backbone for skills required within this sector, there has emerged a need for a higher degree of specialisation that is required amongst professionals to be able to meet the challenging and fast developing built environment needs of the country.

Based on feedback from primary surveys and discussion with industry experts, this research has highlighted specific disciplines that need to be encouraged and developed on a priority basis in order to bolster the professional expertise in the Indian built environment. These are Valuation, Quantity surveying, Facilities management and Sustainable development.

Specialized skill sets across various critical functions require a combination of the skills possessed by core and non-core professionals. Consequently, special training and education courses are required for professionals to hone these skill sets. Although academic courses for these professionals are covered to some extent in civil engineering, architecture and planning curriculum, it is expected that there will be need for dedicated professional courses related to these specialist domains.

Table 1.9 **Estimated demand of specialised professionals in Indian built environment (All figures are in '000s)**

	2010	2011	2012	2013	2014	2015	2020
Valuers							
Demand for Valuers	112	118	124	130	**136**	143	182
Quantity Surveyors							
Demand Quantity Surveyors	70	72	74	77	79	82	97
Facility Managers							
Demand at Management Level	16	17	17	17	18	18	21
Demand at Executive Level	26	27	27	28	29	29	33
Demand at Technician Level	78	77	82	84	86	88	98
Total Facility Managers	*120*	*121*	*126*	*129*	*133*	*135*	*152*
Sustainability Professionals							
Demand for Civil & Related	270	273	276	278	281	284	300
Demand for Architects	65	65	65	66	66	67	69
Demand for Planners	24	24	24	25	25	25	27
Total Sustainability Professionals	*359*	*362*	*365*	*369*	*372*	*376*	*396*

Valuers

Valuation professionals act as independent land and property economists to determine the value of land and property portfolios for mortgage, taxation, probate and collateral purposes.

Based on the likely projects to come up across residential, retail, commercial, industrial, and hospitality segments, it is estimated that nearly 800 – 1300 thousand potential valuation assignments (amounting to a cumulative total of 11.5 million assignments over 2010-20) would need to be undertaken, across multiple purposes such as land, investment, home loans, compensation etc.

Based on these volume estimates and the average productivity of valuers, it is estimated that on an annual basis, an average of approx. 44,000 valuers would be required for the real estate sector and another 102,000 valuers would be required towards infrastructure, making the total requirement of valuers at an average of approx 146,000 valuers each year.

Quantity Surveyors (QS)

Quantity Surveyors manage all cost and commercial aspects of a building project, from initial calculations to the final figures, and in the procurement of goods and services

Quantity surveying, as an independent profession, is still in a nascent stage in India. Quantity surveying is largely undertaken by civil engineers and related, who are currently multi-tasking while undertaking quantity surveying activities.

Based on the estimated productivity of each quantity surveyor in context of potential spatial development and infrastructure, it is estimated that on an annual basis, an average of approx. 25,000 QS would be required for the real estate sector and another 58,000 QS would be required towards infrastructure, making the total requirement of QS at an average of approx 83,000 QS each year.

Facilities Managers (FM)

Increasing number of properties is necessitating a more professional and cogent approach towards managing facilities to high standards on a long term basis. However, the biggest lacuna in the industry is the lack of any professional discipline which seeks to teach facility management as a full time profession.

Based on estimated productivity of facilities managers at various hierarchy levels, in context of potential spatial development, it is estimated that on an annual basis, an average of approx. 18,000 FM would be required at managerial level, another 29,000 at an executive level and approx. 88,000 at technician level, making the total requirement at an average of approx 136,000 FM professionals each year.

Professionals specialising in sustainable development

There can be little doubt concerning the important role that property professionals play at each stage of the building lifecycle, and the lifecycle's overlap with the three elements of sustainable development. Whilst a property or construction professional may not be a specialist in sustainability, it is important that they possess a level of sustainability competency and understanding this allows the recognition of an issue and intervention where necessary.

Nearly 7% of the overall demand of civil engineers is required to be specialised in sustainable development, while 17% of overall demand of architects needs to specialise in sustainability. The highest degree of specialisation in sustainable development is estimated from the planning profession, where nearly 21%.of the overall demand for planners is required to be specialising in sustainable development.

Industry in India has already begun to recognise the lack of professionals that possess the adequate skill-sets for undertaking various activities efficiently. In context of higher economic growth in the coming years, these skill-set shortages are only likely to be exacerbated in the future.

Table 1.10 **Broad areas of skill-set shortages**

Valuers	Facilities Managers	Professionals specialising in sustainable development
• IFRS Standards • Limited knowledge of methods and approaches for valuation • Transaction understanding • Demand forecasting techniques • Inadequate exposure to real estate laws	• maintenance services and annual maintenance contracts • quality and cost control • multi-tasking and coordination with multiple agencies • customer orientation	• Inter-linkages between energy, economics and environment • Advance energy conservation principles and renewable energy in Indian context • Integration of different knowledge domains • Carbon Credit Trading

7 The education and professional development system for this sector has not kept pace with the economic growth and is therefore in dire need for reform

Discussions with industry experts and practitioners revealed a number of factors that are resulting in the current skill-set shortages in professionals related to the built environment in India. These same factors are likely to contribute to this continued shortage in future if remedial measures are not taken to address these shortages.

- One of the key reasons identified is the inadequate number of available places at colleges which is directly resulting in a quantum shortfall of the necessary level of educated professionals required in India. The current annual supply of professionals in India is nowhere near to meeting the much higher level of annual demand figures, not to mention enhanced demand requirement for these professionals going forward.
- India also has a severe shortage of courses dedicated to the evolving requirements of the built environment in India. This research identified that while courses do exist related to various core and non-core professionals, these do not explicitly capture emerging specialised skill set requirements in the Indian context.
- A latent aspect that emerged from the study regarding Education establishments in India was the need for securing and positioning a higher number of adequately trained faculty staff in that are aware of the latest and emerging technologies and techniques that are available globally.
- It was also observed that current academic structures were orthodox with limited room to adapt to innovation and market needs. While this may be an aspect that requires addressed at the institutional level, there is a need to make curricula formats more flexible by allowing students greater freedom to align more parts of curricula according to their interests and emerging skills.
- One of the root causes identified for this shortage of professionals was the constant introduction of new technologies, or changes therein, in India's built environment. New technologies mean that professionals or construction workers may not have the new skills required to work with the new processes. It may induce unemployment as low skilled workers are replaced by workers skilled with new technology. Global competition and new technologies have reshaped skill demands of construction firms, helping to explain the emergence and persistence of skill shortages even where overall demand for skills is static or even declining.
- A concomitant and important aspect that emerged was the lack of an adequate number of training programs for professionals already in the discipline. Since existing technologies are constantly being improved and new technologies are emerging, current professionals need to keep up with this evolving environment. Training programs for these professionals entailing regular participation and involvement would become imperative to maintain a culture of continued professional improvement.
- Lack of formalized incentive structures for these professionals to work towards their continued professional enhancement is another bottleneck observed in the industry. While the industry does reward professionals with additional training and certification, a formalized structure for mainstreaming this continued professional improvement appears to be largely missing.
- Another root cause observed by the industry was the availability of better pay scales in other fields and the options available for professionals in developed countries for professionals with good skill-sets, which, in turn, lead to shortages of professionals in the field of built environment.

8 The estimated shortage of professionals and skill-sets is likely to become a threat to the future growth of real estate, construction and infrastructure sectors

The current shortage of various built environment professionals is poised to become a threat / deterrent for the high growth of real estate, construction and infrastructure sectors in India. Industry has already begun to be adversely impacted by the shortage of professionals with adequate skill-sets for undertaking various activities efficiently. In relation to the predicted higher economic growth in the coming years, these skill-set shortages are only likely to be exacerbated in future unless remedial measures towards increasing new supply and up-skilling existing workforce are not taken on a priority basis.

The potential impact of skill shortages on the India economy and the built environment is not well defined, but is likely to result in:

- Recruitment difficulties, a situation where firms find it difficult to recruit and retain staff
- Increased cost of human resource, adversely impacting development costs and profitability of operations
- Skill gaps, where existing staff do not have requisite skills required to complete tasks efficiently in a time-bound manner
- Sub-standard quality of construction as compared to the global products
- Lower production levels and delay of new projects

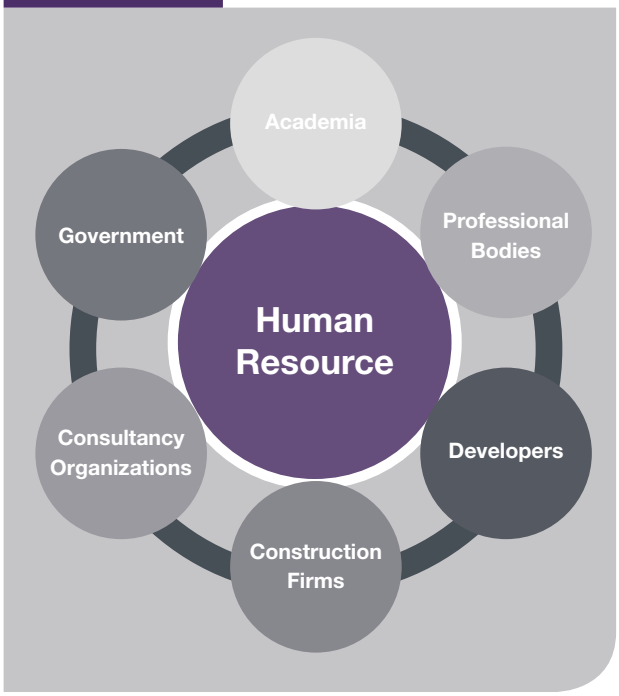
It is evident that immediate remedial measures need to be undertaken at the earliest opportunity to ensure that bottlenecks are not observed in the growth path anticipated for India.

9 A cohesive approach across all stakeholders is recommended to increase annual supply of professionals and address skill-set gaps in existing manpower

It is evident that steps will need to be taken to address the current and anticipated future skill-set shortages related to the built environment in India. These steps may include increasing the number of student places (for built environment courses) currently existing in institutions and/or enhancing the number of institutions currently educating professionals related to the built environment. Needless to say this is likely to require additional investments, both in setting up educational infrastructure, but also bringing in the latest tools and technologies while imparting education and involving a higher number of trained professionals who will be needed to enhance the quality and quantum of teachers in these institutions. Inclusion of the latest and evolving global best practices, both in practice and in educational curriculum, such as dedicated specialized courses addressing these skill-set shortages, would immensely benefit the current and future professionals in the built environment in India.

Given the diverse set of stakeholders in the built environment in India, it is evident that a multi-pronged approach needs to be adopted to address the current and future anticipated skill-set shortages related to the country. At this point, an approach that enables cohesive and collaborative involvement across all stakeholders is imperative. At present, most of the stakeholders of built environment are largely operating in their respective domains with limited inter-linkages between domains. This has created different silos of knowledge base for different domains limited to respective stakeholder groups, with little understanding or knowledge of other domains. There has to be a cohesive approach which needs to be created in order to tie up the various initiatives and ensure that all the stakeholders get to benefit from the common knowledge pool and bring in best practices from the drawing boards to the implementation side much faster.

Figure 1.8 **Required Active Participation by all Stakeholders**



Key suggestions on potential roles that may be played by key stakeholders such as Government bodies, private sector firms, academic institutions, as well professional bodies are presented below:

Table 1.10 Key suggestions on potential roles

Government	Academia	Professional bodies / Industry forums
• Effectively collaborate with the private sector demand generators for skills gap identification and then leverage private entrepreneurship to impart training across segments • Facilitate increase in number of educational institutions imparting professional education through state and private enterprise • Set up a multi stakeholder focus group to review and upgrade curriculum • Provide incentives for training related to skill-sets enhancement particularly for vocational side, rural programs for skill upgrade, research & development in construction & infrastructure • Mandate certification programs for professionals at varying levels • Chair industry member panel on vocational skill development in partnership with National Skill Development Corporation (NSDC)	• Interact with private sector entities to understand evolving industry requirements • Provide inputs to government focus group for upgrading curriculum to global standards • Review academia best practices as followed in developing and developed nations in architecture, engineering and construction (AEC) sector • Position training programs for existing industry professionals to ensure continued excellence • Develop standardised knowledge portal / content base for e-learning	• Interact with private sector entities to envision future trends • Provide directions to government and academia for mainstreaming global practices • Facilitate tie-ups with global institutions and organize forums for workshops / discussions • Lead initiatives towards professional certification, quality control and accreditation of institutions • Institutionalize measures of awards / recognition for initiatives in skill upgrade / quality augmentation measures, research & development.

Real estate developers	Construction firms	Consulting organizations / Service providers
• Provide inputs to academia and government for evolving curriculum • Underpin practical considerations in theoretical courseware • Engage actively in setting up internship and staff exchange programs • Organize periodic internal training programs	• Provide inputs related to latest technologies and their applications to academia for evolving curriculum and structuring training programs • Engage extensively with government to facilitate policies for faster upgradation of India's technical infrastructure and mainstreaming global technologies and techniques • Encourage employees for participation in certification and accreditation programs	• Engage extensively with stakeholders to mainstream global best practices • Enable information transfer between varying disciplines and domains • Provide inputs for developers and construction firms for evolving systems and processes to global standards • Participate extensively in training programs • Incentivize employees for gaining certification and accreditation

The full potential of the Indian real estate and construction industry will only be realized once the crucial issues of skilled manpower shortages get addressed. The private sector will find a way to address this as a business opportunity as the demand for it rises from the affected stakeholders, whereas the government and academia educators need to play the enabling role to support the initiatives.

2.1 Aims And Objectives

INDIA, an emerging global economy, is poised for considerable growth in the medium to long-term perspective. In the context of our current levels of urbanization, which are likely to increase manifold in the years to come, it is inevitable that India need to create infrastructure and urban development of global standards. This is likely to be exacerbated by the fact that current efforts have not been adequately geared to address current urbanization pressures, leave alone impending urban growth levels. One key challenge that India is likely to face, while moving forward in the direction of unprecedented growth, is the presence of adequately skilled and trained human resource that will be needed to deliver real estate and construction of high global standards. In perspective of potential future growth of India, the built environment professions in India are likely to face considerable demand-supply gap, which will impede India's growth aspirations. In various researches, it is estimated that the construction industry in India is facing considerable shortage of manpower, particularly those with skill-sets to sustain the burgeoning growth in infrastructure and housing sectors.

In order to ensure that the Indian economy is best able to take advantage of the opportunities afforded by greater integration into the world economic system, it is necessary that the built environment profession both possesses the necessary skills and has the capacity to respond.

The objectives of this research are to:

- Assess the potential future demand for the services of the built environment profession, by skills, discipline and by size of market
- Based on the above, identify potential gaps in provision, in terms of the capacity of the industry and in terms of the skills offered by the industry
- Put forward proposals for how any 'gaps' identified can most effectively be filled, looking at the roles of the corporate sector, the academic sector, government and regulation and professional bodies in addressing these issues

To achieve the above-mentioned objectives, the following questions will need to be answered to arrive at a meaningful assessment:

- How is India's growth story likely to pan out in future? Are we headed for a higher growth curve?
- What is the relationship between the real estate sector (built environment) and the GDP of a country?
- How have other countries fared in their relationship between GDP and the real estate sectors' contribution? Where does India stand in this perspective?
- What is the potential demand for real estate in India in the coming years?
- What is the trickle-down impact in terms of number of professionals required per unit area of developed real estate space based on inter-relationship with the real estate sector and GDP in India? What is the potential shift that India may observe in these multipliers and correlates from its current position?
- What is the total estimated demand for professionals for select disciplines (including select disciplines that have not taken off in a big way in India but are present in mature economies) and skill sets for the period 2010-2020 for India?
- What is the current and estimated future supply of these select disciplines in India?
- What is the estimated demand-supply gap for professionals from these select disciplines for the period 2010- 2020?
- In case a demand-supply gap exists, what are the potential remedial measures that may need to be taken to address this gap?

2.2 Research Methodology

The methodology adopted for the research report is contextualised on incremental growth in India's GDP. Future area and human resource requirement for real estate and infrastructure sectors is subsequently based on demographic projections. At the first level, the demographic growth of the country has been forecast till year 2020 based upon historical growth trends of population and workforce participation, which has been translated into demand for various real estate sectors namely, residential, commercial, retail, industrial education, healthcare and hospitality. This has then been viewed in context of productivity levels of various professionals, including their efficiency improvement factors that may allow for improved productivity of professionals as economies mature, to ascertain the future demand for these professionals.

In the case of select professionals, this demand has been compared with the existing supply and future supply of professionals to arrive at the quantitative shortfall of these professionals. In order to ascertain what are the type of skill shortages across various human resource categories, a primary survey has been undertaken covering industry professionals from all related sectors like developers, financial institutions, professional bodies, consulting firms, construction and contracting firms etc.

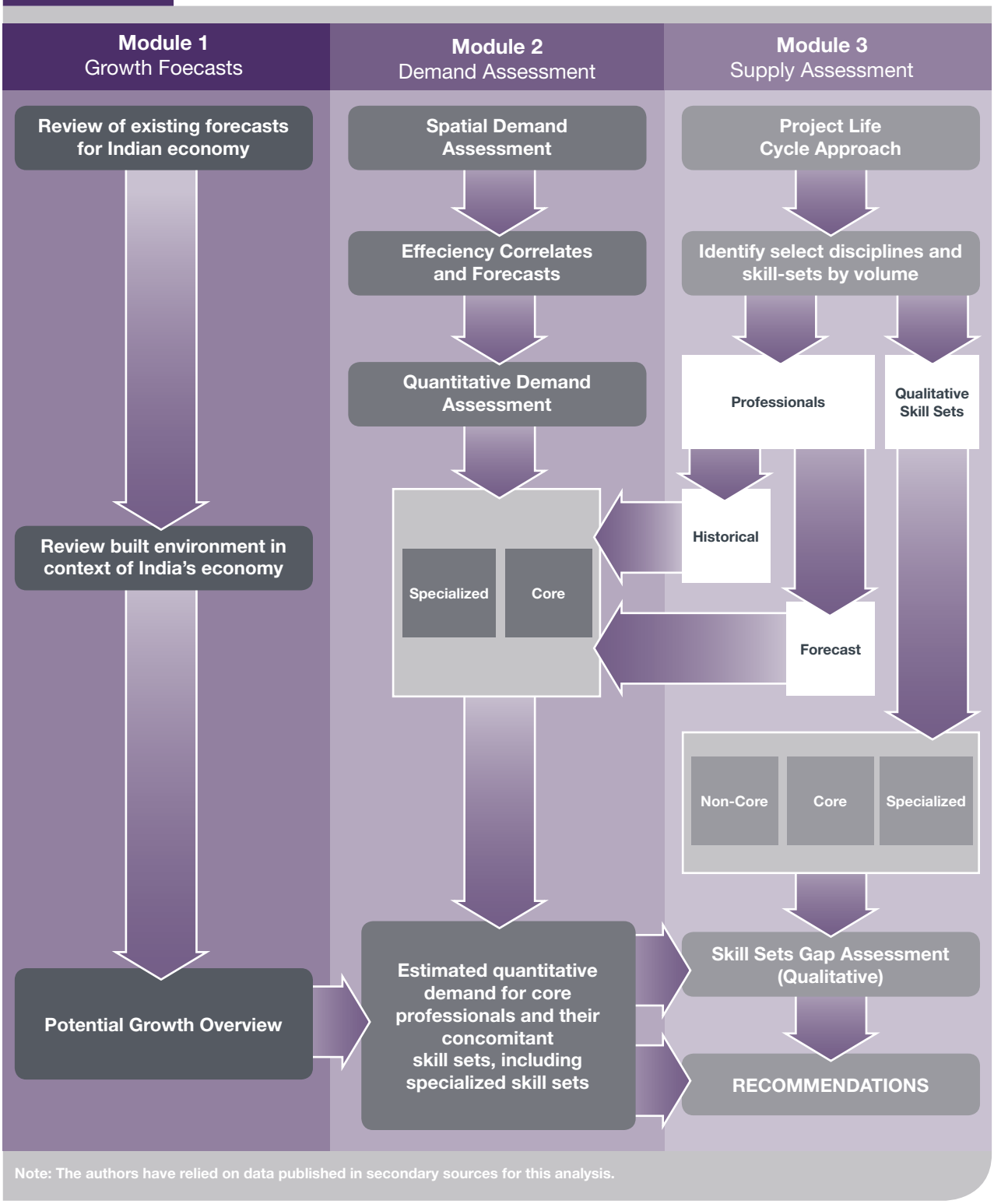
This research has been undertaken in following three broad modules:

a. **Module 1 (India's growth forecasts):** The first module reviews the overall growth trends of Indian economy along with the future growth potential as estimated by various economic bodies. This has been observed in context of the built environment in India and its contribution to Indian economy.

b. **Module 2 (Demand assessment):** This module begins with an overall assessment of the estimated built space requirement for the various real estate sectors. This spatial demand is then translated into quantitative demand for core professionals, including those with specialized skill sets. In addition, demand for select professionals in infrastructure sector is also estimated.

c. **Module 3 (Supply assessment):** The third module works in parallel to the second module. This module adopts the Project Life Cycle Approach while categorizing professionals as core, non-core, and those with specialized skill-sets. While historical supply has been ascertained for the core and non-core professionals, forecasts are made only for core and specialized skill sets professionals. The skills gap assessment at the qualitative level have been undertaken for core, non-core, and specialized skill sets professional, based on findings from primary surveys and discussions with industry experts. The quantitative demand assessment for core professionals in the second module is compared with the supply forecasts in the third module to arrive at the estimated quantitative demand supply gap assessment for core professionals. In addition, demand figures are estimated for specialized skill-sets.

Figure 2.1 **Methodology Adopted**



Note: The authors have relied on data published in secondary sources for this analysis.

3.0 Indian Economy and Built Environment

India's economy has observed consistent growth in the past and is regarded as the fourth largest economy[1] in the world, following US, China and Japan in terms of Gross Domestic Product (GDP) Dollar estimates derived from purchasing power parity (PPP). It is observed that the built environment has been in focus during the last decade and is likely to be a strong support function for growth of the Indian economy. It is well established that the influence of the construction industry spans across several sub-sectors of the economy as well as the infrastructure development as established in the five year plans. Thus, it becomes the basic input for economic growth of the country.

This Chapter looks at the contribution of built environment to the GDP of Indian economy and how it compares with those of select developed and developing economies of the world, to understand the growth path we may have to traverse to become a developed nation. Building upon these assessments, potential size of the built environment in India has subsequently been estimated. This has provided the background for further assessments related to human resource requirement that has been undertaken in subsequent chapters.

1 As sourced by Central Intelligence Agency (CIA): https://www.cia.gov/library/publications/the-world-factbook/geos/in.html

3.1.1 A Decade of Growth

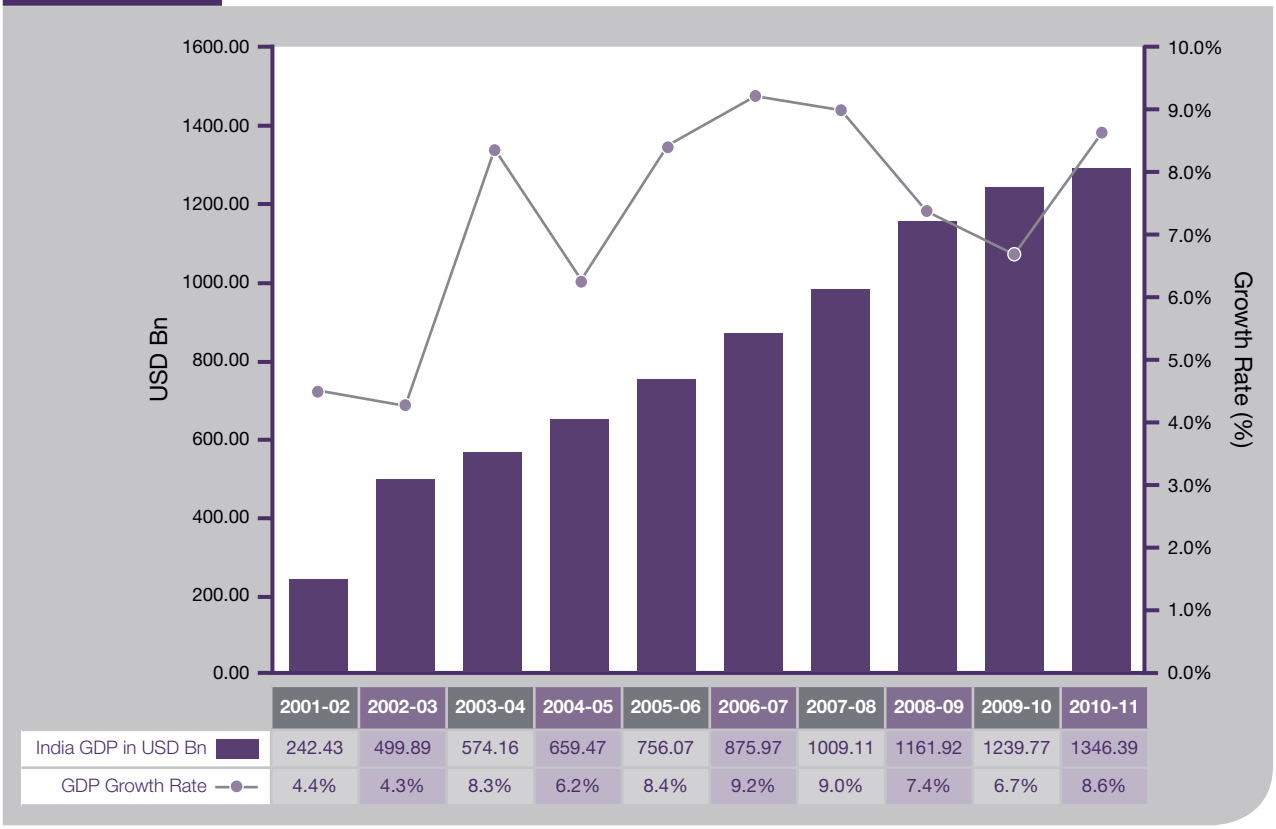
The country's GDP has shown tremendous improvement with growth rate increasing from 4.3% in 2002-03, to about 8.6% in 2010-11. The year 2003-04 indicates the beginning of a new phase of cyclical upswing which continued with marked stability during the year 2008-09. However, 2009-10 saw a significant slowdown in India's GDP rate to 6.7% in line with global economic scenario.

While the Indian economy was reasonable resilient to the global slowdown in 2008-09 and 2009-10, it was adversely impacted by negative consumer sentiment, decline in exports, curbed expansion plans of corporates and slump in flow of Foreign Institutional Investments (FIIs) and Foreign Domestic Investment (FDI) in the country, among others. Amidst global and domestic liquidity crunch, timely monetary and credit measures in India have played a key role in sustaining 5%+ growth levels.

Figures from 2009-10[2] indicate that real GDP at constant prices has grown at the rate of 6.7% owing to strong performance of the service sector. Indian economy continued on an impressive upward trend, recording 8.6 % GDP growth in year 2010-11.

One of the important reasons for a relatively faster recovery compared to other economies has been the infusion of large sum of money by foreign investors, reflecting a positive sentiment worldwide and bolstering India's image of being a safe and lucrative investment destination.

Figure 3.1 **India Growth Statistics**



	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
India GDP in USD Bn	242.43	499.89	574.16	659.47	756.07	875.97	1009.11	1161.92	1239.77	1346.39
GDP Growth Rate	4.4%	4.3%	8.3%	6.2%	8.4%	9.2%	9.0%	7.4%	6.7%	8.6%

Source: National Accounts Statistics, Asian Development Bank, Central Statistical Organization, Central Intelligence Agency (CIA), Dalalstreet.biz

2 National Accounts Statistics, Central Statistics Organization, MOSPI; http://mospi.nic.in

3.1.2 Benchmarking with Select Global Economies

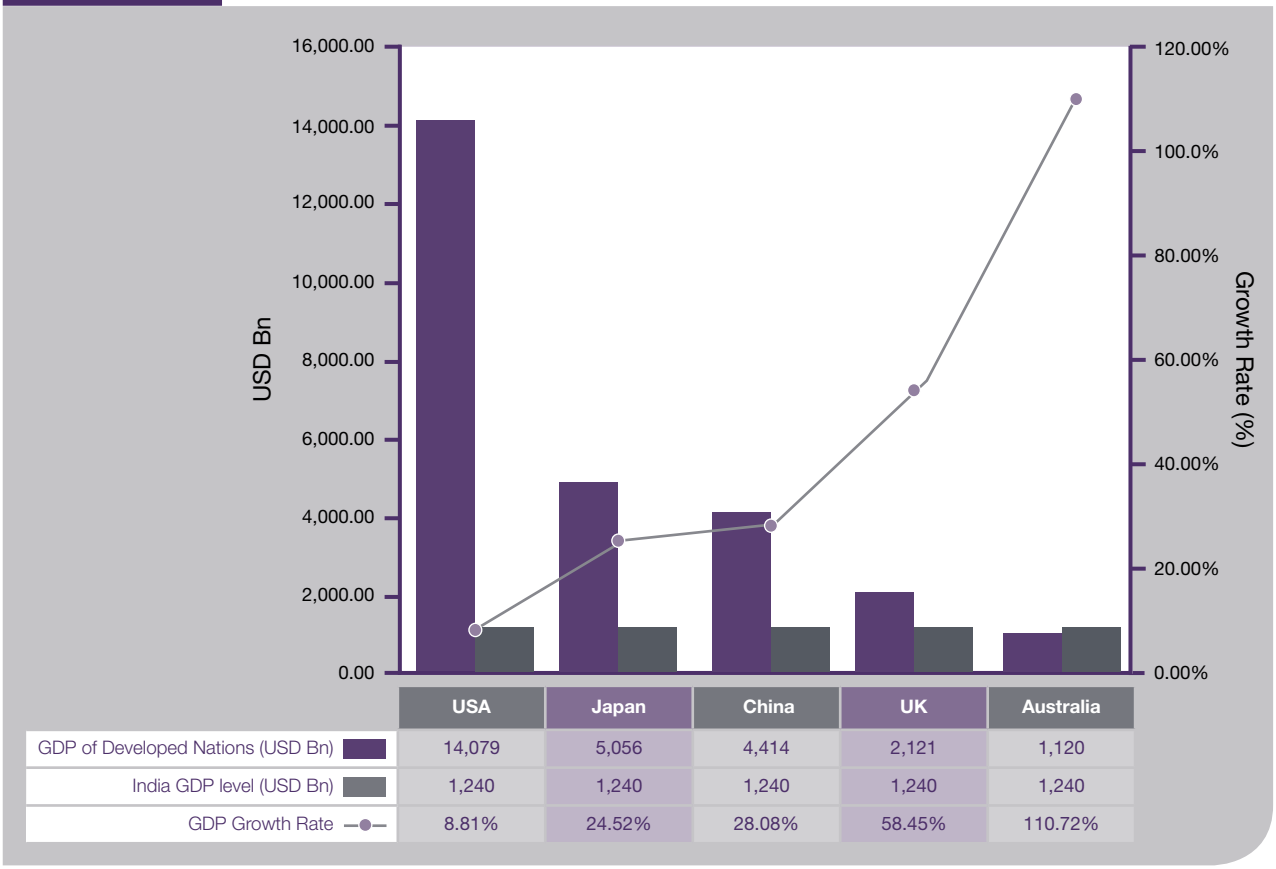
In order to assess how India stacks up against some of the major global economies, India's GDP has been compared with the GDP of select developed nations viz. USA, UK, Japan, & Australia, and the GDP of developing nations such as China to ascertain the potential for future growth. Having studied the GDP of four developed nations and one developing nation, it is evident that India is still in its initial stages of development and is yet to observe large growth levels for it to be projected as a mature economy.

The economy[3] of United States of America (USA) observes a GDP of USD 14,079 billion and is far more than United Kingdom (UK), Japan, China and India owing to its geographical extent and production capacities. However, as per output statistics, India's GDP (USD 1,240 billion) is more than Australia's GDP levels (USD 1,120 billion) and is almost 60% of the GDP levels of UK (USD 2,121 billion).

However, India's per capita GDP is still in the range of 5.0% – 10.0% of GDP of all mentioned developed countries which further signify large potential for the economy to grow and develop in coming decades.

India's closest competitor in the Asian markets, China, has observed substantial growth in GDP numbers. A comparison by GDP per capita basis reveals that China's per capita GDP at USD 6,600 is more than India's per capita GDP level of USD 3,100. Moreover, comparing the sizes of these economies, India measures approx. 28% of the Chinese economy in terms of GDP output. However, India is likely to observe similar GDP levels as China in the coming decades as growth rates of both nations range between 7% – 9% per annum for 2010-11. Witnessing the historical GDP statistics of China and India, it is estimated that the development time lag between the two countries may be approx. 8 – 10 years.

Figure 3.2 **India's GDP output as compared to developed nations in 2009-10**



	USA	Japan	China	UK	Australia
GDP of Developed Nations (USD Bn)	14,079	5,056	4,414	2,121	1,120
India GDP level (USD Bn)	1,240	1,240	1,240	1,240	1,240
GDP Growth Rate	8.81%	24.52%	28.08%	58.45%	110.72%

Source: National Accounts of various Nations

3 As per National Accounts Statistics for various benchmarked countries

3.1.3 Growth Forecast over 2011 to 2015

Indian economy has witnessed an early recovery and a turnaround in business sentiment as a result of the policy responses by Government and the RBI[4] to handle the recent economic slowdown. However, inflation risk, concerns regarding recession in some developed economies, cannot be overlooked. It is expected that the primary driver in the near future will continue to be domestic consumption, the aspirations of a large middle class and the spread of the income base across different segments of the economy. In spite of continuing uncertainty related to consumer confidence in the economy, foreign investors and domestic investors have demonstrated confidence which have positively influenced its performance in 2009-10 and 2010-11.

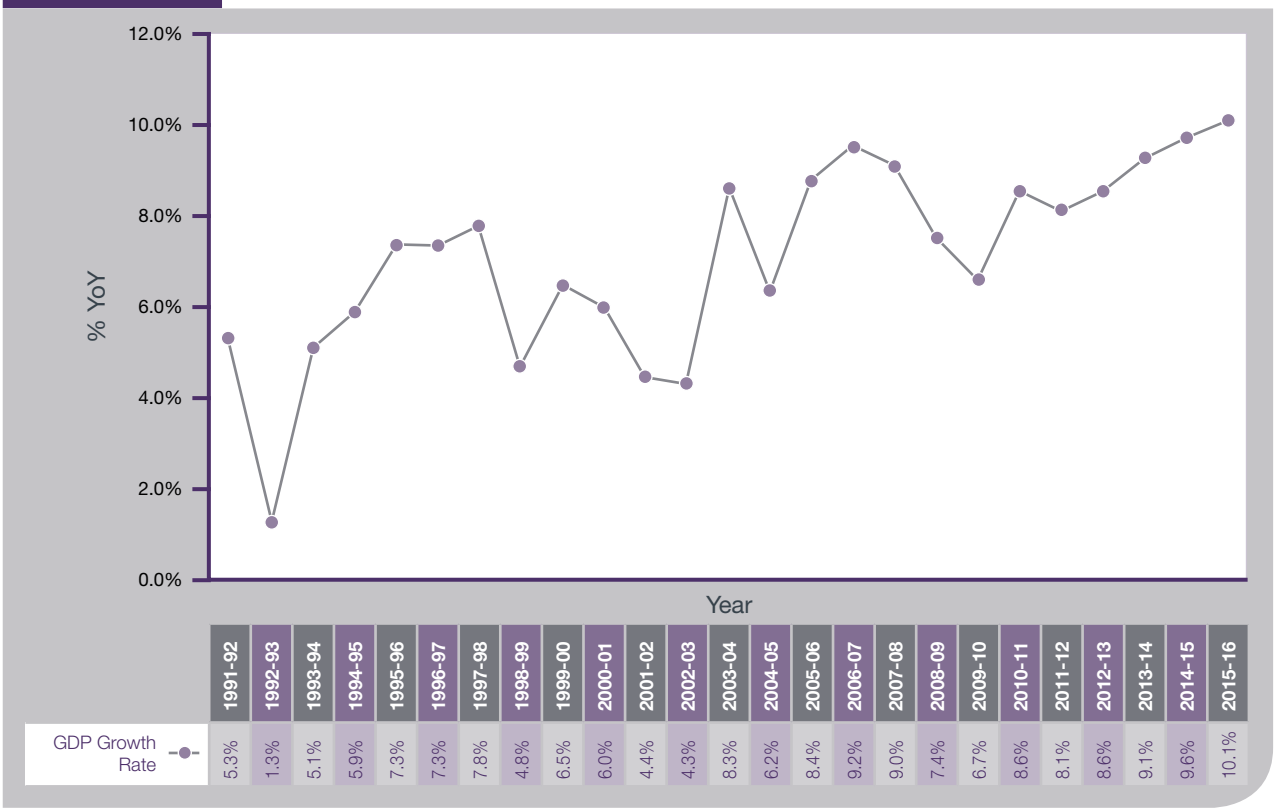
Various prominent financial institutions, such as Asian Development Bank (ADB) and International Monetary Fund (IMF), among others, have revised GDP growth rate estimates for India owing to sturdy revival symptoms and strong fundamentals of the economy. Estimate for 2010 -11, as stated by ADB initially was approx. 7.2%[5]; however, actual figure recorded was 8.6%.

It may be noted here that projections by various agencies, such as Ministry of Finance, Government of India; ADB; IMF and World Bank, for growth of Indian economy are largely restricted to the year 2009-10 and 2010-11 with no credible estimates available for the subsequent years. Observing GDP growth trend and focusing on revival of Indian economy based on its strong fundamentals, the CAGR of 5.8% in GDP growth rate has been estimated by Jones Lang LaSalle from 2010-11 – 2015-16.

The United Nations Conference on Trade and Development (UNCTAD) has estimated an economic growth of 8.1% for 2011-12. However, this is marginally lower than the International Monetary Fund's estimate of 8.2% and slightly above the 8.0% level forecast by the Reserve Bank of India (RBI). These estimates are also in line with the World Bank's projection of 8.0% and Asian Development Bank's estimate of 8.2% for the year 2011-12.

Based on assessments conducted in this section, it is estimated that GDP output may grow to approx. USD 1.35 trillion in the year 2010-11 and approx. USD 2.08 trillion by year 2015-16. Therefore, India is likely to observe positive growth in the coming years not withstanding financial crisis that may be observed in future. It is evident that this high level of economic growth will need to be supported by built environment to accommodate economic activities.

Figure 3.3 **Projection of India GDP**



Source: Jones Lang LaSalle estimates based on projections by ADB and India Finance Ministry

4 Reserve Bank of India 5 http://www.adb.org/Documents/Fact_Sheets/IND.pdf

3.2 Defining The Built Environment Sector

One of the critical aspects of this research is the definition of "Built Environment". After studying various literature related to Indian economy, and data available from different sources, such as government statistics and various multilateral institutions, it is clear that real estate and construction sectors carry different meanings when used in different contexts.

In order to address this overall potential ambiguity, for the purpose of this research, **Built Environment** has been determined as a combination of the following constituents:

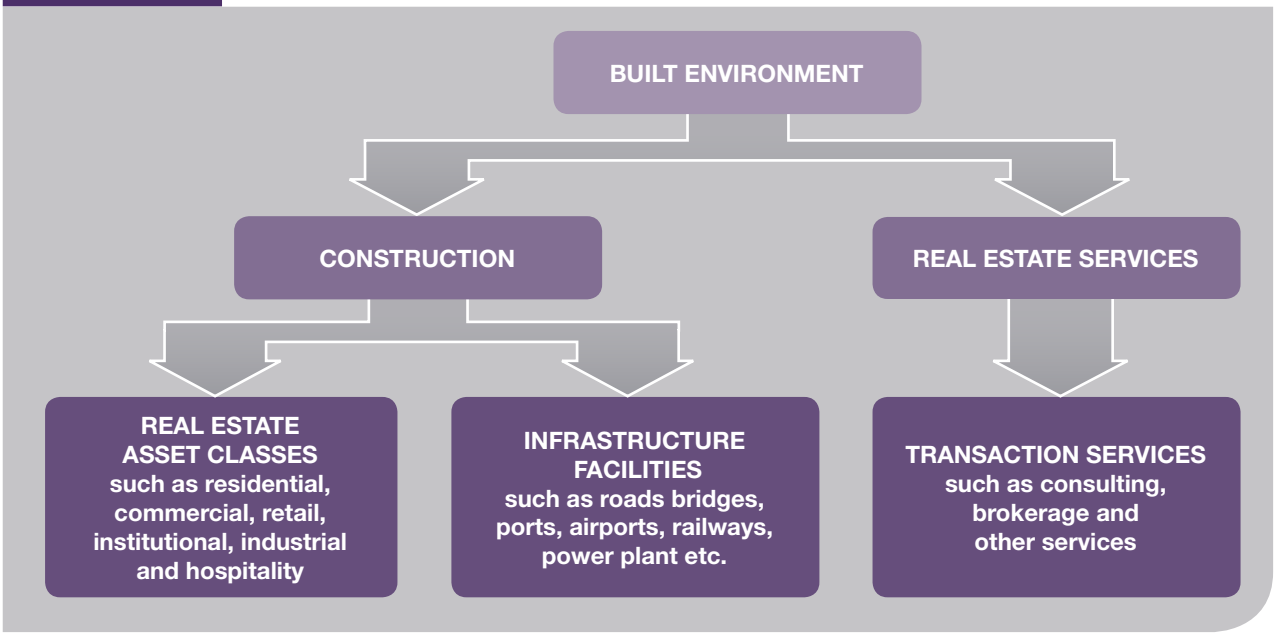
a. Construction sector, which is in turn constitutes the following:

- Construction of real estate developments, namely residential, commercial, retail, hospitality, institutional, and industrial development, and
- Construction of various physical and economic infrastructures, namely roads, bridges, railways, irrigation, ports, airports, water supply and sanitation, power sector, telecommunications, storage and gas.

b. Real estate related activities, namely transactions, banking and financial services related to real estate

This definition is based on the format in which statistical information related to the construction and real estate sector is organized by government departments. This is essential to maintain continuity of assessments in line with data available for the Indian context.

Figure 3.4 Built Environment Sector



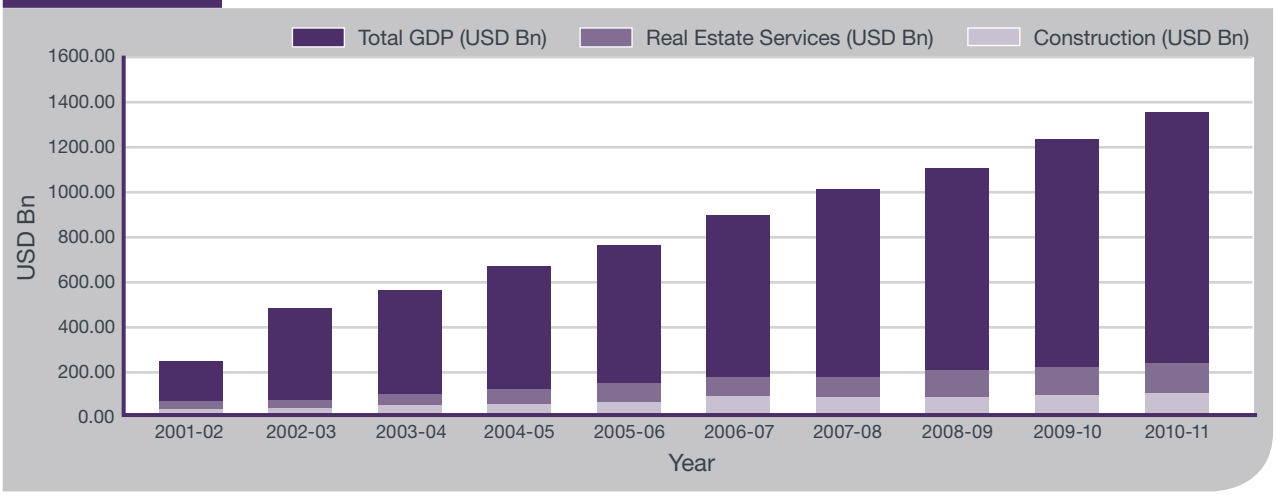
3.3.1 Contribution of Built Environment to GDP over 2001–2010

Construction and real estate services (collectively considered as Built Environment) are among the prominent sectors contributing to India's GDP and have attained a strong position over the last decade. Among all sectors recognized to form a share in national GDP, **'Construction' has observed the maximum average growth rate[6] of 18.28%** followed by 'Banking, finance and real estate business' at 17.83%. Of the latter category, **real estate services have observed an average annual growth rate of 19.51%** whereas banking and related activities have witnessed a growth rate of 15.12%[7].

Built environment, comprising of construction and real estate services, contributed approx. 19% in 2008 – 09, whereas the sector contribution was a mere 10% in 1991. It was only post 2004 – 05 that the sector's contribution to GDP has gone over 15%. Construction industry, in particular, has observed an upsurge in growth as high as approx. 19.0% in 2005-06 and continued to grow thereafter at almost similar rate.

Owing to economic slowdown, various sectors of Indian economy had been impacted adversely including real estate and construction. These sectors observed decline in rentals and capital values of all asset classes, diminishing demand from investors and end users, stalled expansion plans of developers, and delay in construction schedules in order to align the supply with demand levels. However, sentiment in Indian real estate market is improving on the back of a buoyant economy. Slowdown in real estate and construction activity was for a short term, expanding for just over a year as the price trends in prime cities and urban centres have reversed to touch almost similar levels as compared to the pre-slowdown year especially in the residential sector.

Figure 3.5 **Contribution of Built Environment in Indian GDP (2001-2010)**



Source: National Accounts Statistics, Central Statistical Organization, MOSPI

Table 3.1 **Contribution of Built environment to Indian GDP**

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
GDP (USD Bn)	242	499.9	574.2	659.5	756.1	876	1,009.1	1,161.9	1,239.8	1,346.4
Construction (USD Bn)	27.6	30.7	40.1	51.1	60.8	71.6	84.8	100.0	98.0	106.5
Construction (% to GDP)	**11.40%**	**6.15%**	**6.50%**	**7.75%**	**8.04%**	**8.18%**	**8.40%**	**8.61%**	**Est. 7.91%**	**Est. 7.91%**
Real Estate Services (USD Bn)	30.3	33.8	44.1	58.8	69	82	98.8	119.9	117.6	127.7
Real Estate Services (% to GDP)	**12.51%**	**6.76%**	**7.50%**	**8.92%**	**9.12%**	**9.36%**	**9.79%**	**10.32%**	**Est. 9.48%**	**Est. 9.48%**
Built Environment (USD Bn)	57.9	64.6	84.2	109.9	129.7	153.6	183.6	219.9	215.6	234.1
Built environment (% of GDP)	**23.9%**	**12.9%**	**14.7%**	**16.7%**	**17.2%**	**17.5%**	**18.2%**	**18.9%**	**Est. 17.4%**	**Est. 17.4%**

6 Constant prices since 2004–05 7 at 2004–05 constant prices

3.3.2 Key Growth Drivers

The gradual liberalisation of the Indian economy since the 1990s has brought in a lot of investments from abroad. We have seen a substantial growth in wages and the rise of the Indian middle class. The growing consumption and rising aspirations of a young country has provided further impetus to the domestic growth. All this plus a pent up demand for real estate saw a flurry of real estate activity happening across the country since the early 2000s. Moreover, Indian government has taken various initiatives such as FDI in real estate, SEZ policy, lowering bank rates on housing loans, to catalyse demand in real estate sector, making it an attractive investment for domestic and foreign players.

The importance of construction activity in infrastructure, housing, and other asset-building activities can be estimated from the fact that construction comprises nearly 60%–80% of the project cost of certain infrastructure projects such as housing, roads, railways as indicated in the 11th Five Year Plan. This is relatively lower in other infrastructure sectors, such as power plants and industrial plants. Planning Commission has envisaged greater investment by private sector, which is anticipated to rise from the level of 18% during 10th Five Year Plan to 30% during the 11th Five Year Plan.

The size of the Indian built environment is estimated approx. USD 234.12 billion in 2010-11. Based on data from National Accounts Statistics, built environment has been observed to grow at a CAGR of approx. 8% since 2007-08 with a tremendous upsurge in commercial real estate, primarily on account of the Indian IT and BFSI sector.

Capital values and rentals have increased at a higher growth rate riding on the back of demand for quality infrastructure. Implementation of relaxed FDI rules has further fuelled demand from foreign investors in Indian real estate sector. It is also observed that private equity players are considering large investments, banks are providing construction loans, and financial institutions are floating real estate funds, which has resulted in further growth of the real estate and construction activity in India.

Nearly 60-70% of demand for office space during the past years has been attributed to IT/ITES and BFSI sectors[8]. IT and IT-enabled services (ITES) have been key drivers of demand for office space in India during the last decade. Primary reasons for India's leadership in this sector has been the presence of a huge English speaking base, a large part of which is well educated and qualified to handle technical and professional jobs. India's IT-ITES export recorded 8.2% growth during year 2009–2010. According to the Department of Information Technology, Government of India, the IT-ITES export revenue is expected to reach USD 72 billion by the end year 2011–2012.

In addition, housing industry is poised for substantial growth in the backdrop of large population base, rising income levels and rapid urbanization. In the current scenario, affordable housing segment is the focus of the stakeholders of the Indian housing industry including developers and buyers, in terms of value and volume. According to the report of Technical Group on estimation of housing shortage constituted in context of formulation of the 11th Five Year Plan, housing shortage is estimated to be approx. 24.71 million housing units. About 99% of this shortage is estimated from economically weaker sections (EWS) and low income groups (LIG), depicting a huge demand for this category. Medium and luxury housing is also expected to observe quantum growth in coming years as this market segment is comparatively very small and has huge potential for further developments.

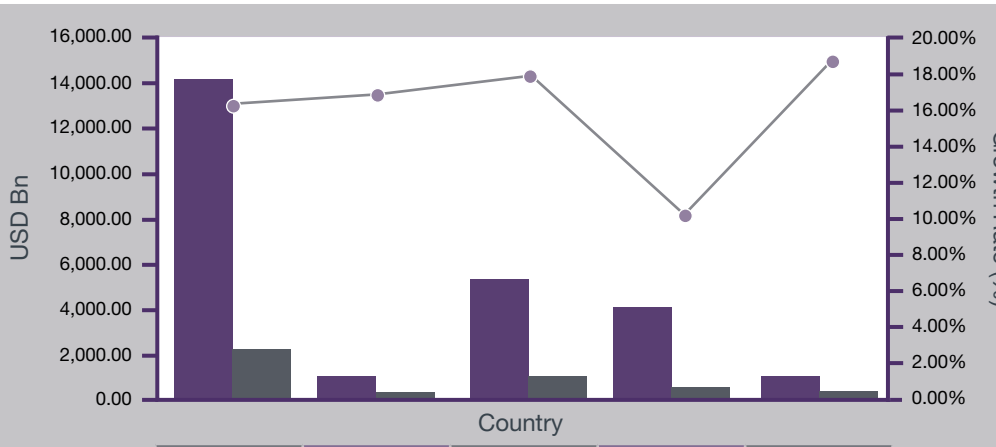
Moreover, total housing requirement during the 11th Plan period, including the backlog, is estimated at 26.53 million housing units. The total investment required for meeting the urban housing demand is anticipated to be approx. USD 80.3 billion, which consists of USD 32.7 billion required for mitigating housing shortage at the beginning of the plan period, and USD 47.6 billion for new additions to be made during the 11th Plan period.

8 Jones Lang LaSalle study, *'Indian Real Estate: An Outlook on Industry Trends and Regularity Policies'*

Figure 3.6 **Prime reasons for high growth of Built Environment in India**

Indian BPO boom (2000–2010)	Leading to upsurge in commercial real estate
Corporates increase scale of operations in India to benefit from low costs	Need for work and housing space triggered demand for commercial and residential space
Housing recognized as priority sector by Government	70–80% of the real estate sector is focused on housing and related construction activities
100% FDI in housing through integrated township development	Added impetus to growth of residential and construction focused real estate activities in India
High consumer spending and disposable incomes	Leading to a boom retail business, need for more malls and large retail spaces
Liberal lending conditions and easy access to finance	Maintaining liquidity in the sector and driving demand especially in housing sector
Favorable Government policies and initiatives	Eg. SEZ Act and securitization regulations have promoted real estate activities

Figure 3.7 International GDP (USD billion) levels and growth pattern 2008–09



	USA	Australia	Japan	China	India
GDP (USD Bn)	14,264.60	1,105.69	5,378.43	4,079.81	1,161.92
Built Environment (USD Bn)	2,365.00	190.56	987.39	412.34	219.93
% contribution	16.58%	17.23%	18.36%	10.11%	18.93%

Source: National Accounts of various Nations

3.3.3 Benchmarking Indian built environment with select global economies

Assessing the contribution of built environment in GDP, many countries (except China) observe a collective contribution of approx. 16% – 19% of GDP from real estate, property and construction related activities. It has been observed that the percentage contribution of built environment has remained almost constant and within this range for various developed markets.

In context of revival of real estate and construction sectors, it has been noticed that India, China and Australia are showing good levels of growth and recovery. There are signs here that monetary policy is being tightened as the stimulus packages designed to promote economic activity are now encouraging financial risk taking, which in some markets, is likely to create asset price inflation. US Federal Reserve is signalling that it is ready to withdraw policy measures employed to curtail the crisis, and Australia's central bank has again raised its benchmark interest rate. Economic growth in UK is still fragile and China, too, is tightening monetary policy and taking control of real estate speculation, while India's government has recently announced plans for a more prudent fiscal policy. These actions indicate that governments and central bankers are more confident that economic growth is on a more robust footing in India, which is a good sign for real estate leasing markets and provides further support for an improvement in real estate investor confidence.

However, the built environment of China's economy is an exception, as it contributes only 10% to the overall GDP, as the economy is more focused on industrial and manufacturing activities that collectively contribute a much large share. Strong domestic-led nature of economic growth is reflected in current real estate market dynamics. Retail, primary residential housing sales and non-bonded logistics have been doing well, while office leasing and luxury residential leasing, as well as bonded logistics (i.e. markets dependent on foreign demand) have had a tougher time, although these sectors have also stabilized since end of 2009. The investment market is strong and high liquidity has been heavily driven by domestic investors. Yields have compressed sharply and are now at all-time lows across all sectors. China will be a highly policy driven market as the government looks to direct capital towards infrastructure and away from speculative property development and land price inflation.

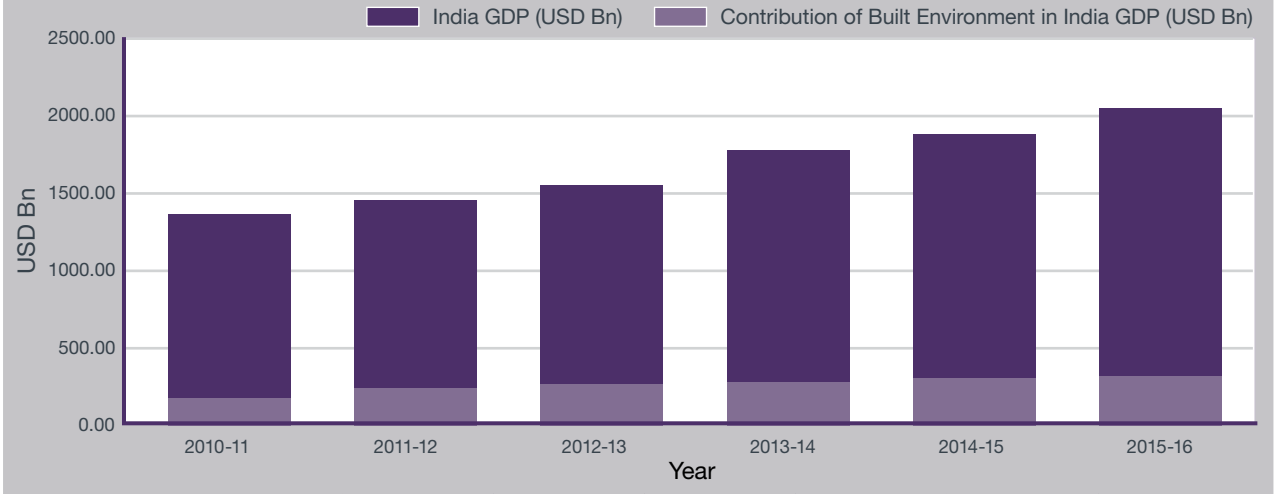
Therefore, averaging the percentage contribution of built environment to total GDP of developed nations, it has been analyzed that the sector is likely to stabilize at nearly 17% – 18% contribution to country's total output. It is evident from the above assessment that contribution of built environment to GDP in India has also attained the same levels that are observed in some of the developed nations during last 2-3 decades. Thus it is unlikely to witness higher growth than these economies, in terms of the contribution of built environment to GDP in India. However, as GDP is estimated to increase at an annual growth rate of 8 – 10%, the contribution of built environment, too, shall increase in terms of volume.

3.3.4 Estimated contribution of Built Environment to India's GDP over 2010-2015

Observing the share of activities related to the built environment to national GDP, it is evident that the contribution of the sector has almost doubled over a period of last two decades due to large scale of development and investments in this sector. It is apparent that India holds a lot more potential in built environment due to strong economy and demographic fundamentals; therefore, **the absolute contribution of the sector is likely to increase in line with GDP output levels. However, the percentage contribution may remain stabilized at 17 – 18% as observed in case of identified developed economies**.

The figure below presents an overview of the estimated growth of India's GDP along with estimated contribution of built environment.

Figure 3.8 **Estimated contribution of Built Environment to India's GDP over 2010–2015**



	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
GDP (USD Bn)	1,346	1,455	1,580	1,723	1,889	2,080
Built Environment (USD Bn)	234	253	275	300	328	362

Source: Estimates based on projections by ADB, IMF and Ministry of Finance, Government of India

3.4 Planned Investments in Infrastructure

Infrastructure sector forms a major component of planned investments in the 11th Five year Plan. The current plan envisages a total investment of USD 514.04 billion (in constant 2006-07 prices) in infrastructure. Of this, USD 97 billion (21% of the total or 30.3% of the public investment) is anticipated to be spent exclusively towards improvement of rural infrastructure. Compared to investment of USD 217.86 billion in the 10th Plan period, the expected infrastructure investment in the 11th Plan is 2.36 times higher. Moreover, looking at provisional estimates for the 12th five year plan, total investment in infrastructure has been envisaged to be approx. USD 1,000 billion, which is almost double of the 11th five year plan figures.

Sector wise breakup of the investments is indicated in the table below:

Table 3.2 **Sector-wise break-up of Investments (USD billion) for Infrastructure as per 11th Five year Plan**

	2007–08	2008–09	2009–10	2010–11	2011–12	Total plan
Electricity	18.21	22.57	28.08	35.12	44.14	148.12
Roads and Bridges	11.52	12.18	13.16	15.19	17.77	69.81
Telecommunications	6.97	8.47	10.80	13.70	17.49	57.43
Railways (incl. MRTS)	7.61	9.10	11.01	13.42	17.04	58.18
Irrigation (incl. WD)	6.11	7.98	10.49	13.84	17.87	56.29
Water Supply and Sanitation	4.29	5.06	6.07	7.39	9.13	31.94
Ports	2.76	3.29	3.86	0.00	5.20	19.55
Airports	1.16	1.23	1.31	1.48	1.71	6.88
Storage	0.84	0.91	0.99	1.07	1.16	4.97
Gas	0.60	0.67	0.74	0.82	0.91	3.75
Total Investment (USD Bn)*	**67.57**	**80.39**	**97.32**	**119.78**	**148.98**	**514.04**

*Total investment figures are same as indicated by Planning Commission at a conversion rate of INR 40 per USD; however all the other figures have been calculated at a conversion rate of INR 45 per USD

Source: Planning Commission of India

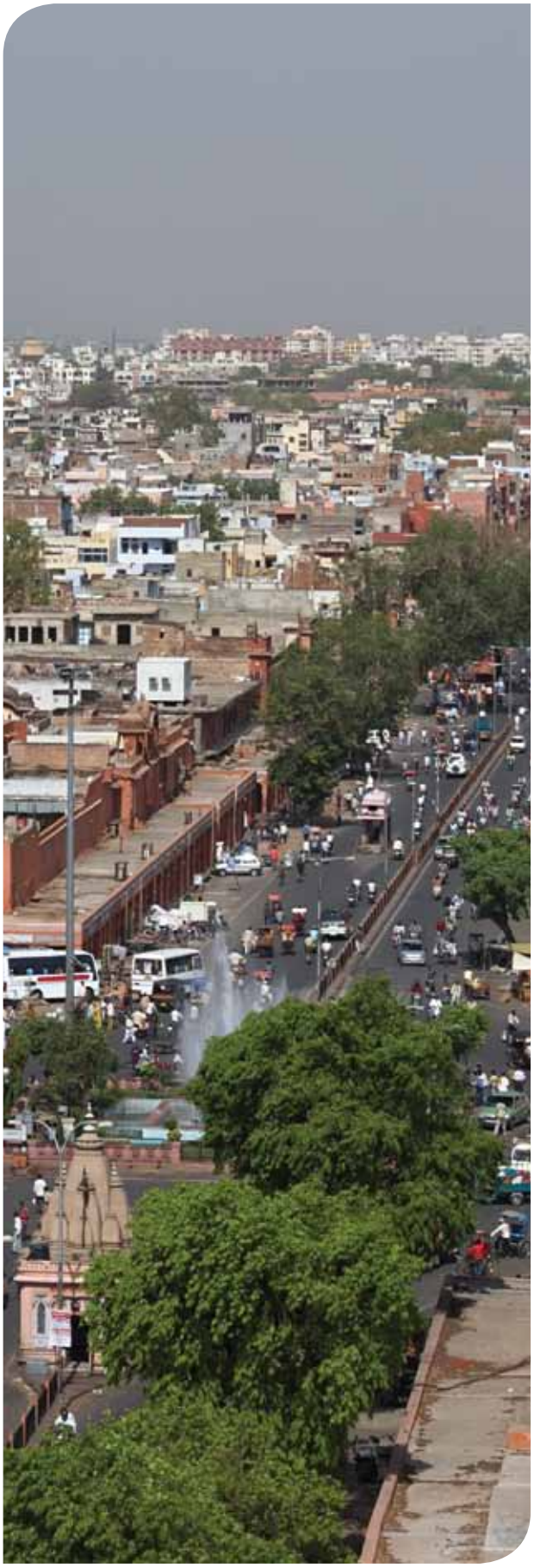
Among various sub-sectors, roads, bridges and railway constitute approx. 28% of total investments planned for infrastructure sector as a whole. Major initiatives to be undertaken in accordance with 11th Plan period are the development of roads, railways, and airports, which are described as below:

- **Road infrastructure:** Development of six-lane 6,500 km Golden Quadrangle and selected national highways, four-lane 6,736 km on north-south and east-west corridors, four-lane 20,000 km highways, widening 20,000 km of national highways to two-lanes, developing 1,000 km of expressways, constructing 8,737 km of roads including 3,846 km of national highways in north east India, constructing 129,707 km of new rural roads and renewal and up-gradation of existing 177,726 km of rural roads covering 60,638 rural habitations.
- **Rail Infrastructure:** Construction of dedicated freight corridors between Mumbai-Delhi and Ludhiana-Kolkata, 8,132 km of new railway lines, modernization and redevelopment of 22 railway stations,
- **Air Infrastructure:** Modernization and redevelopment of 4 metro and 35 non-metro airports and construction of 3 Greenfield airports in North east India and 7 other Greenfield airports.

Viewing these investment estimates and future growth projections, it is assessed that coming years are going to observe high volume of development.

As detailed later in this study, India could potentially need to build approx. 7,325 million to 10,146 million square feet of new residential, commercial, retail and institutional space every year from 2010 up to 2020. These figures are based on anticipated demographic shifts owing to increase in urbanization and migration of population to urban nodes. This estimated increase in residential and commercial activity shall lead to consequent need for infrastructure such as roads, water supply, sewage management etc. In light of anticipated high level of construction and real estate activity in pipeline over next few years, likely demand for employment in the stated sectors is expected to be substantial.

Employment in infrastructure is likely to go up on the back of the investment outlay by the Government of India, which has been increased from USD 514 billion to USD 600 billion in infrastructure sector alone. Moreover, construction and, BFSI and real estate services sectors exceeded the Tenth plan target of employment, which further justifies the potential for higher employment in both sectors in light of investment outlays, changing demographic and socio- economic patterns, and increasing spending propensity of Indian middle income population.



4.0 Estimating demand for real estate development

Real estate is a vital component of built environment, as it forms the platform for most construction and service activities related to this sector. In order to understand the need for professionals in the built environment, it is imperative to first analyse the demand and potential growth of real estate sector in future.

For ascertaining the real estate demand, a three-step approach has been adopted in this chapter for estimation of area under various asset classes. The first step entails the assessment of demographic growth levels in India to estimate demand to be generated for various real estate sectors.

The next step is to ascertain the areas required on per capita basis for residential, retail, commercial, industrial, hotel and social infrastructure including community amenities. This has further allowed for estimation of total square foot area needed in subsequent years across various real estate segments.

This forms the basis of the third step which has been incorporated in subsequent sections, wherein estimated demand for professionals employed in real estate has been ascertained based on the productivity of various Indian professionals employed in India realty sector.

4.1.1 Urban population projection

Census of India population statistics indicates a population base of 1.04 billion in the year 2001. This rose to 1.1 billion in year 2008 – 09[9], which forms approx. 17.5% of the world population.

In line with this incremental increase in population of India, urban population of the country has also witnessed a robust growth, as the percentage of urban population has increased from 10.8% (25.8 million) in year 1901 to 27.8% (289.12 million) in year 2001.

Number of urban agglomerations and towns has grown from 1827 in year 1901, to 5161 in year 2001, primarily because of generation of more job opportunities in the urban centres, increase in industrialization levels, and emergence of new economic sectors. Average annual population growth rate in India is higher than the world and is estimated at approx. 1.5% over the recent period whereas the world growth rate has been recorded close to 1.14%.

India's urbanization levels are also much lower at 28% in 2000-01. Developed countries have much higher urbanization levels (76% in 2000) compared with developing countries (40% in 2000). Projections for year 2030 by United Nations indicate the world's urban population level to rise till 60%. Urbanization level has almost stabilized in developed countries. However, the countries in Africa and Asian sub-continent are in the process of urbanization and annual growth rate of urbanization is likely to be higher in these regions.

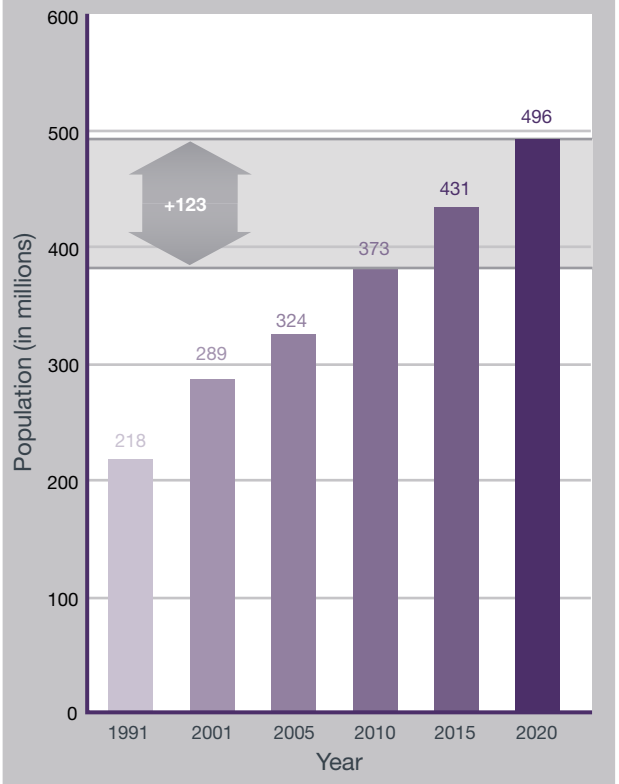
Annual average growth of urban population has been observed to increase at 2.24% between year 2001 and year 2008 and is likely to increase to 2.54% from year 2008 onwards till year 2030. Growth rate is expected to be on the higher side till the urban economy of India stabilizes and reaches close to the level of developed economies of the world.

Therefore, **future projections of urban population have been estimated at 2.88% per annum, indicating the share of urban population of India to grow from 31.41% in year 2010 to 33.62% by year 2015 and 35.98% by 2020.**

This increase in urban population is estimated to generate unprecedented demand for quality real estate and infrastructure to house and employ this additional population.

For the purpose of this research, it is assumed that the entire urban population is likely to require professional assistance for construction of houses. This is also based upon the fact that most of rural developments are getting urbanized at a rapid pace. Therefore, the demand for residential sector has been assessed on the basis of urban India requirement for the future.

Figure 4.1 **Population Growth Statistics (in million)**



	1991	2001	2005	2010	2015	2020
Total Population (in million)	846	1,040	1,106	1,188	1,280	1,379
Urbanization Rate (%)	25.70	27.80	29.29	31.41	33.62	35.98

Source: Census of India, National Accounts Statistics, Central Statistical Organization, MOSPI

9 *National Accounts Statistics*

4.1.2 Working population projection in services and industrial sectors

Another level of demographic assessment has been made to estimate the Indian workforce employed in service and industrial sectors. This assisted in establishing demand for commercial and industrial sectors by projecting the total incremental area required in these two segments.

Approx. 39.7%–42.3%[10] of the total population of India has been working over a sample of 7 years ranging between 1977-78 and 2005-06. The average Work Force Participation Rate in India has been recorded at 41.43%, which is further expected to rise as the percentage of working Indian population is also expected to grow.

Current estimates[11] indicate that 66% of the current population is less than 35 years of age. With a fairly large young population base, Work Force Participation Rate of India is expected to rise over medium term. Employment trends have observed a shift post liberalization of India economy; therefore, growth of working population in absolute terms has been used to project the growth of workforce in India for future years.

Growth rate of working population in the period ranging from 1993-94 to 2005-06 has been observed to be 1.67%. On the basis of these projections, **Work Force Participation Rate in year 2020 has been estimated at approx. 42%, with total number of workers being approx. 585 million. Net increase in workforce from year 2010 till year 2020 is likely to be approx. 97 million.**

Table 4.1 **Growth rate of workforce as assessed from Workforce Participation Rate**

	Working Population	Work force Participation rate
1993-94	374 million	42.0%
2005-06	456 million	41.3%
2010-11	496 million	41.7%
2015-16	529 million	42.1%
2020-21	585 million	42.4%
CAGR of Workforce participation		**1.67%**

Source: IAMR India Yearbook, 2009 – Manpower Profile; National Accounts Statistics, Central Statistics Organization, MOSPI

10 As per Indian Association of Manpower Research (IAMR), India Yearbook – 2009
11 As per Rajiv Gandhi National Institute of Youth Development

Working population in India is categorized to be employed in three sectors viz. agriculture, industrial and service sector. However, for the purpose of this research, only services and industrial sectors have been considered.

Services sector

Approx. 20%-24% of the total workforce[12] is employed in service sector (tertiary sector) over a sample of 5 years between 1987-88 and 2005-06. However, in the decade prior to 1987-88, contribution of workforce employed in tertiary sector was limited to 15% - 18%. Annual growth rate of services sector since 1993-94 till 2005-06 has, thus, been estimated as 2.43%.

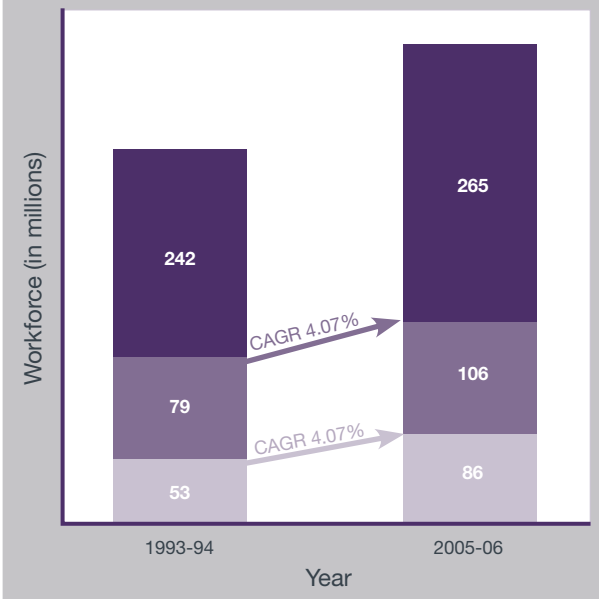
In perspective of this estimated growth rate, **27% of total workforce is likely to be employed in the services sector by year 2020 with an addition of almost 36 million jobs over a span of one decade**.

Industrial sector

Growth trend in industrial sector has been assessed in a similar manner, which indicates an annual average growth rate of approx. 4%. Total employment in industrial sector is observed between 12% and 18.8% over a sample of 28 years beginning 1977-78 to 2005-06. While the current employment in India is largely in the agriculture sector and rural economy, a shift anticipated to services and industrial sectors in coming years.

The figure below presents a summary of the estimated growth rate of workforce in the services and industrial sector. This growth rate is manifest in the projected workforce levels that are estimated in figure 4.3.

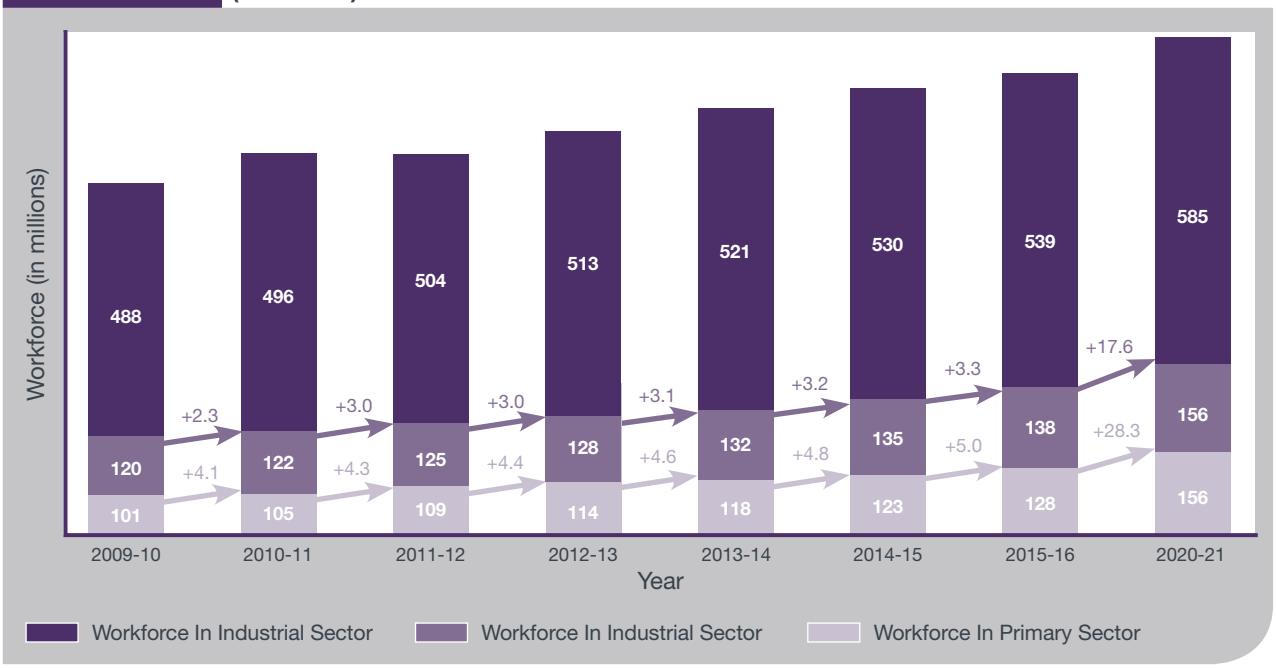
Figure 4.2 **Growth of Workforce in Services and Industrial sector (1993-94 to 2005-06) (in millions)**



	Contribution to Workforce
Services sector in 1993-94	21.2%
Services sector in 2005-06	23.2%
Industrial sector in 1993-94	14.20%
Industrial sector in 2005-06	18.80%

Source: Institute of Applied Manpower Research

Figure 4.3 **Projected Growth of Workforce in Services and Industrial sector (2009-10 to 2020-21) (in millions)**



Source: Projections based on Census of India, 1991 and 2001

12 As per IAMR

4.2 Assumptions For Area Requirement Across Real Estate Sectors

This section builds upon population growth estimation to estimate total area requirements in real estate and civic amenities, which is based upon incremental population projection in India over years 2010 – 2020. This has been calculated by understanding total area requirement per person for development of residential, retail, commercial office, industrial and hotel industry.

The assumptions are based on Indian and International standards as published by Neufert Architect Data (3rd Edition), AT Kearney, KPMG, FICCI, Forrester Research, MOSPI, UDPFI Guidelines, All India Council of Technical Education, (AICTE), Urban Grants Commission (UGC), Technopak and JLL Hotels.

Table 4.2 **Assumptions for area requirement for various real estate sectors**

Residential	304 sq ft	Assessment for demand for per capita residential area has been estimated on basis of paying capacity of the Indian population from the Indicus sample survey 2009 – 2010. Demand for larger units is likely to be generated by high paying propensity educated and employed class and smaller units are likely to be demanded by population with low income levels. SEC A is likely to opt for larger unit size accommodating 4 and 5 BHK units within area size of 4750 sq. ft, SEC B is likely to opt for 3 BHK with average area of 2500 sq ft and SEC C may opt for 2 BHK within an average area of 1,500 sq ft. However SEC D and E are likely to fall in low income bracket with less paying propensity therefore are likely to opt for smaller units within an area range of 600 and 275 sq ft respectively. Viewing Socio – economic classification (SEC) pattern in India in 2009–10, per person average residential space requirement is estimated at 304 sq ft.
Retail	2 sq ft	Jones Lang LaSalle estimates and published presentation viz. 'The Indian Retail Sector' by Lakshmi Narayanaswamy and Mudit Sharma, which sources: AT Kearney, Forrester Research 2006 , KPMG-FICCI Report, http://www.indiainbusiness.nic.in states the average retail space requirement per person is 2 sq. ft.
Commercial Offices	100 sq. ft	Technopak, Neufert Standards indicate average commercial area space per employee is 100 sq ft per person. This also entails service sector employment in Government sector
Industrial	764 sq. ft	Average unit areas and employment per unit have been factored in and this has been translated to average per capita built up area in a particular type of industry. The average of these areas for different typologies is calculated to arrive at mean industrial built up area per person employed in this sector. The data set has been sourced from Annual Survey of Industries, 2001-2005, MOSPI & Jones Lang LaSalle estimates.
Hotel	Dependent on Commercial supply: **Tier II and III city** Per 1000 sft commercial = 2.5 rooms **Tier I city** Per 1000 sft commercial = 3.5–5 rooms depending upon market activeness in terms of hospitality and tourism	Jones Lang LaSalle Hotels
Amenities Education and Healthcare	Estimation of per capita Amenities requirement is detailed below	Amenities have broadly been categorized into education and healthcare sectors, which contribute to the built environment. Standards for space calculation for various types of healthcare centres and educational institutes have been referred from the UDPFI Guidelines, UGC and AICTE.

Table 4.3 **Projected Growth of Workforce in Services and Industrial sector (2009-10 to 2020-21) (in millions)**

Healthcare Centres	Requirement in No.	Area requirement
Hospital A (501 beds and above)	1 per 500,000 persons	2.5 - 4.5 ha
Hospitality B (201 beds to 500 beds)	1 per 250,000 persons	1.5 - 2.5
Hospitality C (101 beds to 200 beds)	1 per 100,000 persons	0.5 - 1 ha
Hospital D (Up to 100 beds)	1 per 100,000 persons	3.5 - 4 ha
Maternity Home	1 per 50,000 persons	1000 - 2000 sqm
Nursing home	1 per 50,000 persons	1000 - 2000 sqm
Dispensary	1 per 10,000 persons	800 - 1200 sqm
Family welfare centre	1 per 50,000 persons	500 - 800 sqm
Pediatric centre	1 per 50,000 persons	500 - 800 sqm
Geriatric centre	1 per 50,000 persons	500 - 800 sqm
Diagnostic centre	1 per 50,000 persons	500 - 800 sqm
Medical college	1 per 1,000,000 persons	2.5 acres*
Nursing and paramedic centre	1 per 1,000,000 persons	2000 sqm

*Area requirement of various technical colleges varies between 0.5 - 4 acres in main cities and metros and up to 10 acres in other places. Therefore average area has been estimated at 2.5 acres per technical college

Source: UDPFI Guidelines

Schools and Educational Centres	Requirement in No.	Area requirement
No. of primary schools	1 per 10,000 persons	0.2 - 0.4 ha
No. of Senior secondary	1 per 10,000 persons	0.6 - 0.8 ha
No. of schools for mentally challenged	1 per 1,000,000 persons	0.2 ha
No. of schools for Physically challenged	1 per 1,000,000 persons	0.2 ha
Vocational Training Institute	1 per 500,000 persons	0.4 ha
General college	1 per 500,000 persons	2.5 acres
Technical Professional college	1 per 500,000 persons	2.5 acres

Source: UDPFI Guidelines, UGC and AICTE

The average area within range stated for each category has been assumed while estimating requirement for total healthcare and education oriented space in the country.

4.3 Estimating Demand for Real Estate Across Various Sectors

Based on the above mentioned assumptions, it is estimated that 7,566 million sq ft of incremental space may potentially be required in 2011, to cater to the real estate needs of the incremental population.

Of this, the estimated incremental demand per annum for residential and industrial area is highest among all sectors at approx. 3,278 million sq. ft and approx. 3,259 million sq. ft. respectively. Statistics reveals that over 85% of the potential demand falls under the residential and industrial category. This is in accord with the area allocated in these uses in various city and master plans.

These are followed by commercial uses entailing commercial offices, retail area and hotel developments with an estimated demand of nearly 10% of overall demand. For year 2011, total demand for all commercial uses is estimated at approx. 736 million sq. ft.. The remaining demand is estimated in public semi-public uses and social infrastructure.

A study of overall growth rates across various sectors reveals that demand for industrial space is likely to grow at fastest rate nearing 4.5% owing to large scale development estimated till 2020. The second highest growth rate is estimated in residential sector wherein demand is likely to generate from rise in population levels and increasing paying propensity.

Demand in other sectors such as retail, commercial and public semi – public uses are likely to grow at 1.54%, 2.55%, and 1.54% respectively. Demand for hotel space is expected to remain in line with demand for commercial office space.

Table 4.4 Summary of Annual Incremental Demand Estimated Across Sector (2011) (millions)

	2011
Annual population increase in India	17.79 million
Annual urban population increase in India	10.77 million
Residential demand	3,278 million sq.ft
Retail	36 million sq.ft
Commercial Offices	298 million sq.ft
Industrial	3,259 million sq.ft
Hotels	402 million sq.ft
Healthcare Sector	93 million sq.ft
Education Sector	202 million sq.ft
Total estimated incremental demand for real estate	**7566 million sq.ft**

Figure 4.4 Real estate area break-up across various sectors – 2011

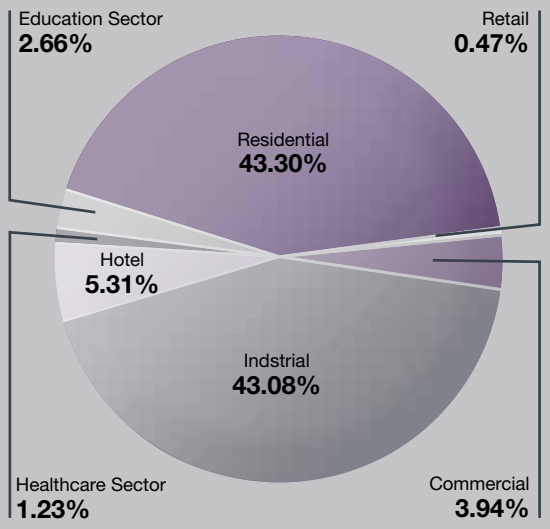


Figure 4.5 **Estimated demand for real estate space (in million sq. ft) for various real estate sectors**

Figure 4.6 Estimated demand for real estate space (in million sq. ft) for various real estate sectors

Table 4.5 Estimated demand for real estate space (in million sq. ft) for various real estate sectors

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Cumulative incremental 2010 - 2020
Incremental Population (mn)	18	18	18	18	19	19	19	19	20	20	20	208
Residential (mn sq.ft)	3,184	3,276	3,370	3,468	3,568	3,671	3,777	3,886	3,998	4,113	4,232	40,543
Retail (mn sq.ft)	35	36	36	37	37	38	38	39	39	40	41	416
Commercial office (mn sq.ft)	291	298	305	312	320	328	336	344	352	361	370	3,617
Industrial (mn sq.ft)	3,132	3,259	3,392	3,530	3,674	3,823	3,979	4,141	4,309	4,485	4,667	42,391
Hotels (mn sq.ft)	392	402	412	422	432	443	453	464	476	487	499	4,882
Healthcare (mn sq.ft)	92	93	95	96	97	99	100	102	103	105	107	1,089
Education (mn sq.ft)	199	202	205	208	211	214	217	220	224	227	230	2,357
Total estimated demand for real estate 2010 – 2020 (mn sq.ft)	**7,325**	**7,566**	**7,815**	**8,073**	**8,339**	**8,616**	**8,900**	**9,196**	**9,501**	**9,818**	**10,146**	**95,295**

5.0 Undersestimating Built Environment Professionals Landscape

Human resource supply in built environment is a direct function of the growth of real estate activities and investments in the built environment sector. Approx. 19% of the country's GDP is contributed by construction, including infrastructure, and real estate activities, which is further estimated to increase in the next five years owing to the large investment outlay in infrastructure and construction sectors.

This chapter provides an overview of the education setup prevalent in India and manpower assessment across various sectors of the economy. A typical lifecycle of project is analysed to understand different skill sets required at various stages of project. This has been viewed in context of key stakeholders that are involved in skill development of human resource in the built environment.

This includes the key initiatives undertaken by the government, along with an assessment of roles and responsibilities of academia and professional bodies that address the supply side of this human resource in the built environment. In addition, demand side issues for these human resources from the perspective of developers, construction firms, and consultancy organizations have also been assessed. This will set the background for detailed supply assessment of professionals in the built environment in India in the subsequent chapters.

5.1 Introduction

Explicit growth of Indian real estate and infrastructure frequently raises the question regarding the demand and availability of trained and skilled manpower for the development activities. At this stage understanding the Indian educational setup for technical education becomes imperative. Technical education plays a vital role in human resource development of the country by creating skilled manpower, enhancing industrial productivity and improving the quality of life.

Technical education for the built environment covers courses and programs in engineering, technology, management, architecture and town planning etc. Amongst this gamut of varied specializations, professionals from streams of architecture, planning and engineering form part of the core manpower resource for this sector.

Other streams of lawyers, management professionals, chartered accountants among others form part of the ancillary support team for this sector. These courses provide numerous avenues of employment within the built environment in respect to varied skill sets required during different phases of project execution.

5.2 Typical Project Lifecycle and Skill Sets Required Under Each Stage

Human resource in the built environment is required to possess a diverse set of specialized skill-sets. From the perspective of this assignment, the first step was to identify the professionals and skill sets that are required for the built environment in India. To address this aspect, the project life cycle approach has been adopted, which seeks to identify what types of professionals are involved at each stages of a typical project. This allows us to appreciate the diversity of professionals' presence in various parts of the project, and the required skill sets by each stage in the project life-cycle. Typical life cycle of any construction and real estate projects has following broad defined stages:

The upper part of drawing illustrates the sequence of processes from pre-design to project completion and project sale stage. The lower section refers to 'staff and support functions' of the development process, i.e., project management, human resource management, marketing and financial management.

To address various requirements of these stages, different professionals are required that possess the requisite skill-sets to undertake various related activities. Table 5.1 presents a typical project life cycle in context of the activities that are required at each stage. It may be noted here that activities are a reflection of the application of skill sets. These activities / skill-set applications are indicated by the type of professional that predominantly possess the requisite skill-sets for the relevant activities.

Figure 5.1 Real Estate and Construction Project lifecycle

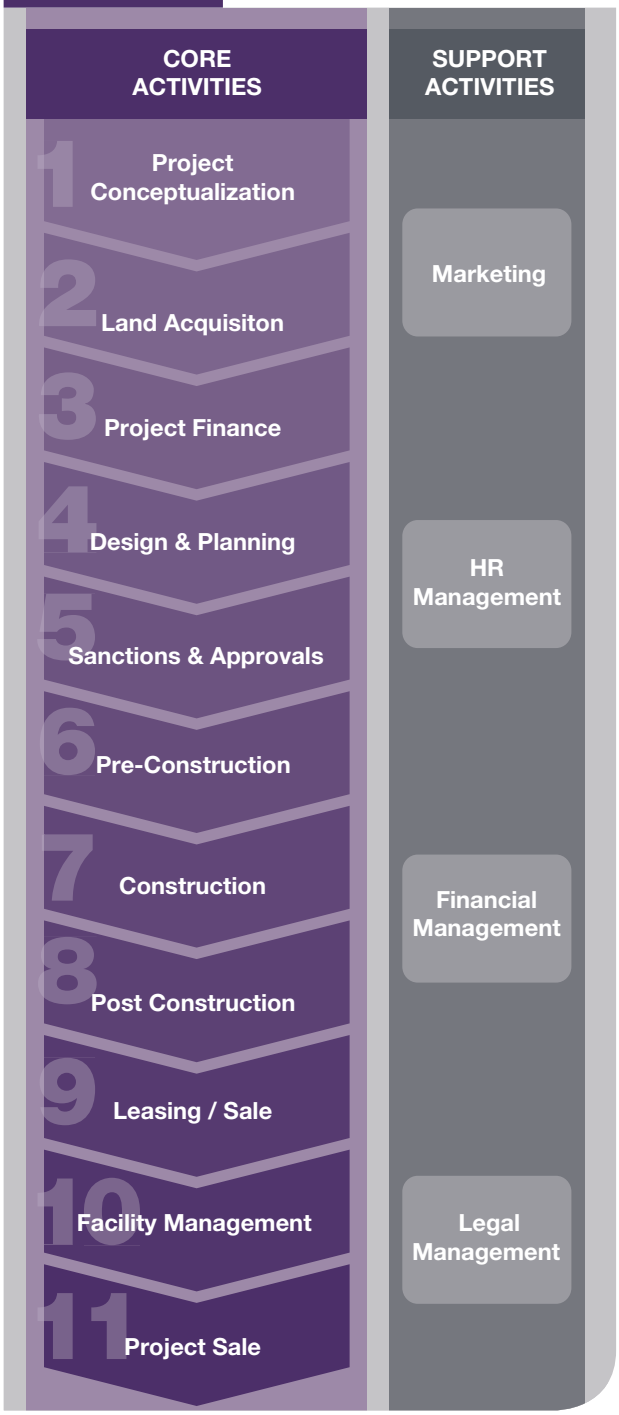


Table 5.1 **Skill set across Project Life Cycle**

	Project Conceptualisation							Land Acquisition		Project Finance		
	Market Scan	Demand Studies	Cost Examination	Revenue Estimation	Green building concepts	Financial Feasibility	Valuation	Land Surveyor	Legal Document Review	Finance Structure	Legal documentation	Valuation
Civil engineer	✓		✓	✓	✓			✓				
Architect				✓	✓			✓				
Planner		✓		✓	✓			✓				
Environment engineer*		✓	✓		✓							
CA/Financial Analyst		✓		✓		✓				✓		
Valuer							✓					✓
QS			✓									
Lawyer									✓		✓	
Geographer/Land Surveyor								✓				
Management Professional												
Facility Manager												
Economist		✓		✓	✓	✓						
Graduate/Other Fields												
Brokers								✓				
Skilled & Semi Skilled Workers												

	Design and Planning		Sanctions and Approvals					Pre-Construction			
	Building Design	Site Planning	Sanction Drawings	Environment Clearance	Structural Clearance	Fire Fighting Clearance	Other Clearances	Quantity Surveying	Preparation of Contract Bid Tender	Review of Bids and Award	Pre-construction Management
Civil engineer	✓	✓			✓	✓	✓	✓	✓	✓	✓
Architect	✓	✓	✓						✓	✓	✓
Planner		✓									
Environment engineer*	✓	✓		✓							
CA/Financial Analyst											
Valuer											
QS								✓	✓	✓	
Lawyer							✓		✓	✓	
Geographer/Land Surveyor											
Management Professional											
Facility Manager											
Economist											
Graduate/Other Fields											
Brokers											
Skilled & Semi Skilled Workers											

Table 5.1 Skill set across Project Life Cycle

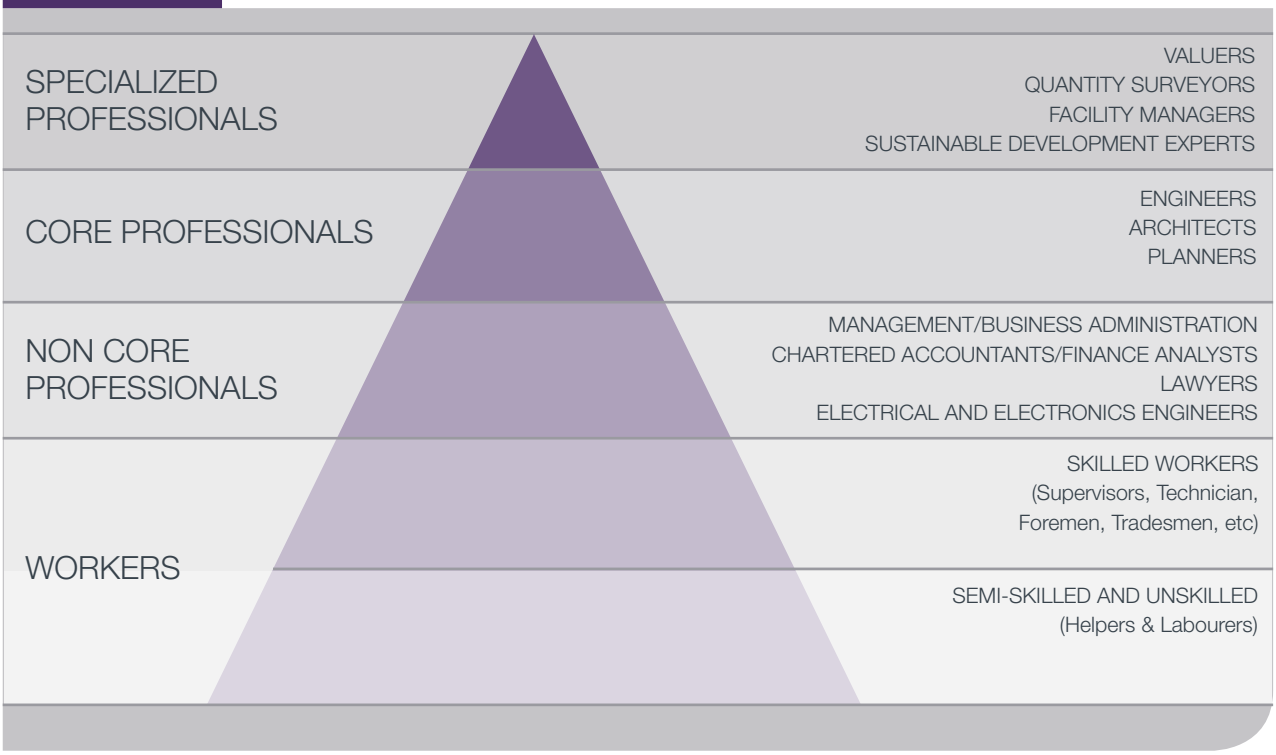
	Construction		Post Construction	Leasing/Sale		Facility Management			Project Sale		
	Construction Management	Construction	Audit	Project Marketing	Legal Documentation	Administration	Operations Management	Lease Administration	Transaction Structure	Financial Structure	Legal Documentation
Civil engineer	✓	✓	✓			✓	✓				
Architect			✓								
Planner			✓								
Environment engineer*			✓								
CA/Financial Analyst									✓	✓	
Valuer											
QS											
Lawyer					✓			✓			✓
Geographer/Land Surveyor											
Management Professional				✓		✓					
Facility Manager						✓	✓				
Economist											
Graduate/Other Fields						✓		✓			
Brokers											
Skilled & Semi Skilled Workers		✓					✓				

Core Specialist Non core/support Not covered in study

5.3 Broad categories of professionals employed in built environment

Key professionals associated with the construction and real estate sectors in India can broadly be categorized into three categories depending on the primacy of their involvement in the built environment sector. These professionals are further categorized as specialized professionals, core professionals and non-core professionals. These professionals are supported by workers who are split as skilled as well as semi-skilled and unskilled categories.

Figure 5.2 **Broad Categories of Professionals in Built Environment**



Core professionals are those who are related directly to the built environment profession and are unlikely to work in a non-built environment sector at their current level of professional training. Professions considered under this category are given as below:

a. Civil Engineers and related

b. Architects

c. Planners

Non-core professionals[13] are those professionals that have utility across various sectors of the economy and may not be restricted to employment within the built environment sector of India. Professions considered under this category are as follows:

a. Business Administration (includes MBA Marketing & Finance. However, Management Professionals with specialization in Finance have been clubbed with Chartered Accountants later in this report and re-termed as Finance Analysts)

b. Chartered Accountants

c. Lawyers

d. Electrical and Electronics Engineers (re-termed as engineers from non-core fields)

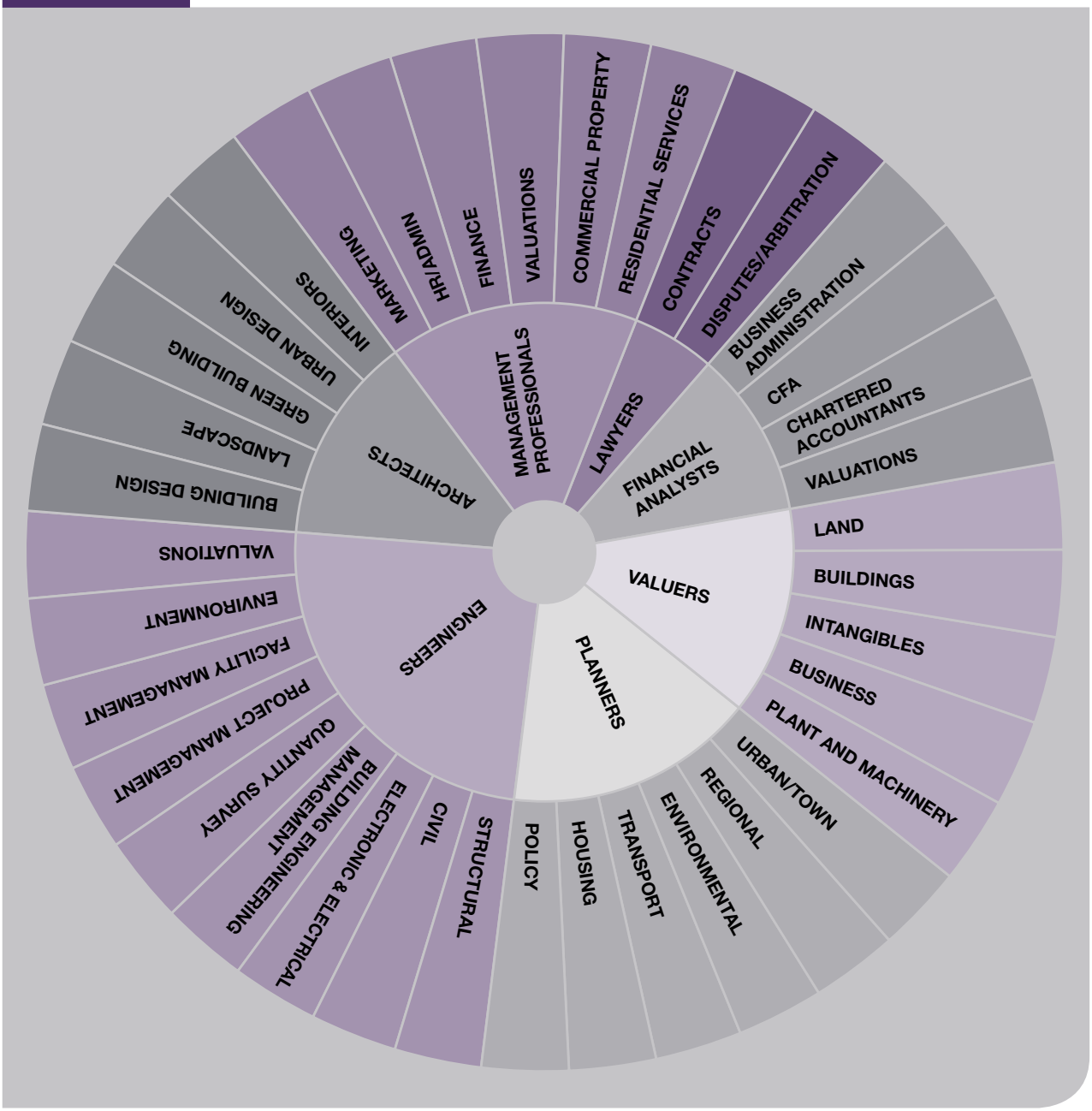
13 It may be noted that the typology of professionals considered under non-core professionals at this stage have changed in the subsequent part of this report following findings from primary surveys and discussions with industry experts.

Different areas of specialization

As in case of any fast growing industry or sector, a variety of specialized streams emerge with advancement of the field. In the case of Built Environment, professionals from both core as well as non core areas have a myriad of further specialisations that they may choose to advance their career in. The figure below gives a top level view of how the core and non core professions can branch out into further areas of specialisation. Very few of the specialisations shown in the below figure are well established in the Indian context but will be instrumental in the development of the Indian built environment in the future.

This research aims to study some of these specialisations, which have been highlighted as priority areas as part of the research findings, in further detail. These have been laid down in the subsequent paragraph.

Figure 5.3 Indicative Areas of Specialization



Specialized professionals are considered to possess the specialized skill sets that need to be performed to address very specific functions of the built environment. These skill sets demonstrate knowledge across various domains, and have been observed to be required in an evolving global economic environment. It has also been observed that these skill sets are playing increasingly important roles in the built environment and are beginning to emerge as core disciplines. The shortage for these professionals has also emerged during primary surveys and discussions with the various industry experts as being critical for the built environment going forward. These include:

a. Valuation

b. Quantity Surveying

c. Facility Management and

d. Sustainable development

Construction Workers include skilled, semi-skilled and unskilled labour for construction, development and various related activities. Although workers play a vital role in the development of built environment, they cannot be termed as professionals as their involvement is limited to execution of projects. The staff considered under this category is as follows:

a. Skilled workers: Supervisors, technicians, foremen, tradesmen, etc.

b. Semi -skilled and unskilled workers: Helpers and labourers, etc.

5.4.1 Higher Education and Technical Education System

University and Higher Education

The Central Government is responsible for major policy relating to higher education in the country. It provides grants to University Grants Commission (UGC) and establishes central universities in the country. The Central Government is also responsible for declaration of Education Institutions as 'Deemed to be University' on the recommendation of the UGC. UGC is also responsible for coordination, determination and maintenance of standards, release of grants.

University Grants Commission (UGC) - a statutory organization established by an Act of Parliament in 1956 for the coordination, determination and maintenance of standards of university education. Apart from providing grants to eligible universities and colleges for various courses, research and programs, the Commission also advises the Central and State Governments on the measures which are necessary for the development of higher education.

Apart from the Central Government, State Governments are also responsible for establishment of State Universities and colleges, and provide plan grants for their development and non-plan grants for their maintenance. Moreover, there are Professional Councils who are responsible for recognition of various professional courses, promotion of professional institutions and providing grants and awards to undergraduate programmes.

Technical Education

Technical Education plays a vital role in human resource development of the country by creating skilled manpower, enhancing industrial productivity and therefore improving the quality of life. Technical Education covers courses and programmes in engineering, technology, management, architecture, town planning, pharmacy, applied arts and crafts, hotel management and catering technology.

The technical education system in the country can be broadly classified into three categories – (a) Central Government funded institutions, such as IITs, IIMs, IISERs, NITs, and others; (b) State Government/State-funded institutions, such as various universities and technical institutes offering the technical courses; & (c) Self-financed institutions. Besides the above, there are four Boards of Apprenticeship Training (BOATs).

All India Council for Technical Education (AICTE) - set-up in November 1945 as a national level Apex Advisory Body to conduct survey on the facilities on technical education and to promote development in the country in a coordinated and integrated manner. To ensure the same as stipulated in the National Policy of Education (1986), AICTE vested as statutory authority for planning, formulation and maintenance of norms and standards, quality assurance through accreditation, funding in priority areas, monitoring and evaluation, maintaining parity of certification and awards and ensuring coordinated and integrated development and management of technical education in the country.

The purview of AICTE covers programs of technical education including training and research in Engineering, Technology, Architecture, Town Planning, Management, Pharmacy, Applied Arts and Crafts, Hotel Management and Catering Technology etc. at different levels, which play quite a major role in developing the professionals with right skill sets in various aspects of development of built environment.

5.4.2 Institutions catering to skill development in Built Environment

To impart basic and technical education to professionals in the Built Environment in India, commissions, professional bodies and organizations have been introduced. The major objectives of these commissions, professional bodies and organizations is to ensure quality education and training of the right skill sets required to develop the Indian built environment in line with the future aspirations. The roles of the these commissions, professional bodies and organizations in imparting the training of requisite skill sets to develop the built environment are as given below;

Construction Industry Development Council (CIDC)
In 1996, the Planning Commission, Government of India, in collaboration with the Indian construction industry, set up Construction Industry Development Council (CIDC) to take up activities for the development of the Indian construction industry.

The Council provides the impetus and the organizational infrastructure to raise quality levels across the industry. This helps to secure wider appreciation of the interests of construction business by the government, industry and peer groups in society. CIDC is a change agent to accelerate a process of self-reform that should enable the industry to answer the challenges in the built environment in future.

The Council has taken several initiatives for the development of the industry including - Training manpower at skilled worker level and construction management level, Standardization of construction contracts and procedures, Devise mechanisms for workers' welfare, Interaction and networking with international organizations to promote emerging technologies and best practices, etc.

CIDC also holds Supervision Skill Development Programmes (SSDP) which aims to address the various skill gaps in a holistic manner for the target audience through innovative training programmes. The main objective of this programme is to upgrade the skills of the working construction professionals through exposure to recent trends and best practices in construction industry.

National Skill Development Corporation (NSDC), India
NSDC is a first-of-its-kind Public Private Partnership (PPP) in India set up in 2008 to facilitate the development and upgrading of the skills of the growing Indian workforce through skill training programs. A large part of the organisation's efforts are directed at the private sector and towards developing the skills in the unorganised sector in India. NSDC supports skill development efforts, especially in the unorganised sector in India by funding skill training and development programmes. It also engages in advocacy and training programmes, in-depth research to discover skill gaps in the Indian workforce, and developing accreditation norms.

NSDC acts as a catalyst in skill development by providing viability gap funding to enterprises, companies and organizations that provide skill training. It will also develop appropriate models to enhance, support and coordinate private sector initiatives. For the built environment up gradation, NSDC have identified various programs and courses where there is need to upgrade the skills of professionals.

The objective of NSDC is to contribute significantly (about 30%) to the overall target of skilling / up skilling 500 million people in India by 2022, mainly by fostering private sector initiatives in skill development programs and providing viability gap funding.

6.0 Demand and Supply Assessment – Core Professionals

Core Professionals are integral part of built environment as they form the backbone of all development and management of real estate and infrastructure projects. Core professionals take up the responsibility of plan, design, construct, and managing the built environment, and being involved right from the initial stages, these professionals guide the quality and timely delivery of projects. Skill sets shortages in this hierarchy of professionals, consequently will impact the future growth of these sectors immensely.

Supply of these professionals in the built environment is assessed from the perspective of project life cycle approach. This approach has allowed for organization of these professionals and their concomitant skill sets in line with various stages of project development and management. Detailed assessment of core professionals in the built environment has been undertaken to arrive at their annual supply release in India in the past. This assessment is further evaluated on the basis of the courses being administered by various academic institutions.

This chapter further seeks to identify the demand-supply gap in terms of numbers and expertise for core professionals in the built environment. This assessment is undertaken at two levels; (a) to understand the shortage of professionals (quantitative assessment) and (b) to understand the requisite skills of these professionals (qualitative assessment).

This assessment further leads to the identification of special skills that will be in greater demand in the future for the built environment sectors and require attention on a priority basis as there is need of increasing the supply of these core professionals and specialists to successfully support growth aspirations of India's built environment.

6.1 Introduction To Core Professionals

This chapter further seeks to identify the demand-supply gap in terms of numbers and expertise for core professionals in the built environment namely civil engineers, architects and planners.

This analysis traces the historical growth pattern of all core professionals being released annually, and the educational set-up being adopted for preparation of these professionals for their involvement in the built environment. This supply trend of core professionals has been analyzed in light of demand for same to understand the quantum of these professionals being made available for the built environment and resulting shortage.

Demand for core professionals has been estimated by adopting a three stage approach:

a. Current productivity levels of professionals: Employee productivity functions have been estimated as per normative assessment[14] in accord with discussions held with various industry experts.

b. Estimated improvements in efficiency levels of professionals: One important aspect that needs consideration is that productivity of professionals' increases over a period of time owing to increasing levels of technological improvements and advancements resulting in production of aids and tools that allow professionals to undertake their work more efficiently. Moreover, industry processes over a period of time become more streamlined enhancing productivity and efficiency levels of professionals. These are reflected in the growing GDP per capita levels by volume of professionals.

c. Estimating demand for professionals: Working on the current productivity levels of professionals and the anticipated enhancement in productivity over the coming years in context of the total demand for various real estate sectors, the potential demand for core professionals required to build the estimated real estate and infrastructure is estimated.

Post demand and supply number assessment, shortage per profession has been assessed at two levels;

a. shortage of professionals in absolute terms i.e. quantitative assessment

b. shortage or gap in requisite skills of these professionals – i.e. qualitative assessment

14 Undertaken as part of this research

6.2 Civil Engineers And Related [15]

Civil Engineers play critical roles at various levels in the built environment sector as they possess the necessary skill-sets that are required for design and execution of various projects. They understand the technique of engineering design and are equipped to adopt different technologies for actualization of these designs.

Civil Engineers' are part of the entire project life cycle and their role comes into play from the project conceptualization stage and they form part of various stages of the project right up to facility management stage after completion of the construction. Major activities undertaken by Civil Engineers are cost estimation, building design and site planning, infrastructure layout planning, sanctions and approvals for certain clearances, quantity surveying, cost estimation for green technologies, preparation and review of tender documents, equipment technologies, project management including pre and post construction management, quality audit, environmental planning, and engineering and facilities management.

Civil engineers and related professionals are majorly responsible for design of structural details, quantity surveying, foundation, construction, hydraulics, and environmental engineering, works management and cost, transportation engineering, irrigation engineering etc., implementation of real estate projects on site. Civil Engineer are involved in sectors ranging from buildings and roads, traffic and transportation, irrigation/power, water supply and sewage disposal, dams and reservoirs, ports and harbors, airways and navigation, treatment for industrial wastes, pollution control and disaster mitigation, among others.

As per Ministry of Human Resource Development, Government of India, there are approx. 1,668 engineering institutes[16] in India providing Bachelor degree and Masters Programs in this field. Premier institutes include Indian Institute of Technology (in 15 cities), Birla Institute of Technology, and National Institutes of Technology (formerly Regional Engineering Colleges), in addition to various private institutes.

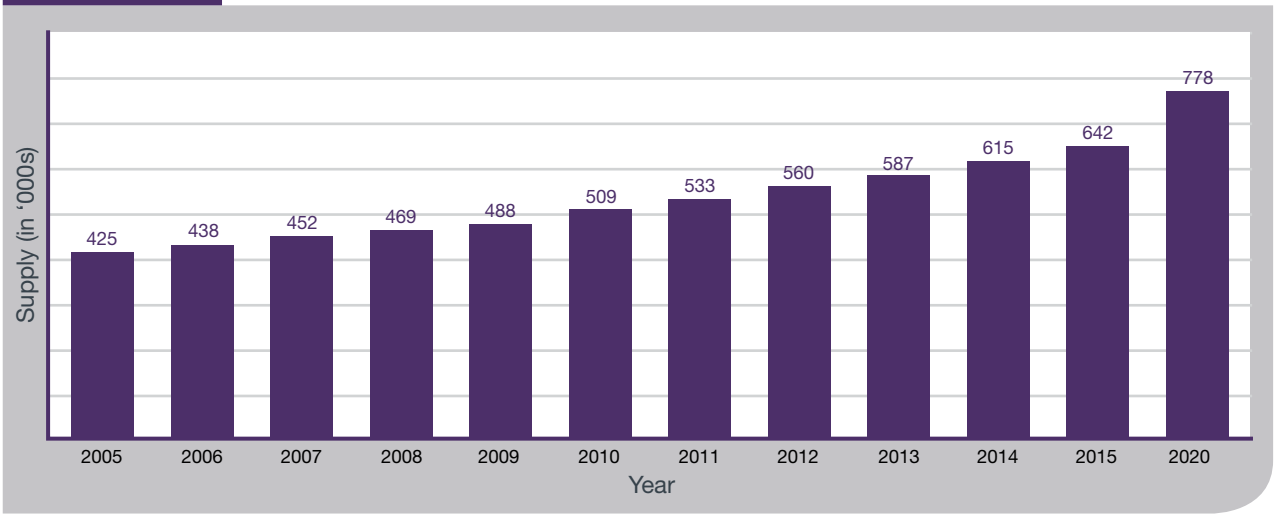
Enrollments in civil engineering and related courses have grown from 11,972 in 2001 to 34,363 in 2009 at a CAGR of nearly 14%. Assuming the CAGR to continue, growth of enrolments in the year 2015 is estimated to touch approx. 75,800.

6.2.1 Supply trend in civil engineering and related professionals

It is estimated that the **cumulative supply of civil engineers and related professionals in India, in the year 2005 was approx. 425,282**[17]. Taking into account the number of students enrolled in engineering courses for a program duration of 4 years, the annual supply of civil engineers has been estimated for next four years. Working on the current supply scenario, **cumulative supply of civil engineers by the year 2015 has been estimated at approx. 641,754 and at approx. 777,761 for the year 2020**.

It has been assumed that the capacity or no. of seats in civil engineering courses will remain constant as of 2009. A drop out rate, including non-working professionals, to a tune of 10%[18] has also been factored in the annual supply figures while making these future projections for Civil Engineers.

Figure 6.1 **Cumulative supply of Civil Engineers and related professionals (in '000s)**



Source: Indiastat.com[19], Ministry of Human Resource Development[20], Council of Architecture (for Building and Engineering Management professionals only as part of this statistic) and extrapolation of data

15 Including Building Engineering and Management 16 *www.education.nic.in* 17 Based upon information and data gathered from various sources concerned with this stream 18 Ministry Human Resource Development and University Grants Commission 19 www.indiastat.com, Region/State-wise Number of Engineering Degree Colleges and their Intake in India (2000-2001 to 2005-2006) 20 Department of School Education & Literacy and Department of Higher Education, Ministry of Human Resource Development

6.2.2 Demand Assessment – Built Environment (Real Estate and Infrastructure)

The demand for civil engineers and related professionals is largely generated from real estate and infrastructure sectors.

Real estate – Demand for civil engineers and related professionals has been estimated on the basis of projected demand for real estate and the number of civil engineers required being involved in construction of the same amount of real estate. This number has further been translated to estimated number of civil engineers required for construction of one square foot of development. This derived number has further been multiplied to the total projected development, in order to establish the demand for civil engineers and related professionals in Indian real estate industry.

Table 6.1 **Demand for civil engineers and related professionals per square foot of real estate development**

Demand for Civil Engineers and related professionals in Real Estate Sector		
Development area	200,000 sq ft	500,000 sq. ft
Nos. of Civil Engineers and related required	38*	65
Engineers per 1,000,000 square foot of development	200	100
Average Engineers per 1,000,000 square foot of development	150	Engineers/ mn sft

*Refer details below

Civil Engineers	For 200,000 sq. ft	For 500,000 sq. ft
Project in-charge	1	1
Planning in-charge	1	1
Site in-charge	1	1
Site Engineers	2	4
Quality Check	1	1
Safety	1	1
Electrical	2	3
Mechanical	1	2
Billing	1	2
PMC	6	8
Client	2	3
10 Packages Vendors	18	36
Others	1	2

Source: Jones Lang LaSalle Research

Subsequently, this current productivity level is viewed in context of its potential improvement that may be observed in future years. This is benchmarked on current productivity and efficiency levels observed in select developed countries, namely USA, Australia, and Japan, which India is anticipated to achieve over a number of years. Based on these levels, potential productivity improvement related to civil engineers for developed economies is estimated at 1.73%, which is the average per annum increase in productivity level of professionals employed in built environment.

Technological advancement is observed in the construction sector owing to growing presence of international players in India that are demanding development of global standards, which in turn is necessitating adoption of global construction techniques and know how. Consequently real estate sector development in India is beginning to observe adoption of global standards and techniques, which will result in productivity levels moving in consonance with globally achieved levels. This productivity improvement multiplier is factored in calculations done to ascertain future productivity levels of civil engineers and related professionals in India.

Based on the current productivity and estimated increase in productivity, a demand of approximately 1.19 million civil engineers is projected in 2011, to cater to 7.5 million square feet required to be built in this year.

Infrastructure – On the back of investments proposed for infrastructure projects, the sector is likely to observe high growth levels which are likely to necessitate quantum jumps in requirement of engineers delivering these outlays.

Moreover, it is estimated that approx. 70% of the total demand of civil engineers and related professionals is likely to be employed in infrastructure sector as infrastructure contributes to 76% of the construction GDP in India. Therefore, it is assumed that the demand derived for real estate is 30% of the total demand for civil engineers and related professionals required in built environment, including infrastructure.

Therefore, total demand for civil engineers across real estate and infrastructure is estimated as below:

Table 6.2 Estimation of demand for Civil Engineers & related professionals in real estate sector

	2010	2011	2012	2013	2014	2015	2020
Incremental demand for real estate space (million sq. ft)	7,325	7,566	7,815	8,073	8,339	8,616	10,146
Demand for Civil Engineers ('000)	1,172	1,190	1,208	1,227	1,246	1,265	1,367

Table 6.3 Estimation of demand for Civil Engineers & related professionals in real estate and infrastructure (in '000s)

	2010	2011	2012	2013	2014	2015	2020
Demand for civil engineers in real estate ('000)	1,172	1,190	1,208	1,227	1,246	1,265	1,367
Demand for civil engineers in infrastructure ('000)	2,734	2,776	2,819	2,862	2,907	2,952	3,191
Total demand for civil engineers in built environment ('000)	**3,906**	**3,966**	**4,027**	**4,089**	**4,153**	**4,217**	**4,558**

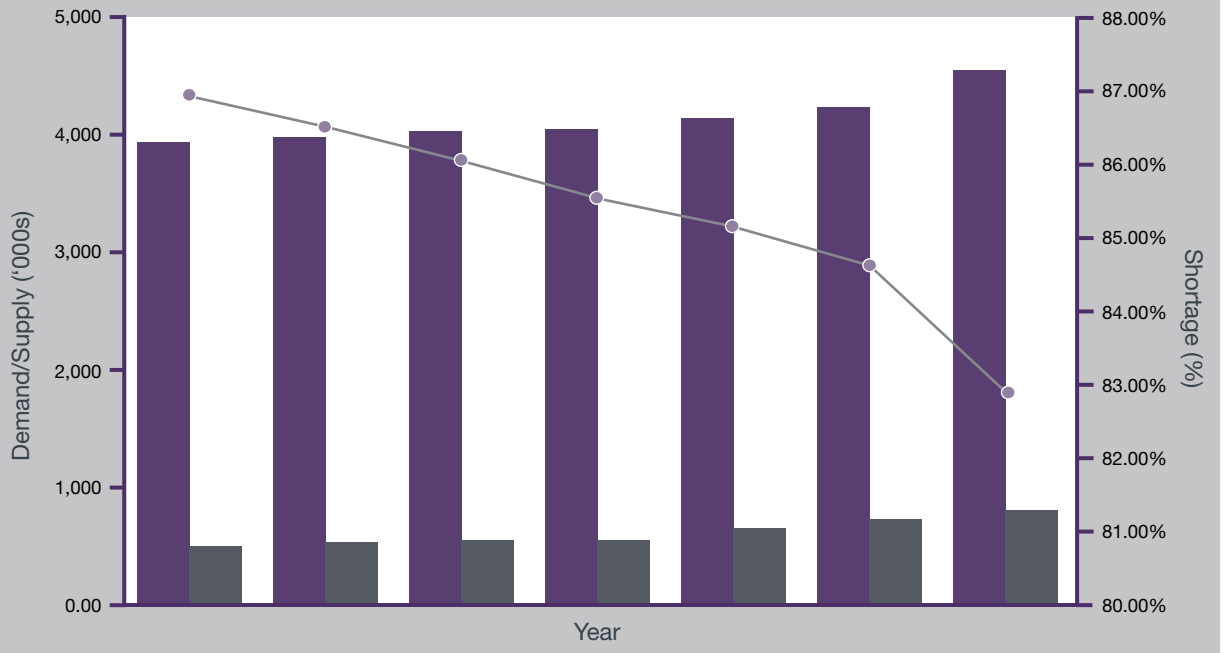
Source: Economic Survey 2007 – 08, CREDAI, NSDC report on Human resource and skill requirements in the building, construction industry and real estate services - Study on mapping of human resource skill gaps in India till 2022 and Primary Surveys conducted by Jones Lang LaSalle

21 Factoring per annum increase of 1.73% in productivity, based on global trends assessed from select developed and developing countries
22 Economic Survey 2007 – 08, CREDAI, NSDC report on Human resource and skill requirements in the building, construction industry and real estate services - Study on mapping of human resource skill gaps in India till 2022 and Primary surveys conducted by Jones Lang LaSalle

6.2.3 Demand Supply Gap

Comparing the demand estimates with projected supply of engineers in built environment in India, the demand supply gap of engineers in built environment is estimated as below:

Figure 6.2 **Demand Supply Gap Assessment – Civil Engineers and related professionals (figures in'000s)**



	2010	2011	2012	2013	2014	2015	2020
Demand	3,906	3,966	4,027	4,089	4,152	4,217	4,558
Supply	509	533	560	587	615	642	778
Shortage	86.97%	86.56%	86.09%	85.64%	85.20%	84.78%	82.94%

Table 6.4 **Shortage of Civil Engineers and Related Professionals (in '000)**

2010	2011	2012	2013	2014	2015	2020	Total Shortage 2010–2020
3,397	3,433	3,467	3,502	3,537	3,575	3,780	39,390

6.2.4 Qualitative assessment of skill sets in civil engineers

Apart from quantifying the shortage of civil engineers, various qualitative shortfalls are observed in the skill-sets that the engineers are expected to possess for efficient delivery, which have been identified based on interviews with select infrastructure development, construction and consulting firms, along with various academia and professional bodies.

The figure below indicates intensity of skill gaps in some activities in which civil engineers are expected to be proficient. Some of the areas where skill shortages have been highlighted are valuation, structural, fire-fighting clearances, quantity surveying, preparation and review of bid/ tender documents, construction management and overall project management. In addition to the above, facility management and exposure to latest construction and equipment technologies emerge as the weak link where there is utmost need to upgrade relevant skills.

In the absence of high degree of mechanization in the construction industry, there is considerable dependence on human resource. To address this limitation of relatively low level of mechanization, human resource needs to constantly upgrade their skills in line with new and emerging global technologies. However, inadequate exposure to latest construction techniques has emerged as prominent gap. Whilst engineers are expected to be up-to date, majority of engineering professionals do not have adequate exposure and experience of pre-cast engineering techniques. Moreover, there is inadequate expertise of latest technologies for developing high-rise buildings, world class airports, and energy efficient buildings. For most of these skills which are found lacking in India, increasingly there is a greater degree of participation by global professional and construction consulting firms, especially for the large and complex projects.

Construction management has emerged as another prominent area of concern where limited formal knowledge is possessed by these professionals. Most developers have identified inadequate exposure to and application of global quality and safety standards as an area of concern that needs to be addressed. Various construction companies and consultancy firms have also highlighted skill gaps in building services controls and quality control.

Lack of specialized training for such areas has been cited as an important bottleneck slowing down project execution and delivery. It has been highlighted that the institutional courseware lacks practical training which is critical in addressing the current industry requirement.

Table 6.5 Civil Engineers Skill Set

Profession	Skill Set	Estimated shortage (Degree)
Civil Engineers	Valuation	High
	Structural, Fire-fighting clearances, etc	
	Quantity Surveying	
	Preparation and review of Bid Tender documents	
	Construction management and overall management oversight	
	Facility management	
	Construction and equipment technologies	
	Project cost estimation	Medium
	Infrastructure Layout Planning	
	Co-ordination with services consultancies and construction firms	
	Construction quality audits	
	Land Surveying	Low
	Building Design	
	Human resource management	

A summary of the major concerns related to engineering skill sets, is listed below:

Table 6.6 **Key Skill Shortages: Civil engineers**

Key Skill Shortages	Summary
Construction Management	Inadequate exposure management techniques
	Limited exposure to application of global quality & safety standards
	Lack of trained manpower for execution of projects
	Inadequate knowledge of project management software
	Lack of cost estimation skills
	Inadequate ability to manage multiple contractors
	Inefficient inventory management
Quality Control	Quality controls and quality assurance
	Inadequate orientation of preventive maintenance schedules
	Lack of trained manpower for execution of projects
Construction Techniqures	Lack of latest construction, survey and lab testing methodologies
	Limited knowledge of pre-cast and pre-fabricated structures
	Constraint in development of high-rise buildings & quality airports
	Lack of knowledge on sustainability and energy efficient systems
	Leading to participation of global firms in Indian built environment
	Inadequate practical working trainings in the institutional courseware to address the current industry requirement
Building Control and Facilities Management	Inadequate training and exposure to aspects in building services
	Emerging industry, less exposure in Indian Construction industry
Tendering Process	Lack of knowledge of tendering process
	Limited knowledge of implication to project cost/ time overruns
	Insufficient orientation of project costing

Architectural skill-set plays a vital role in built environment as the input of this is required right at the initial stage for conceptual designing of the project. Detailed site planning, building designs, sanctioning of drawings and on site supervision are some of the major activities undertaken by architects. Besides being primarily responsible for preparation of working drawings for implementation of real estate projects, they also contribute to construction advisory services, design consultancy and building interiors.

There are approx. 177 architecture institutes in India[23] providing Bachelor degree and Masters Programs in architecture. Premier institutes include Government Colleges of Architecture, School of Planning and Architecture (Delhi), CEPT (Ahmedabad), MS University (Baroda), School of Architecture and Planning under Anna University, and architecture wings of various National Institutes of Technology, and other private sector architecture colleges. Architecture programs largely encompass Bachelors Degree in Architecture followed by specialization in various fields such as Urban Design, Conservations, Landscape Architecture, and Industrial Design. Major courseware entails design and execution of building projects, innovative building and construction technologies, and resolve other issues related to the manmade environment, architectural presentation, research and writing on architecture works, services planning, structural aspects of design and technical and managerial aptitudes in construction. However, the concept of sustainability and green buildings is yet to be included in mainstream architecture courseware in India.

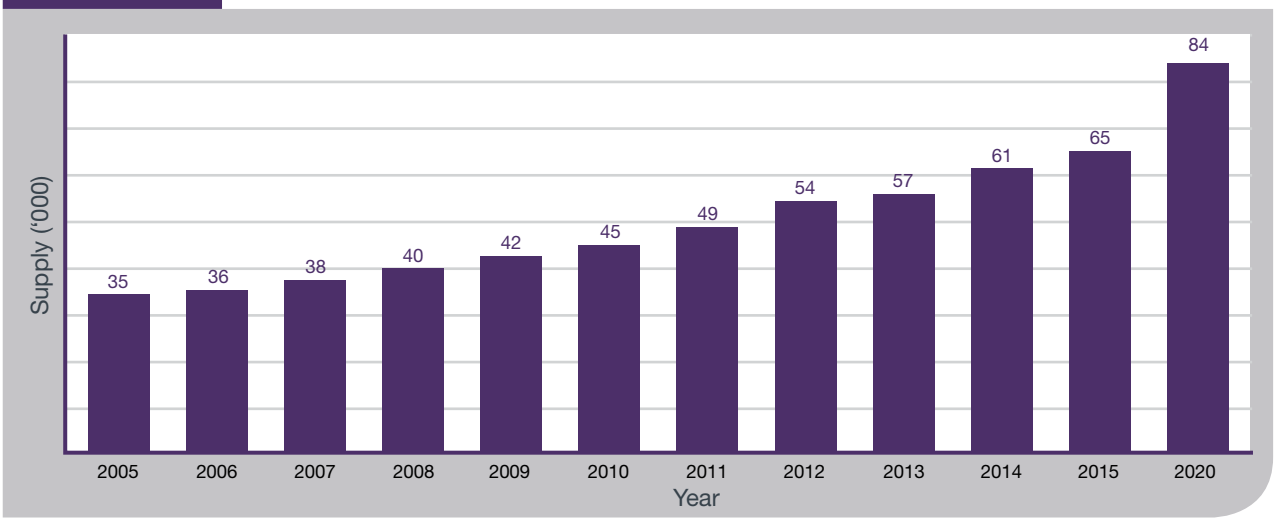
Number of enrolments in architecture courses has grown from 1,712 students in 2001 to 4,213 students in year 2009. This reflects a remarkable CAGR of approx. 12%. Annual enrolment of landscape architects has however; stayed constant at 40 seats as there is only one college offers this course. Assuming this CAGR of approx. 12% to continue, the growth of the enrolments in the year 2015 is estimated at approx. 8,278 students.

6.3.1 Supply trend of Architects

Over time, increased volume of construction activities has led to substantial growth in terms of number of institutions and students as well. More and more institutions have also introduced newer courses in the architectural stream. Given that supply of Government educational institutions is not driven by market-based demand, this growth in number of institutes imparting architectural education has been largely owing to the private sector. However, during the years 2008 and 2009, a dip was observed in the total number of enrolments which may be attributed to de-recognition of some privately run education institutions by AICTE, the nodal entity that determines whether educational institutions are capable of providing education of minimum quality standards.

Tabulating information from various sources, it is observed that there was a cumulative supply of 34,518 architects in India in the year 2005. Taking into account the number of students enrolled in architectural course for program duration of 5 years, the annual supply of architects has been estimated. Therefore, in the light of above stated assumptions, the cumulative supply of architects by the year 2015 has been estimated at 64,934 nos. and for the year 2020 has been estimated at 83,893 nos. It has been assumed that the capacity or no. of seats in architecture courses will remain constant as of 2009. A drop out rate, including non-working professionals, to a tune of 10%[24] has been factored in the annual supply figures.

Figure 6.3 **Cumulative supply of Architects (in '000s)**



Source: Ministry of Human Resource Development[25], Institute of Applied Manpower Research (IAMR)[26] and extrapolation of data

23 Council of Architecture 24 Ministry Human Resource Development and University Grants Commission 25 Annual Report (2007-08, 2008-09, 2009-10), Department of Higher Education, Ministry of Human Resource Development and Department of School Education & Literacy and Department of Higher Education 26 India Yearbook 2009, Manpower Profile Institute of Applied Manpower Research

6.3.2 Demand Assessment – Built Environment (Real Estate and Infrastructure)

Similar to estimation for Civil engineers and related professionals, demand for architects is also largely from the real estate and infrastructure.

Real estate: The future demand for architects has been estimated on the basis of projected demand for real estate space and the productivity level of architects. To calculate the productivity of architects, an estimate of the number of architects required to build approx. 200,000 sq. ft and 500,000 sq. ft real estate space as been taken as a benchmark.

Productivity factor has further been introduced by working out a growth multiplier of 1.73% which is indicative of the per annum increase in future productivity levels of all professionals working in built environment in India.

Post working the total area requirement in India and productivity of architects employed in Indian built environment, incremental demand for the same has been estimated from year 2010 – 2015 and for the year 2020.

Table 6.7 Estimated demand for Architects per square foot of real estate development

Demand for Architects in Built Environment		
Development area	200,000 sq. ft	500,000 sq. ft
Nos. of Architects required	4	5
Architects per 1,000,000 square foot of development	20	10
Average Architects per million square foot of development	15	Architects/ mn sft

Based on the current productivity and estimated increase in productivity, a demand of approximately 112,000 architects is projected in 2011, to cater to 7.5 million square feet required to be built in this year. However, the incremental demand for the same has been estimated from year 2010 – 2015 and 2020 below:

Table 6.8 Estimation of demand for Architects in real estate sector

	2010	2011	2012	2013	2014	2015	2020
Incremental demand for real estate space (million sq. ft)	7,325	7,566	7,815	8,073	8,339	8,616	10,146
Demand for Architects ('000s)	110	112	113	115	117	119	128

Table 6.9 Estimation of demand for Architects in real estate sector and infrastructure (in '000s)

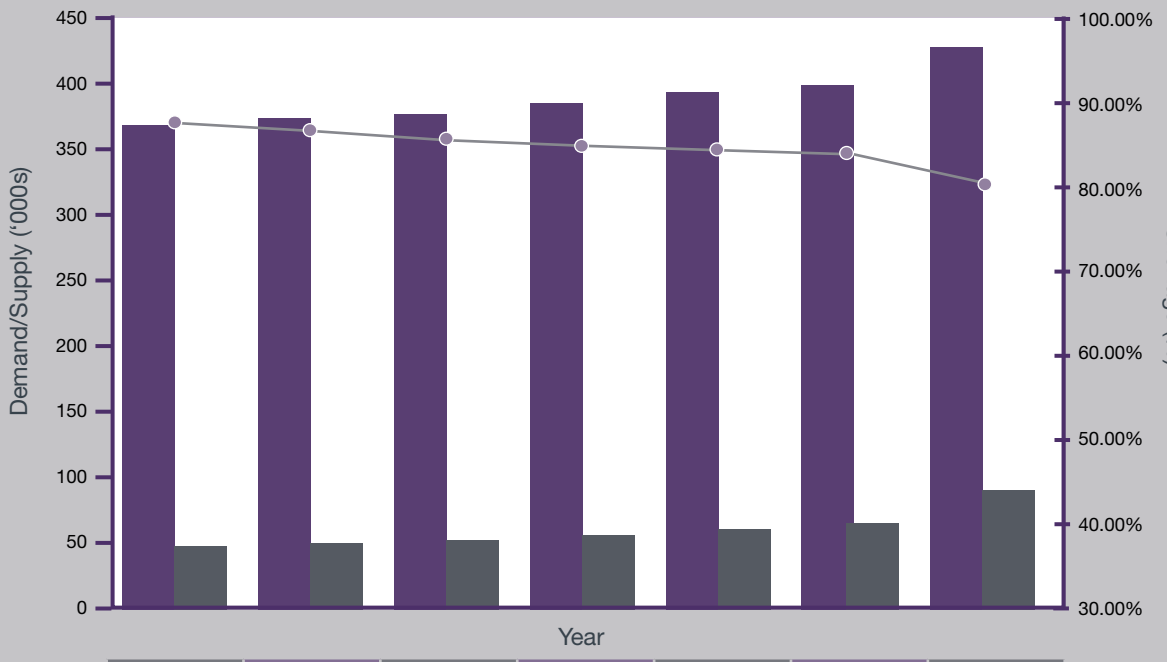
	2010	2011	2012	2013	2014	2015	2020
Demand for Architects in real estate ('000)	110	112	113	115	117	119	128
Demand for Architects in infrastructure ('000)	256	260	264	268	273	277	299
Total demand for Architects in built environment ('000)	**366**	**372**	**377**	**383**	**390**	**396**	**427**

25 Annual Report (2007-08, 2008-09, 2009-10), Department of Higher Education, Ministry of Human Resource Development and Department of School Education & Literacy and Department of Higher Education 26 India Yearbook 2009, Manpower Profile Institute of Applied Manpower Research
27 Economic Survey 2007 – 08, CREDAI, NSDC report on Human resource and skill requirements in the building, construction industry and real estate services – Study on mapping of human resource skill gaps in India till 2022 and Primary Surveys conducted by Jones Lang LaSalle

6.3.3 Demand Supply Gap

Comparing the demand estimates with projected supply of architects in built environment in India, the demand supply gap of architects in built environment is estimated as below:

Figure 6.4 Demand Supply Gap Assessment – Architects (Figures in '000s)



	2010	2011	2012	2013	2014	2015	2020
Demand	366	372	378	383	389	395	427
Supply	45	49	54	57	61	65	84
Shortage	87.58%	86.69%	85.80%	85.04%	84.29%	83.57%	80.37%

Table 6.10 Shortage of Architects (in '000)

2010	2011	2012	2013	2014	2015	2020	Total Shortage (2010–2020)
321	323	324	326	328	330	343	3,641

6.3.4 Qualitative assessment of skill sets in architects

Apart from quantifying the shortage of architects, various qualitative shortcomings are observed in the skill-sets that the architects are expected to possess for efficient delivery, which have been identified based on interviews with select construction and consulting firms, along with various academia and professional bodies.

The figure below indicates the intensity of skills gap in some of the activities which architects are expected to be proficient in. Service planning, approval of building drawings and liaisoning, coordination with services consultancies and construction management emerge as areas where there is utmost need to upgrade relevant skills.

Overall market perception is that there would be a shortage of landscape architects, interior decorators, project supervisors and resident architects, architectural engineers, specialist and sub consultants for façade and green landscape for the period 2010-2020.

Specifically in context of skill-sets, the main issue of concern as observed by large number of respondents is the aspect of coordination with services consultancies and construction firms to streamline the development process. It has been indicated that fresh entrants in the profession lack the skill of coordination between various aspects such as structural, service and architecture drawings that contribute to the holistic profession of architecture. Shortage of skills related to designs, such as luxury designs, interiors and landscape architecture have been observed primarily by various developers and construction firms. It has been highlighted that architecture education system may need to consider these specializations as an important part of its curriculum.

Interior design with specialist knowledge of finishes, materials, and finishing are additional skill-sets that need attention within this profession. Important aspects that contribute to overall architectural design, such as facade design, lighting design, and energy efficient building design, too, have been identified as areas where the need of knowledge up-gradation is observed.

Apart from the basic design aspects, various respondents have indicated inadequate knowledge of latest tools and technologies related to architecture profession. Knowledge of aspects such as remote sensing and aerial photography for large scale projects needs to be imparted.

Moreover, it has been felt by a number of respondents that architects need to be more aware of site management techniques. A concomitant aspect that emerged was the limited knowledge possessed by fresh graduates related to preparation of shop drawings for execution. Lack of knowledge towards use of design aids and tools such as three-dimensional modelling software; have been highlighted by some respondents as additional skill-sets that need to be imparted to architects.

Table 6.11 **Architects Skill Set**

Profession	Skill Set	Estimated shortage (Degree)
Architects	Services Planning	High
	Drawing approvals/ Liaisoning	
	Coordination with services consultancies and construction firms	
	Construction management and overall management oversight	
	Preparation and review of Bid Tender documents	Medium
	Preparation of shop drawings	
	Site Planning	Low
	Land Surveying	
	Building Design	

In addition, aspects such as large scale planning for infrastructure, liaison activities, project profitability assessments and disaster management have been highlighted as other key areas of concerns. In particular, it was observed that the architects may need to focus on up-gradation of their liaison skills for obtaining approvals from relevant government departments. In addition, professional bodies feel that there is lack of awareness related to various aspects of disaster mitigation and management, and their inclusion in the architectural design process.

Table 6.12 **Key Skill Shortages: Architects**

Key Skill Shortages	Summary
Specialization	Lack of specialized skills such as landscape, interiors, project execution and management techniques, GREEN building design principles
	Lack of government initiatives in specialized programs and better options abroad
	Lack of interest in students to pursue specialized disciplines
	Key design concerns: Luxury design and elevation design
Coordination and Site Management	Coordination with service consultancies and construction firms
	Coordination issues between structural, service and architecture drawings
	Preparation of shop drawings for execution
	Lack of knowledge towards use of design aids and tools which help in spatial understanding of concepts in third dimension
Land Management	Use of technologies and tools related to land management
	Inadequate knowledge of urban land management principles
	Quandary in liaisoning for obtaining development approvals
Other core issues	Issues in large scale infrastructure planning
	Inadequacy in project profitability assessment
	Constraint in development of high-rise buildings & quality airports
	Lack of awareness related to aspects of disaster mitigation and management, and their inclusion in design process

25 Ministry Human Resource Development and University Grants Commission

6.4 Planners

Role of urban and regional planners in the built environment in India is important for positioning sustainable cities and developments. Planning aims to achieve sustainable development for a region through the process of formulating and translating economic, spatial and environmental objectives in the ordering of activities at various territorial levels such as village, block, district, sub-region, region, and state level in an integrated manner. Planners work at varying levels ranging from conceptualizing layouts of cities and large-scale townships to understanding spatial growth dynamics. Planners are also equipped to understand economic policies and plans and their implications on future growth and development. Expertise of planners is largely related to policy decision-making in town/country planning. Planners are also responsible for preparation of master plans, physical and social planning consultancy, and preparation of redevelopment and city revitalization strategies. These professionals possess skills in varied levels, from social level to physical level of development pertaining to betterment of human life and environment as a whole. Major activities, they are involved in are demand assessment studies, land surveying, site planning, sanctions and approvals of certain clearances, environmental impact assessments, and sustainable development practices among others.

There has been relatively flat growth in the number of enrolments in the field of planning in India. Over the period of time, India has observed sporadic growth in terms of number of institutions and students as well. While the overall economy improved considerably over the last decade, this profession has not grown at a pace commensurate with this growth. Lack of awareness of this profession may be one of the reasons for the lack of private sector's involvement in providing more educational institutions related to this discipline.

At present, total number of institutes providing planning programs in India is only 21. Courses from renowned planning institutions entails planning, development and management of human settlements, planning for integrated and balanced developments of varying sizes, environment impact assessment and relevant mitigation/ preventive measures, infrastructure planning and requirements, real estate and housing markets, Government policies and programs, mobilization of resources, monitoring, evaluation and implementation of programs, financing strategies and disaster mitigation and management in urban agglomerations. Bachelors and Masters Degree in Planning is available in select premier institutes in India such as School of Planning and Architecture (Delhi), Centre for Environment Planning and Technology (Ahmedabad), Guru Nanak Dev University (Amritsar) and Jawaharlal Nehru Technological University (Hyderabad), among others. Trend of students' enrolment has been seen to be consistently steady in the field of planning courses. In the year 2001 the number of enrolments in planning courses was approx. 614 students, which increased to approx. 684 students in 2009. This depicts the CAGR of approx. 1%.

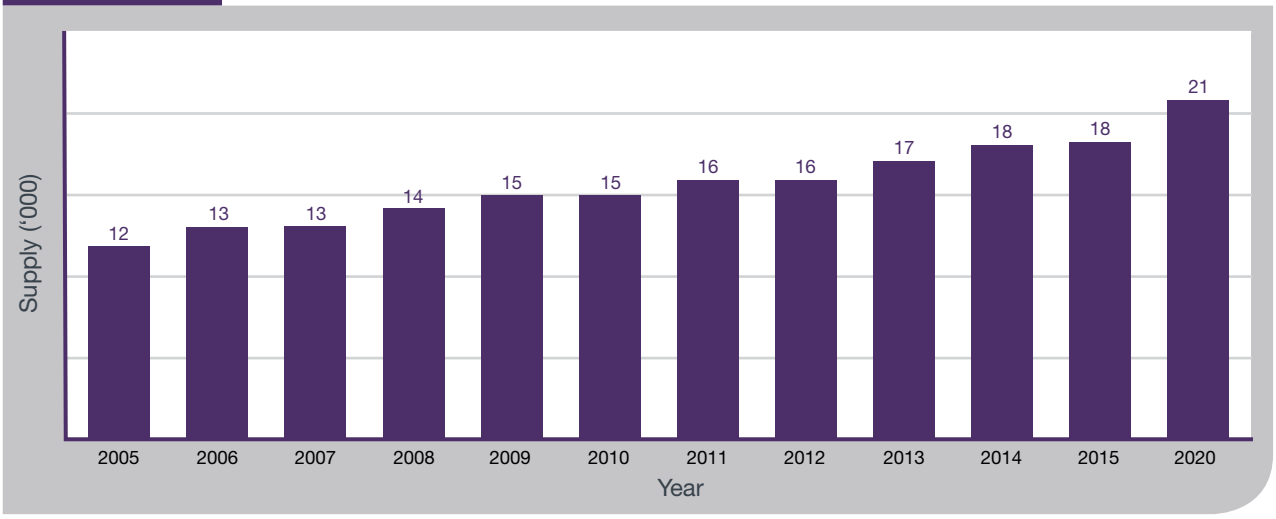
Assuming this CAGR to continue, the growth of the enrolments in the year 2015 is estimated to be approx. 742 students.

6.4.1 Supply trend of Planners

Tabulating information from various colleges offering planning programmes there was a cumulative supply of 12,380 planners in India in the year 2005. Taking into account the number of students enrolled in planning courses for program duration of 4 years, the annual supply of planners has been estimated. Therefore, in the light of above stated assumptions, the cumulative supply of planners by the year 2015 has been estimated at 18,164 and for the year 2020 at 21,242. It has been assumed that the no. of seats in planning courses will remain constant as of 2009. A dropout rate, including non-working professionals of 10%[28] has been factored in the annual supply figures.

The cumulative supply estimates are as presented below:

Figure 6.5 **Cumulative supply of Planners (in '000s)**



Source: Collation from all the Planning Colleges of India

6.4.2 Demand Assessment – Built Environment (Real Estate and Infrastructure)

Real estate: Similarly on the lines of civil engineers and architects, demand for planners has been estimated on the basis of projected area requirement in real estate sector, and subsequently working out efficiency levels based on number of planners required to work upon approx. 200,000 sq. ft and 500,000 sq. ft area.

Productivity enhancement has been considered by working out a growth multiplier of 1.73% which is indicative of the per annum increase in future productivity levels of all professionals working in built environment in India. Post working on total area requirement in India and productivity of planners employed in Indian built environment, incremental demand for the same has been estimated from year 2010 – 2015 and 2020.

Table 6.13 **Demand for Planners per square foot of real estate development**

Demand for Planners in Built Environment		
Development area	200,000 sq ft	500,000 sq. ft
Nos. of Planners required	1	2
Planners required per 1,000,000 square foot of development	5	4
Average Planners required per million square foot of development	4.5	Planners/mn sft

28 Ministry Human Resource Development and University Grants Commission

Based on the current productivity and estimated increase in productivity, a demand of approximately 33,000 planners is projected in 2011, to cater to 7.5 million square feet required to be built in this year. However, the incremental demand for the same has been estimated from year 2010 – 2015 and 2020 below:

Table 6.14 **Estimation of demand for Planners in real estate**

	2010	2011	2012	2013	2014	2015	2020
Incremental demand for real estate space (million sq. ft)	7,325	7,566	7,815	8,073	8,339	8,616	10,146
Demand for planners ('000s)	33	33	34	35	35	36	38

Infrastructure – Based on previous sections and assumptions, it is assumed that approx. 70%[29] of the total demand for planners is likely to be employed in infrastructure sector. Therefore, it is assumed that the demand derived for real estate is 30% of the total demand for planners required in built environment, including infrastructure. Therefore, total demand for these professionals has been estimated as below:

Table 6.15 **Estimation of demand for Planners in real Estate and infrastructure (in '000s)**

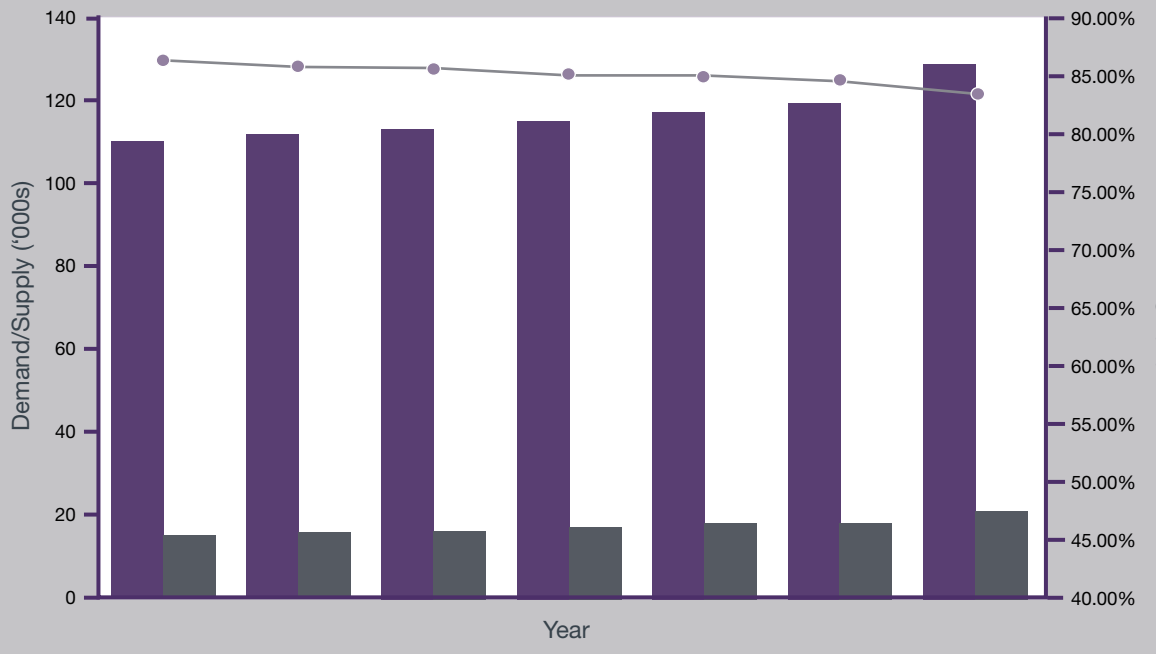
	2010	2011	2012	2013	2014	2015	2020
Demand for planners in real estate ('000)	33	34	34	35	35	36	38
Demand for planners in Infrastructure ('000)	77	78	79	80	82	83	90
Total demand for planners ('000)	**110**	**112**	**113**	**115**	**117**	**119**	**128**

29 Economic Survey 2007 – 08, CREDAI, NSDC report on Human resource and skill requirements in the building, construction industry and real estate services - Study on mapping of human resource skill gaps in India till 2022 and Primary Surveys conducted by Jones Lang LaSalle

6.4.3 Demand Supply Gap

Comparing the demand estimates with projected supply of planners in built environment in India, the demand supply gap of planners in built environment is estimated as below:

Figure 6.6 Demand Supply Gap Assessment – Planners (figures in'000s)



	2010	2011	2012	2013	2014	2015	2020
Demand	110	112	113	115	117	119	128
Supply	15	16	16	17	18	18	21
Shortage	86.20%	85.89%	85.59%	85.28%	84.97%	84.68%	83.43%

Table 6.16 Shortage of Planners (in '000)

2010	2011	2012	2013	2014	2015	2020	Total Shortage (2010 – 2020)
95	96	97	98	99	101	107	1,106

6.4.4 Qualitative assessment of skill sets in planners

Planners are preferred for the activities of physical / site planning, infrastructure layout planning, sustainable development, environmental planning and engineering, environmental impact assessment, and demand assessment and forecast studies in some instances. The overall market perception is that there would be a shortage of professionals in town planning, master planners, regional, urban, rural planners, environment planners, and infrastructure/urban planners in the period 2010-20.

Since the expertise of this profession is largely in the domain of government activities (planning is largely under the government's jurisdiction with some participation by private consultancy organizations), there may be lesser incentive for these professionals to remain in this discipline for long. With relatively higher level of participation by private sector in large scale projects, demand for professionals from this discipline is likely to increase in future.

In context of skill-sets, infrastructure planning has emerged as the critical area of concern from a technical knowledge perspective. It is felt that there is inadequate knowledge of physical infrastructure planning (namely water supply, sanitation, and sewerage disposal) at various levels of execution. In addition to the same, it has been observed by various respondents that fresh entrants lack skills related to coordinated infrastructure planning for large-scale projects. Another key concern that has been highlighted is inadequate exposure of these professionals to aspects of project finance and project profitability assessment. Many respondents suggested that these professionals are not completely familiar with economic, social, and financial appraisals of the projects, and had inadequate practical exposure to these aspects.

The review of respondents also indicate that the ability to integrate knowledge from different domains such as financing mechanism of projects needs to be inculcated in the professionals from early stages in their careers. Various respondents have emphasized on the inadequate knowledge of professionals about latest survey tools and technologies, such as remote sensing and aerial photography for large scale projects.

Apart from the above stated core issues, aspects pertaining to process and procedures such as obtaining environmental clearances from various government institutions have also been observed as key concern areas. Need for higher levels of specialization such as sustainable development, valuation, infrastructure planning, finance and econometrics, apart from the existing specializations including urban and regional planning, transportation planning, environmental planning, and housing, has also been identified. This would also deal with for concerns related to lack of familiarity of planners with modern planning techniques, as raised by academia.

Table 6.17 **Planners Skill Set**

Profession	Skill Set	Estimated shortage (Degree)
Planners	Demand Assessment and Forecast studies	High
	Site and Services Planning	
	Drawing approvals/ Liaisoning	
	Coordination with services consultancies and construction firms	
	Construction management and overall management oversight	
	Preparation and review of Bid Tender documents	Medium
	Preparation of shop drawings	
	Site Planning	Low
	Land Surveying	
	Building Design	

Table 6.18 Key Skill Shortages: Planners

Key Skill Shortages	Summary
Sectoral ownership pattern	Planning sector largely under the government's jurisdiction with some participation by private consultancy organizations
	Pursuance of non-planning disciplines by planning professionals owing to better pay scales
	Lack of employment opportunities in the profession
Quality Control	Inadequate knowledge of physical infrastructure planning such as water supply, sanitation, and sewerage disposal at various levels of execution
	Skills related to coordinated infrastructure planning for large-scale projects lacking in fresh entrants
Construction Techniqures	Use of technologies and tools related to land management
	Inadequate knowledge of urban land management principles
	Uncertainty in liaisoning for obtaining development approvals
Building Control and Facilities Management	Missing areas in sustainable development studies
	Missing areas in Valuation studies
	Missing areas in Finance and econometric studies
	Missing areas in existing specializations such as urban and regional, transportation, housing and environmental planning
	Lack of familiarity with modern planning techniques
Tendering Process	Inadequacy in project profitability assessment
	Inadequate practical exposure in financial assessment of projects

7.0 Supply Assessment –Non-Core Preofessional

The Non Core professionals, in contrast to core professionals, are not directly involved in development of built environment. However, they provide various critical inputs such as sale and marketing management, financial analysis, legal advice, and electrical works, among others. These non-core professionals have been so classified owing to the diversity of these professions that allow them to work in various economic activities apart from those related to built environment.

Supply of non-core professionals in the built environment, too is assessed from the perspective of project life cycle approach. Detailed assessment of non core professionals in the built environment has been undertaken to arrive at their annual supply in India in the past.

This chapter further seeks to identify the expertise for non-core professionals in the built environment. This assessment is undertaken at two levels; (a) to understand the supply of non-core professionals (quantitative assessment) and (b) to understand the requisite skills of these professionals (qualitative assessment).

This assessment further leads to the identification of special skills of non-core professionals that will be in greater demand in the future for the built environment sectors and require attention on a priority basis as there is need of increasing the supply of these non-core professionals and specialists to successfully achieve the growth projections of India's built environment.

7.1 Introduction to Non-core Professionals

Non-core professionals are those professionals that have utility across various sectors of the economy and may not be restricted to employment within the built environment sector of India. Professions considered under this category include Management Professionals, Chartered Accountants, Lawyers and Engineers from non-core fields, limited to electrical and electronics engineering.

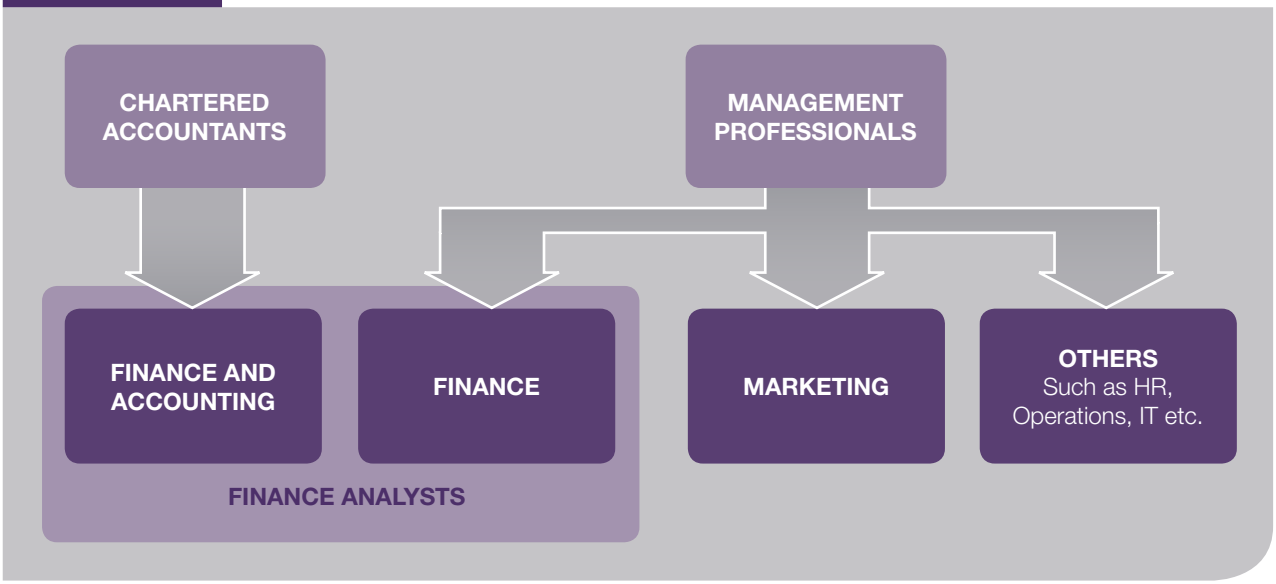
Given that these are non-core professions, it is not possible to quantify the demand for these professionals owing to their floating nature between industries. However, this research tries to establish the current supply of these professionals, using some well researched assumptions. These assumptions have been taken after due consultation with select Human Resource experts in relevant sectors.

These assumptions are listed as below

- 50% of the total engineers in electrical and electronic stream are estimated to contribute to built environment as majority works of electrical engineers are building oriented.
- 12%[30] of the total management professionals are estimated to contribute to built environment
- 10% of the total chartered accountants are estimated to contribute to built environment
- 5% of the total lawyers are estimated to contribute to built environment

NOTE: Management Professionals with specialization in Finance and Chartered Accountants have been qualitatively analyzed under the category of 'Financial Analysts'. Refer to the categorization below:

Figure 7.1 **Non-core Professionals**



30 Based on Census data of 2001, where approx. 12% of the total managers contribute to the construction / real estate industry

The contribution of management professionals is mostly into marketing, human resource and administration functions in built environment. As the requirements of this industry are becoming more complicated and precise, the demand for management professionals is likely to increase manifold. Innovative marketing strategy impacts the success of a real estate product to a large extent.

Out of the entire management professionals, it is assumed that approx. 12% of this volume contributes to construction and real estate industry in India. Students passing out with these degrees get engaged in national and international level organizations dealing with real estate developments, real estate consultancy, financial institutions, and fund managers, among others.

As per Ministry of Human Resource Development, Government of India, there are a total of 1,149 management institutes[31] that provide Masters Programs in this field. Premier institutes include Indian Institute of Management, Indian School of Business, Fore School of Management and XLRI. The course helps in enhancing the ability to communicate, analyse situations and take decisions using quantitative and qualitative factors, and to develop a holistic view of the different functional areas and the business environment. Courses from renowned management institutions includes functions such as personnel, production, finance, retail, marketing, operational research, planning, construction etc. The courses are offered in the areas like retail management, hotel management, NGO management, health management, event management, development management, hospitality management. Most popular management courses in India are Bachelor of Business Administration (BBA), Bachelor of Business Studies (BBS), Bachelor of Business Management (BBM), and Master of Business Administration (MBA).

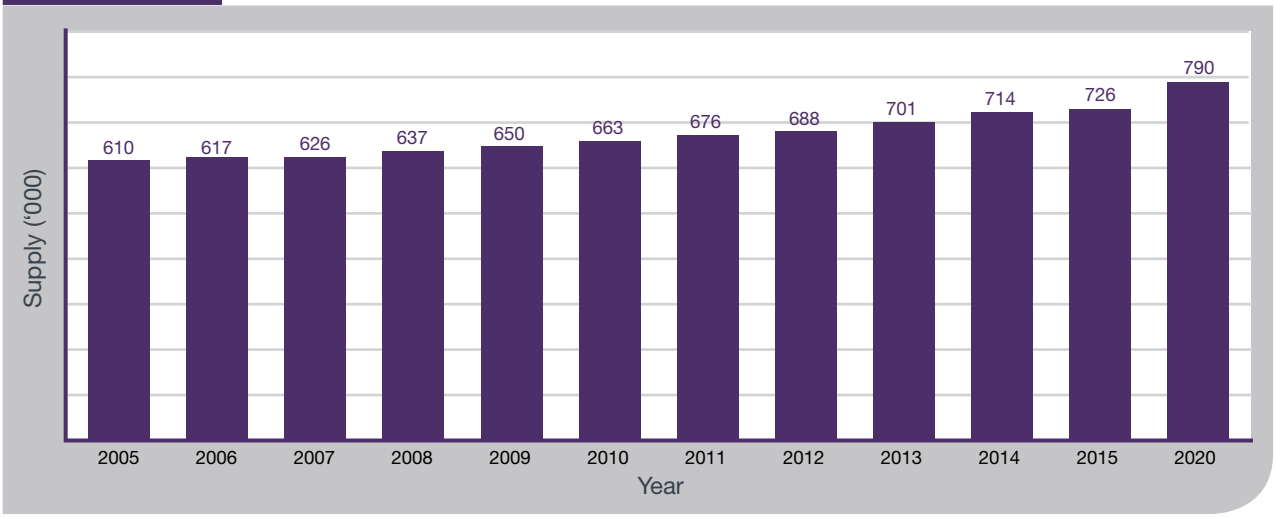
Number of enrolments in management courses has increased from 46,604 in 2001 to 136,893 in 2009. Working with the assumption that approx. 12% of these volumes would be contributing to the built environment, the number of enrolments in management courses that are likely to be a part of the construction and real estate sectors is estimated to have been approx. 5,730 in year 2001, which is estimated to have increased to approx. 16,707 in the year 2009, indicating a CAGR of approx. 14%. Assuming this CAGR to continue, the growth of the enrolments specific to construction and real estate sectors only, is estimated to be approx. 37,281 by year 2015 and approx. 72,773 by the year 2020.

7.2.1 Supply trend of Management Professionals

Tabulating information from various sources, it is observed **that there was a cumulative supply of 609,544 management professionals in built environment in India in the year 2005**. Taking into account the number of students enrolled in management courses for program duration of 2 years, the annual supply of these professionals has been estimated. With these assumptions, **cumulative supply of management professionals in the built environment sector by the year 2015 has been estimated at 726,440 and 789,864 for the year 2020**.

It has been assumed that the capacity or no. of seats in management courses will remain constant as of 2009. A drop-out rate, including non-working professionals of 10%[32] has been factored in the annual supply figures.

Figure 7.2 **Cumulative supply of Management Professionals estimated to contribute to built environment (in '000s)**



Source: Ministry of Human Resource Development[33] and extrapolation

31 www.education.nic.in 32 Ministry Human Resource Development and University Grants Commission 33 Annual Report (2007-08, 2008-09, 2009-10), Department of Higher Education, Ministry of Human Resource Development and Department of School Education & Literacy and Department of Higher Education

7.2.2 Qualitative assessment of skill sets in Management Professionals

Among all management courses, Business Administration courses are considered highly sought after and have resulted in a large number of professionals from the engineering profession among others undertaking post graduate studies in this discipline. Although these specialists are not sector-specific, they are trained in principles of business administration and management, and hence can work in any business lines. Specific to the built environment sector, these specialists are preferred largely for their knowledge in marketing, finance and administration domains. Finance professionals are largely deployed for financial analyses and valuations, while marketing specialists are deployed for project marketing and sales. Finance professionals have been discussed separately in detail under 'Finance analysts'.

Overall industry perceives a potential shortage of these business administration specialists. It was indicated by various industry experts that shortage of these professionals was largely due to the lack of specialization related to the built environment sector from the educational system perspective. Various respondents have observed that inadequate understanding of urban growth and real estate dynamics is the primary area of untapped learning for these professionals, which has been perceived to be important from the perspective of project marketing and sales.

Table 7.1 Management Professionals Skill Set

Profession	Skill Set	Estimated shortage (Degree)
Management Professionals in built environment	Demand assessment and forecast studies	**High**
	Project sales and marketing	
	Understanding of Business models	**Medium**
	Project evaluation and Financial feasibility analyses	**Low**

7.3 Financial Analysts

Financial analysts play myriad roles in the built environment in India. Given that there is no major specialization that train and educate financial analysts especially for the built environment, it is more of learning-on-the-job. Financial analysts are largely comprised of Chartered Accountants and Business Administration professionals with specialization in Finance. These professionals are largely preferred for activities such as preparing business models for varying business types, undertaking demand assessment and forecast studies, conducting financial feasibility analyses, structuring project finance, valuations, preparing project transaction and preparing balance sheets for various real estate companies and special purpose vehicles (SPVs) involving partnerships with domestic and international entities, ensuring compliance with global and national laws related to fund flows. In built environment, their contribution is mainly for project finance and structuring, tax implications, cash-flow projections, finance structure, and valuations of assets and businesses, among others.

Out of the total professionals in chartered accountancy, it is assumed that approx. 10% contributes to built environment in India.

It may be noted that quantitative assessment in this section is limited to chartered accountants owing to unavailability of data related to management professions with finance specialization who are working in the built environment. It is difficult to estimate how many of the finance professionals are ensconced or directly associated with the built environment. Given the specialized nature of this profession which can be absorbed in any industry it is not possible to allocate any percentage to the total finance professionals being released in the economy every year. However, qualitative assessment includes both these professionals under this section.

Courses from renowned chartered accountancy institutions includes Fundamentals of Accounting, Economics, Auditing, Business and Corporate Laws, Fundamentals of Financial Management and Costing, Cost Management, Direct / Indirect Taxes etc. Other aspects of this course cover management consultancy services including management accounting, management information and control system, international finance, information technology and financial services sector. Other areas of practice include assurance and certification services, tax consultancy and allied services, financial and management services, accounting and company secretary work, and information technology and computer software related services.

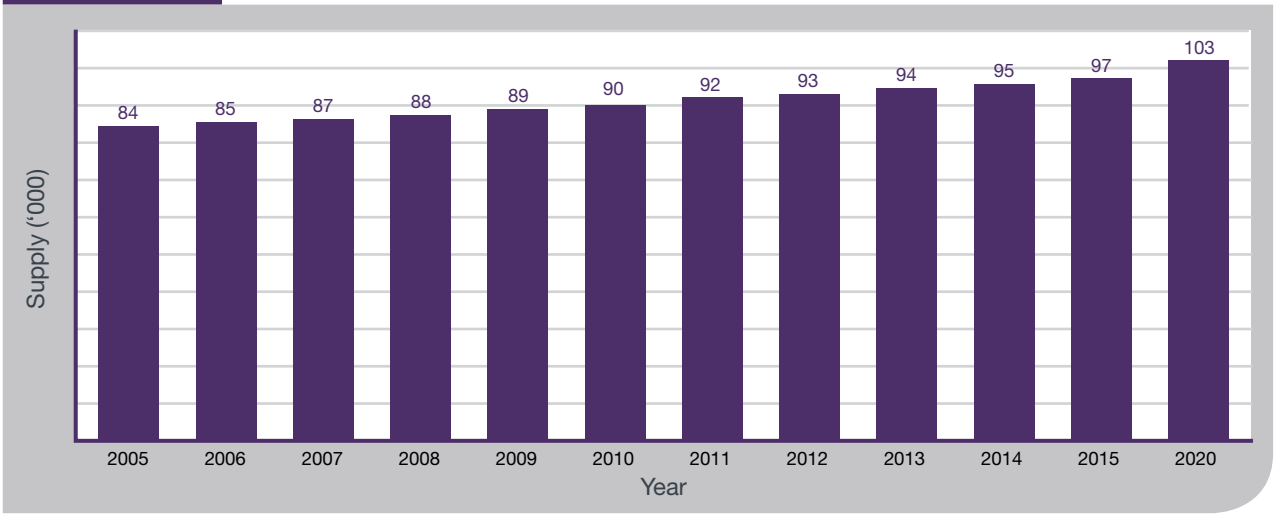
Number of enrolments in chartered accountancy courses has grown from 9,565 in 2001 to 13,935 in 2009. Working on the assumption that approx. 10% of these professionals are contributing to the construction and real estate sector, it is estimated that number of enrolments in this course that eventually would be associated with the built environment was around 957 in year 2001, which is estimated to have grown to approx. 1,394 in year 2009. This depicts the CAGR of approx. 5%. Assuming this CAGR to continue, the growth of the enrolments in the year 2015 is estimated to be approx. 1,848 and approx. 2,338 in the year 2020.

7.3.1 Supply trend of Chartered Accountants

Tabulating information from Institution of Chartered Accountants of India, **there was a cumulative supply of 83,916 Chartered Accountants estimated to be in built environment in India in the year 2005**. Taking into account the Chartered Accountants professionals registered with Institution of Chartered Accountants of India, the annual supply of these professionals has been estimated. Based on above mentioned assumptions, the cumulative supply of Chartered Accountants in the built environment sector has been estimated at 96,561 by 2015 and 102,832 by the year 2020.

It has been assumed that the no. of registrations with the Institution of Chartered Accountants of India will remain constant as of 2009. A drop out rate, including non-working professionals, to a tune of 10%[34] has been factored in the annual supply figures.

Figure 7.3 **Cumulative supply (registered) of Chartered Accountants estimated to contribute to built environment (in '000s)**



Source: Institution of Chartered Accountants of India and extrapolation of data

34 Ministry Human Resource Development and University Grants Commission

7.3.2 Qualitative Assessment of Finance Analysts

An important aspect from the perspective of potential shortages of these professionals that needs consideration here is the introduction of International Financial Reporting Standards (IFRS) in India beginning April 2011. Government of India has prepared a phased plan for transitioning to these global standards from our current generally accepted accounting procedures (GAAP). This transitioning is likely to necessitate transitioning of books of accounts to the new global standards for approx. 650 entities by the year 2014. Moreover, going forward, these will need to be updated annually. It may be interesting to note here that total number of registered companies in India was more than 700,000[35] even in year 2006, which will eventually need to comply with IFRS standards at some point of time in future. This is likely to form a critical component as most companies are likely to have multiple real estate assets, which will need to be valued and reported appropriately under the new reporting format. This is likely to produce considerable demand pressures in the industry for these finance professionals.

Overall industry observations indicate that current courses that are offered in traditional degree programmes are unable to deal with challenges of multi-disciplinary problems that are inherent in infrastructure and real estate projects. These courses do not offer sufficient operational and real world training that calls for significant apprenticeship time commitment even after completion of the degree program. It was highlighted during discussion with various industry experts that management education needs to bring in greater degree of specialization with focus on built environment.

Moreover, inadequate training and exposure to formal and informal real estate finance structures and mechanisms is also observed as a skill set shortage. This indicates inadequate skills for correlation of financial modelling with practical issues of legal requirements and responsibilities for financial reporting. A large number of respondents have observed that lack of in-depth knowledge related to business profitability models for different business typologies and their correlation with built environment needs to be addressed to strengthen the skill sets of these professionals. In addition, few observations were also made related to skill-sets of these professionals. Majority of respondents are of the view that finance professionals have inadequate understanding of urban and regional growth dynamics. Complementary knowledge of urban growth dynamics and development controls and regulations are quite essential for these professionals. It is observed that current knowledge dissemination systems do not actively cover urban and regional growth perspective, and, consequently, do not focus on these critical aspects.

Further, some of the respondents believe that there is lack of formal training for portfolio and asset management in finance professionals working in real estate sector that needed attention for these professionals. Given that finance professionals are quite suited to be employed as fund managers, exposure and knowledge of these skill-sets is quite essential. It is also observed post discussions with various fund managers that finance professionals are not adequately equipped to perceive and analyse risks associated with real estate and infrastructure projects.

Table 7.2 **Financial Analysts Skill Set**

Profession	Skill Set	Estimated shortage (Degree)
Financial Analysts in built environment	Demand Assessment and Forecast studies	**High**
	Preparing project transaction and finance structure	
	Procurement of debt and equity for projects	
	Tax structuring	
	Project Evaluation	**Medium**
	Financial feasibility analyses	**Low**
	Project Balance sheets	

35 http://dqindia.ciol.com/content/top_stories/2006/106103002.asp

Table 7.3 Key Skill Shortages: Finance Analysts

Key Skill Shortages	Summary
Valuation Practice	Detailed understanding and application of IFRS
	No formal courseware pertaining to real estate valuations in Indian Universities and colleges
	Lack of formal training to professionals on real estate valuations
Real Estate Finance	Lack of formal training for portfolio and asset management in finance professionals working in real estate sector
	Understanding of revenue flow structures from real estate developments and assets
	Traditional degree programmes unable to deal with challenges inherent in infrastructure and real estate projects
	Adequacy to perceive and analyse risks associated with real estate and infrastructure projects
Real Estate Sectoral Performance	Use of technologies and tools related to land management
	Inadequacy in understanding of various locational attributes and potential related to real estate developments
	Inadequacy in understanding development control regulations

7.4 Legal Advisors or Lawyers

The role of the legal advisors or lawyers varies significantly across legal jurisdictions with reference to built environment in India. Working as a legal advisor involves the practical application of abstract legal theories and knowledge to solve specific individualized problems, or to advance the interests of those who retain (i.e. engage) lawyers to perform legal services. Responsibilities of a legal advisor in the field of built environment involve preparation and reviewing of legal reports of property or asset ownerships, acting on behalf of client in arbitration proceedings, preparation and reviewing of bid / tender documents, among others. Out of the total number of lawyers, it is assumed that approx. 5%[36] contributes to built environment in India. Expertise of legal advisors in real estate is largely focused on document title review, and legal due diligence, legal documentation for project finance and preparation/ drafting of lease and sale documentation. Issues such as dispute resolution, arbitration and litigation in real estate also need attention of legal advisors.

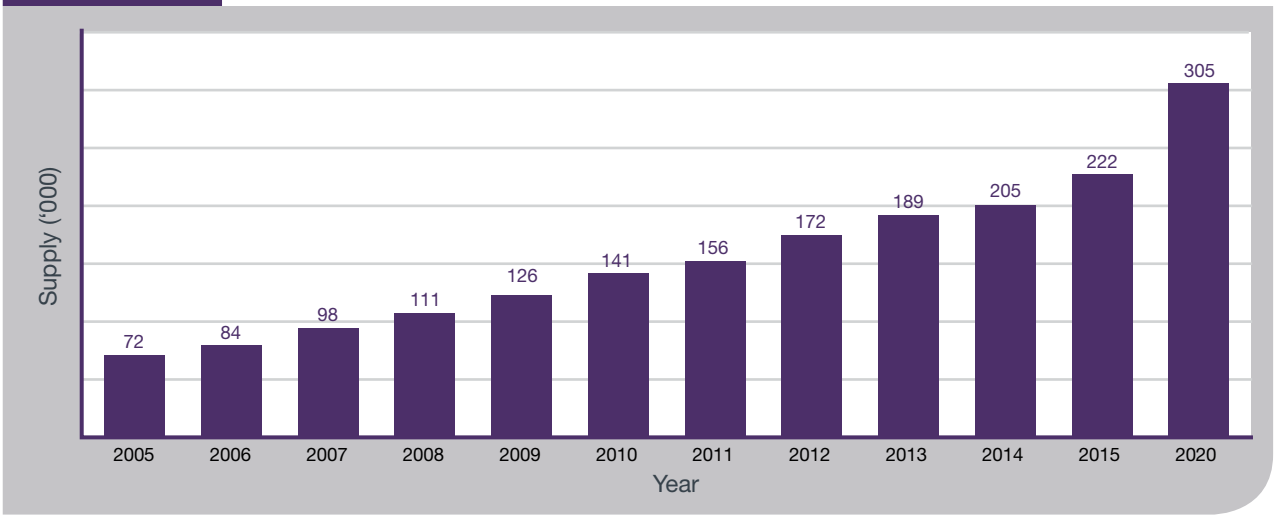
There is no specialized course in law pertaining to real estate sector. People acquire knowledge on real estate laws in a piecemeal basis from different sources. Assuming approx. 5%[36] of total volume of lawyers to be contributing to the built environment of India, the number of enrolments in this course that would eventually may have become a part of the construction and real estate sector in the year 2001 is estimated to be approx. 14,022. This has, since, increased to 19,266 in the year 2009, which depicts a CAGR of approx. 4%. Assuming this CAGR to continue, the enrolments in the year 2015 is estimated to be 24,448 and 29,818 in the year 2020.

7.4.1 Supply trend of Lawyers

There was a cumulative supply of 71,787[37] lawyers in built environment in India in the year 2005. Taking into account the number of students enrolled in law courses for program duration of an average of 3 years, the annual supply of these professionals has been estimated. Based on above mentioned assumptions, **the supply of lawyers in the built environment sector by the year 2015 has been estimated at 221,903 nos. and 305,223 for the year 2020**.

It has been assumed that the capacity or no. of seats in law courses will remain constant as of 2009. A dropout rate, including non-working professionals, to a tune of 10%[38] has been factored in the annual supply figures.

Figure 7.4 **Cumulative supply of Lawyers estimated to contribute to built environment (in '000s)**



Source: Indiastat.com[39] and extrapolation of data

36 Primary surveys conducted by Jones Lang LaSalle 37 Indiastat.com 38 Ministry Human Resource Development and University Grants Commission
39 www.indiastat.com, Faculty-wise Enrolment in Higher Education in India (1999-2000 to 2005-2006)

7.4.2 Qualitative assessment of skill sets in Legal Advisors or Lawyers

The legal advisor's profession in India, like finance professionals, is not limited to a particular sector. Rather they adopt an overarching role that spans across various sectors. Given the multi-faceted requirement, there is no formal demarcation of lawyers that are trained exclusively for the built environment. However, some firms do focus on real estate and infrastructure related cases, and over a period of time became preferred lawyers for these legal activities.

In terms of qualitative assessment of legal advisors serving the built environment sector in India, overall industry perception is that there will be a shortage of legal advisors that have adequate exposure to this sector, which presents its own unique challenges. Various industry experts have observed that there is inadequate exposure of fresh law graduates on law related to land and development activities. It has been indicated that the current legal education system does not delve deeply into built environment sector, and it is more of learning-on-the job. Rather, it is preferred that it would be better if professionals may have adequate exposure and training prior to their formal entry in the built environment sector.

Moreover, inadequate familiarity with government institutions related to built environment and their processes has also been identified as another set of skill-set shortages related to this profession. The key area of concern related to this profession is limited knowledge and familiarity with land revenue records systems and processes.

From the perspective of various respondents, it has been observed that there are relatively few professionals who have adequate and comprehensive knowledge of laws, systems, and processes related to development approvals. In addition, lack of exposure to urban growth and real estate dynamics has also been indicated as a potential shortfall in the learning curve. It is also observed that this is important for the professionals to understand finer nuances of the built environment sector. Another issue that has been observed is inadequate exposure of professionals to fundamentals of finance, particularly in the stage of contract documentation, which hampers the overall understanding of transaction structures and documentation of the same in legal language. It has been felt that these professionals needed to upgrade their knowledge related to structures of development rights and joint venture agreements, and other modes of participatory development, especially in financial terminology.

Table 7.4 Legal Advisors/Lawyers Skill Set

Profession	Skill Set	Estimated shortage (Degree)
Legal Advisors or Lawyers in built environment	Familiarity with development dynamics	**High**
	Documentation for project finance	
	Project transaction structure documentation	
	Drawing approvals	
	Land document review and due diligence	**Medium**
	Documentation for contract tender documents	**Low**
	Review of bids received in response to contract tenders	
	Lease and sale documentation	
	Arbitration and legal representations	

Table 7.5 **Key Skill Shortages: Legal Advisors/Lawyers**

Key Skill Shortages	Summary
Land and Development Regulations	Lack of familiarity with government institutions related to built environment and their processes
	Current legal education system does not delve into built environment sector
	Lack of formal training to law professionals on Built environment industry
	Limited knowledge and familiarity with land revenue records systems and processes.
	Inadequate knowledge of laws, systems, and processes related to development approvals
Real Estate Finance	Inadequate exposure to fundamentals of finance
	Limited understanding of transaction structures and documentation of the same in legal language
	Limited understanding of joint venture agreements and other modes of participatory development
Real Estate Sectoral Performance	Inadequacy in understanding growth dynamics
	Inadequacy in understanding of various locational attributes and potential related to real estate developments
	Inadequacy in understanding development control regulations

Out of the total number of engineers in this field, it is assumed that approx. 50% contribute to built environment in India. The basis for this is that electrical engineers are most likely to be employed in the development-related industry, such as infrastructure, real estate developments, and construction industry. Expertise of electrical / electronics engineers in real estate is majorly restricted to design of electrical layouts and supervision at site. They are primarily responsible for electrical layout drawings and implementation of the same.

Total engineering institutes in India are 1668 nos.[40], that provide Bachelor and Masters Degree Programs in the stated field. Premier institutes include Indian Institute of Technology (15 cities), Birla Institute of Technology, and National Institutes of Technology (formerly Regional Engineering Colleges), among others. Courseware of renowned engineering institutions in the department of electrical / electronics entails Electrical Engineering discipline in the areas of Circuits, Networks and systems, Measurements, Power Systems, Electrical Machines, Control Systems, Semiconductor Devices, Analog and Digital electronics, Communications and Signal processing.

Assuming approx. 50% of total volume of engineers in the field of electrical / electronics to be contributing to the construction and real estate sector of India, the number of enrolments in this course, which would eventually have become a part of the construction and real estate sector in year 2001 is estimated to be approx. 57,681. This has, since, increased dramatically to approx. 164,423 in year 2009. This depicts a CAGR of approx. 14%. Assuming this CAGR to continue, growth of enrolments in the year 2015 is estimated to be approx. 360,712 nos. and in the year 2020 is estimated to be approx. 694,212 nos.

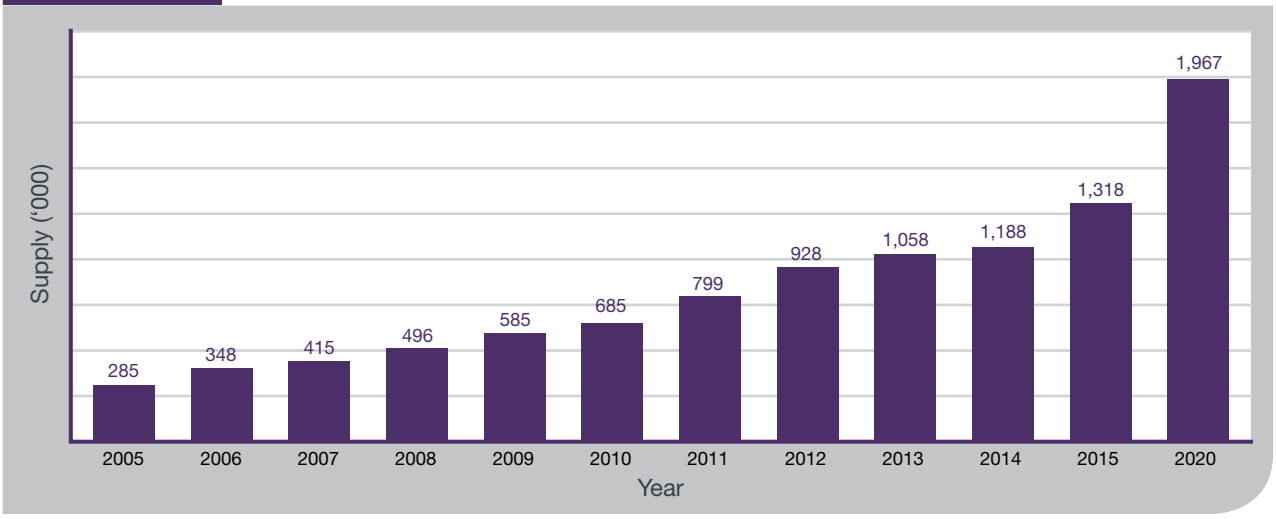
7.5.1 Supply trend of Electrical/ Electronics Engineers

There was a cumulative supply of 285,147[41] electrical and electronic engineers in built environment in India in the year 2005. Taking into account the number of students enrolled in engineering courses for program duration of 4 years, the annual supply of these professionals has been estimated. Based on the above mentioned assumptions, **the supply of electrical/ electronic engineers in the built environment sector by the year 2015 has been estimated at 1,317,779 and at 1,966,873 for the year 2020**.

It has been assumed that the no. of seats in electrical / electronic engineering courses will remain constant as of 2009. A dropout rate, including non-working professionals, to a tune of 10%[42] has been factored in the annual supply figures.

Note: No qualitative analysis has been done for this category, as it was not part of the research scope.

Figure 7.5 **Cumulative supply of Electrical /Electronic engineers estimated to contribute to built environment (in '000s)**



Source: Indiastat.com[43], Ministry of Human Resource Development[44] and extrapolation

40 www.education.nic.in 41 Indiastat.com and Ministry of Human Resource Development 42 Ministry Human Resource Development and University Grants Commission 43 www.indiastat.com, Region/State-wise Number of Engineering Degree Colleges and their Intake in India (2000-2001 to 2005-2006) 44 Department of School Education & Literacy and Department of Higher Education, Ministry of Human Resource Development

8.0 Demand Assessment – Specialized Professionals

This research has highlighted that unlike in other developed economies; the professions associated with built environment in an organised manner are limited to those of engineering, architecture and planning. Whilst these are essential to serve as a backbone for skills required within this sector, there has emerged a need for higher degree of specialisation that is required amongst professionals to be able to meet the challenging and fast developing real estate and infrastructure needs of the country.

Specialized skill sets across various critical functions require a combination of the skills possessed by core and non-core professionals, special training and education courses are required for professionals to hone these skill sets.

A detailed assessment of likely demand of specialized professionals based on their intervention and requirement across the project life cycle has been undertaken. This demand assessment provides an estimate for the future supply of these specialised skills that Indian built environment will require by 2020.

This assessment has been undertaken at two levels (a) to quantify the future demand of specialized professionals (quantitative assessment) and (b) to identify the kind of specialised skills these professionals must possess (qualitative assessment).

The findings of this research including feedback from primary surveys and discussion with industry experts, have brought to light specific disciplines that need to be honed on a priority basis to bolster the built environment in India

a. Valuation

b. Quantity surveying

c. Facilities management, and

d. Sustainable development

Given the importance of the above professions which are critical for the sector's growth, this research seeks to draw an estimate of the potential demand for these skill-sets for India for the period 2010 – 20. These estimates are largely pivoted on spatial demand that has been assessed earlier in this report and correlated with estimated productivity of these specialised professionals.

8.1 Valuers

Valuation underpins financial decisions and impacts all critical functions for a healthy stable economy namely financial reporting, taxation, direct investments, secured lending and structured finance markets, IPOs, Mergers and Acquisitions, land and property markets, etc.

Valuation professionals act as independent land and property economists to determine the value of land and property portfolios for mortgage, taxation, probate and collateral purposes

The output from the valuation discipline forms the benchmarks based on which investments in projects are determined. Purchasers or investors in any project measure the expected returns or benefits to be received from the projects against the cost outlay. The most critical task for the valuer is to state the benefits in monetary terms while interpreting returns as a function of the input cost, which would enable the purchaser / investor to make rational choices related to investment.

It has been observed by a number of industry professionals that valuations are being done by a number of professionals who may or may not possess adequate skills of a valuer of global standards. Valuation discipline transcends the base qualifications of engineering and architecture, and requires a more holistic understanding of various other facets of development, such as law, economics, global and local taxation, accounting policies and standards, town planning, environmental science, building construction technology, and finance, among others.

However, there is scarcity of educational and training centres across India that address this holistic underpinning required for understanding what valuations are all about. Formal education in valuation of real estate as well as plant and machinery is provided by a handful of educational institutions. Whilst Sardar Patel University (SPU) offers full-time residential courses, Dr. Babasaheb Ambedkar Open University (BAOU) offers distance learning / correspondence courses. As general eligibility criteria, academic background in either valuation of real estate, engineering, architecture, science, law or commerce is required.

8.1.1 Estimation of demand for valuers

Demand for this skill-set has been assessed by adopting a two-step approach. At the first level, total number of potential valuation assignments have been assessed, which emerges from the project life-cycle:

a. Land for almost all projects undergo valuation once in their life-cycle

b. Some projects are valued once during their life-cycle while attracting investments

c. Some projects are valued annually till they are sold out. In this case, they are usually valued 3-4 times additionally during their life-cycle

d. Residential units are valued before home loans are disbursed for them (and not all applications receive home loans while they are still valued)

e. Infrastructure projects, such as roads, and highways, among others, also get valued at least once in their project life-cycle even it is for purpose of determining compensation during land acquisition.

These key factors have been considered while assessing potential demand for Valuers in India for the period 2010–20. Estimation has been made broadly on project basis encompassing likely projects to come up across residential, retail, commercial, industrial, and hospitality segments.

Total demand for residential space in urban areas, which is likely to be valued at least once in its lifetime at the acquisition stage, has been estimated. However, multiple assessments may be made for a percentage of these projects in case any investments are considered by the market in these projects.

Post analysis of projects in all categories and total loan disbursals in housing sector, the above table highlights that total demand for project valuations vary between 800,000 – 1,310,000 per annum.

Further to estimation of total projects likely to get valued at least once in their lifetime, requirement for valuers has been assessed. Based on existing estimations[45], a minimum of 3 days and a maximum of 10 days time is understood to be sufficient to carry out a valuation. In case of outstation properties or in case of large property valuations, the time required can vary. For the purpose of this research, an average time of 10 days has been estimated for carrying out a valuation exercise. Assuming 240 working days in a year, it is estimated that a valuer may be able to carry out 24 valuation projects in a year. Therefore, there is an estimated requirement of approx. 33,000 – 55,000 valuers on annual basis in real estate sector till 2020.

Table 8.1 **Estimation of total projects in India on incremental basis (2010–2020)**

	2010	2011	2012	2013	2014	2015	2020	Total (2010–2020)
Residential	763,494	801,604	841,618	883,630	927,741	974,056	1,242,736	10,842,294
Retail	537	545	553	561	570	578	623	6,366
Commercial	5,931	6,076	6,223	6,375	6,530	6,689	7,543	73,788
Industrial	33,190	34,542	35,948	37,411	38,934	40,519	49,467	449,269
Hotels	6,006	6,152	6,301	6,454	6,611	6,772	7,637	74,710
Total Valuations estimated in real estate sector	**809,157**	**848,917**	**890,643**	**934,432**	**980,387**	**1,028,615**	**1,308,005**	**11,446,427**

45 Draft handbook by Indian Banks Association (IBA) and National Housing Bank (NHB), JLL estimates

Estimated requirement of valuers under each sector has been assessed, post which indicative requirement for valuers for infrastructure projects has been drawn. Based on previous sections and assumptions, it is assumed that approx. 70%[46] of the total demand for professionals is likely to be employed in infrastructure sector. Therefore, it is assumed that the demand derived for real estate is 30% of the total demand for valuers required in built environment, including infrastructure. Therefore, total demand for these professionals has been estimated as below:

Table 8.2 **Estimation of demand for valuers over 2010–2020 (in '000s)**

	2010	2011	2012	2013	2014	2015	2020
Demand for Valuers in real estate ('000)	34	35	37	39	41	43	55
Demand for Valuers in infrastructure ('000)	78	83	87	91	95	100	127
Total demand for Valuers in built environment ('000)	112	118	124	130	136	143	182

From Table 8.2 above, it is estimated that annual demand for valuers in 2010 was approx. 112,000, which is anticipated to increase annually close to 182,000 valuers in 2020.

46 Economic Survey 2007 – 08, CREDAI, NSDC report on Human resource and skill requirements in the building, construction industry and real estate services - Study on mapping of human resource skill gaps in India till 2022 and Primary Surveys conducted by Jones Lang LaSalle

8.1.2 Qualitative assessment of skill sets in valuers

Industry experts have observed that there is shortage of valuation professionals which is likely to continue in the years through 2020. One of the key reasons identified for this shortage is the inadequate number of professional courses that address this discipline as an independent discipline requiring knowledge of all aspects of development. In addition, various other aspects have been identified as causes of the shortage of these professionals, such as lack of awareness of this profession, limited experience, relatively unorganized nature of this sector, and limited availability of professionals with real estate experience that can act as profession ambassadors to induce growth of professionals within this discipline.

Based upon discussion with industry experts as employers or clients of valuation services as well as academics and professional associations, following issues and gaps have been identified in the quality of skill-sets in this profession:

Table 8.3 **Key Skill Shortages: Summary**

Key Skill Shortages	Summary
Finance	Lack of in-depth familiarity with varying methods and approaches for undertaking valuations
	Limited knowledge related to business models for varying businesses
	Inadequate understanding of financial viability analyses and risk analysis
	Limited exposure to project transaction and finance structures
	Inadequate knowledge related to investment vehicles and structures, including joint venture structures
Planning and development	Inadequate knowledge of planning processes including development controls and regulations
	Limited understanding of demand assessment and forecasting techniques, and their application to real-life scenarios
	Limited exposure to actual construction processes, and limited ability to understand construction processes (such as reading project construction and delivery schedules)
	Lack of familiarity with latest building surveying techniques
Land and Laws	Inadequate working knowledge of title and tenure-related issues
	Limited exposure to review of legal due diligence reports and lease conditions / renewal documents and their implications on valuations
	Limited exposure to title recording and spatial information systems, including land surveying techniques
	Inadequate knowledge of all laws related to real estate and infrastructure
	Limited knowledge of proactive conflict avoidance and management
Accounting and Taxation	Inadequate knowledge of law, taxation, and local and global accounting policies and standards
	Inadequate knowledge of FDI compliance norms and their application in valuations
	Inadequate knowledge of IFRS and lack of skills to conduct fair valuation under IFRS development
Institutions	Limited working knowledge of government agencies and institutions involved in varying stages of the development life-cycle

8.2 Quantity Surveyors

Quantity surveying is broadly concerned with cost control in construction projects. There are two main aspects within quantity surveying:

- **Bill of Quantities** – In this aspect, quantity of each of the components of the building is calculated in a detailed way. Similarly, material requirements are calculated along with the ancillary requirements. The cost to be incurred for the entire project is estimated on the basis of this bill of quantities. This step is carried out prior to inviting bids and tenders prior to award of contract for project construction.
- **Bill Checking** – This part of quantity surveying is carried out during the process of construction and continues till project completion. This is basically checking the bills in a phase wise manner in order to regulate the cost of construction as detailed out in the bill of quantity and to ensure that adequate materials and labour have been deployed in an appropriate and timely manner.

Quantity Surveyors manage all cost and commercial aspects of a building project, from initial calculations to the final figures, and in the procurement of goods and services. Construction costs are monitored and controlled by accurate measurement of civil works, application of knowledge of costs for the civil work, and labour and material requirement. QSs seek to ensure value for money, whilst still achieving the required standards and quality. Lifecycle costing, cost of alternative materials, renewable energy schemes, recycled content schemes, the ethical sourcing of materials and labour all need to be considered by the QS throughout the lifecycle of the project. QS and Construction professionals should promote performance measurement as a means of driving continual improvements in building performance.

Quantity surveying, as an independent profession, is still in a nascent stage in India. Quantity surveying is largely undertaken by civil engineers and related, who are currently multi-tasking while undertaking quantity surveying activities. These professionals are either diploma holders in Civil Engineering and / or graduates in Civil Engineering and building engineering management.

8.2.1 Estimation of demand for quantity surveyors

Potential demand for quantity surveyors in India is assessed based on estimated productivity of each quantity surveyor in context of potential spatial development. To estimate this, the following three steps have been adopted:

a. Total spatial demand for real estate has been considered since quantity surveying skill-sets will be required for all of these developments.

b. This total estimated spatial demand is then divided by the productivity of each quantity surveyor, which is based on estimates backed by a set of detailed assumptions and calculations.

It may be noted that this productivity level is only for the initial period of projects where involvement of quantity surveyors is extensive. During project execution, involvement of quantity surveyors is significantly reduced and is largely limited to checking the periodic bills that are presented by contractors for periodic payment release.

c. Since quantity surveying is required both by clients and service providers, in this case contractors and sub-contractors, it is estimated that multiple quantity surveyors are required for each project

d. For infrastructure, the total number of quantity surveyors thus estimated is then extrapolated to include estimated requirement of quantity surveyors for infrastructure requirements. Research has indicated that approx. 30% of the total professionals in the real estate and infrastructure sectors are engaged in the real estate sector. Working with this norm, total potential requirement of quantity surveyors has been estimated.

Following table presents a summary of this estimation:

From Table 8.4 below, it is estimated that annual demand of quantity surveyors in 2010 was approx. 70,000, which is anticipated to increase annually to near 97,000 quantity surveyors in 2020.

It may be noted here that this assessment works on the assumption that professionals undertaking the quantity surveying tasks are working full-time on these aspects and are not multi-tasking. Consequently, it may be appropriate to develop professionals that are dedicated towards undertaking these quantity surveying activities. Criticality of this point emerges in light of the fact that there are no dedicated courses that focus exclusively towards enhancing the quality of quantity surveying in India.

8.2.2 Qualitative assessment of skill sets in quantity surveyors

Shortage of skills related to this particular aspect was identified by a number of professionals during the course of discussions. Going forward, it may be noted that efficiency and productivity levels of these professionals will be contingent on technological applications that allow for quicker calculations of areas, and, consequently, quantities required for development. While a number of project management and design review software exist related to project developments, quantity surveyors would need to be skilled in usage of these software. It is also anticipated that since costs of construction are driven by market forces, quantity surveyors are unable to keep pace with updated market information. This becomes quite critical in light of the fact that this discipline requires and in-depth understanding of the vast plethora of materials, which may not be readily available in immediate vicinity of projects under development.

Table 8.4 **Estimation of demand for quantity surveyors over 2010 – 2020 (in '000s)**

	2010	2011	2012	2013	2014	2015	2020
Demand for quantity surveyors in real estate ('000)	21	22	22	23	24	25	29
Demand for quantity surveyors in infrastructure ('000)	49	50	52	54	55	57	68
Total demand for quantity surveyors in built environment ('000)	**70**	**72**	**74**	**77**	**79**	**82**	**97**

Facility Management (FM) is an emerging field in the domain of real estate. Increasing number of properties is necessitating a more professional and cogent approach towards managing facilities that have been created. It is imperative that properties be maintained and managed to a high degree to enable competitiveness in terms of attracting higher prices. However, the biggest missing area in the industry is the lack of any professional discipline which seeks to teach facility management as a full time profession. Since this is a relatively new discipline, lack of trained resources in this field is being felt severely at this point of time in the industry.

Facility Management requires trained human resource with skills at varying levels. Broadly, facility management teams may be structured at three broad levels:

- **Management:** This level of professionals generally comprise of professionals that assume the roles of Facility Managers and Assistant Facility Managers, supported by facility executives. These are usually preferred to have both technical and non-technical skills. Technical skills would entail application of engineering knowledge related to mechanical and electrical engineering with some presence of civil engineers.
- **Technicians:** Skills required at this level vary across the entire spectrum of services provided by buildings. Hard services require technical aspects, while soft services require various other aspects, such as housekeeping, janitorial services. For the hard skills, professionals are generally a mix of semi-skilled human resource from ITIs with technical knowledge related to heating, ventilation, and air-conditioning (HVAC) and electrical engineering.
- **Executives:** Management and Technician segments of facility management teams are supported by varied workers and executives, who largely are unskilled human resource for undertaking various activities, such as housekeeping, pantry boys, and mail room activities.

8.3.1 Estimation of demand for facilities managers

In quantitative terms, potential demand for facility managers in India is assessed based on estimated productivity of each facility manager group in context of potential spatial development.

Following approach has been adopted while estimating the demand for facility management professionals:

a. Given that facility management is largely focused on operational facilities, usually commercial office space and retail space, spatial demand for these asset classes has been considered.

b. At the next level, the productivity for facility managers at varying levels has been estimated

c. The total annual incremental estimated demand for commercial and retail space is then viewed in context of the productivity levels of facility management professionals

Table 8.5 below summarizes the estimated requirement for at varying levels:

From Table 8.5 below, it is estimated that total annual demand of professionals and support staff related to facilities management in 2010 may be approx. 120,000, which is anticipated to increase to about 152,000 in 2020.

Table 8.5 **Estimation of demand for facilities managers and support staff in real estate sector over 2010-2020 (in '000s)**

	2010	2011	2012	2013	2014	2015	2020
Management level ('000)	16	17	17	17	18	18	21
Executive level ('000)	26	27	27	28	29	29	33
Technician level ('000)	78	77	82	84	86	88	98
Total facility managers	**120**	**121**	**126**	**129**	**133**	**135**	**152**

8.3.2 Qualitative assessment of skill sets in facility managers

Since this field is relatively new in India there are very limited experienced professionals in this field at this point of time. However, as the Indian economy matures and markets demand better quality products and services, demand for these highly specialized professionals is only likely to increase. From a global perspective, this profession is working towards positioning trained staff with skill sets that are being enhanced on a continual basis. An important aspect highlighted during discussions with industry professionals in India was that there is no specialized course or program that aims to develop professionals with these skill sets. This is essential from the perspective of enabling infrastructure management to ensure that discerning demands of market are addressed and efficiency of working environments is improved to allow for increased productivity of employees.

Following observations related to skill sets shortages in facility managers were highlighted by industry experts during discussions:

Management Level

- Limited industry exposure
- Inadequate understanding of maintenance services and annual maintenance contracts
- Inadequate knowledge of quality and cost control,
- Inadequate interaction skills which emerges from lack of customer orientation
- Inadequate skills for multi-tasking and coordination with multiple agencies and vendors at the same time
- Inadequate skills towards documentation related to managing facilities.

Technician Level

- For “hard” services related to FM, such as power back up, HVAC, fire-fighting systems, ETPs, plumbing and drainage, it is observed that most of the manpower has relatively low levels of experience.

Executive Level

- For “soft” services, related to FM, such as janitorial services, help desk, housekeeping, cafeteria, horticulture, and concierge, among others, it is observed that unskilled and semi-skilled labour are not trained to take on these specialized requirements.
- Specific to “security” services as part of FM services, there is a dire need for imbibing knowledge related to security procedures. Particularly from the perspective of unskilled labour in this field, these are largely uneducated people who need to have a high level of training related to technology and security measures.

8.4 Professionals Specialising In Sustainable Development

Sustainable development is best thought of as a process for growth that understands, invests in and maintains not just financial resources, but human, social and environmental resources, all at the same time. Only by avoiding the damaging consequences of trading one off against the other can the goal of sustainability be met. Sustainability can be as simple as making conscious decisions about how to approach a project. When presented with a wide range of options, the choices professionals make should be deliberate and seek to balance economic, environmental and social costs and benefits at a local and global level.

It is recognised that sustainability should be considered throughout the property lifecycle[47]. There can be little doubt concerning the important role that property professionals play at each stage of the building lifecycle, and the lifecycle's overlap with the three elements of sustainable development (the environmental, economic and social pillars in the 'triple bottom line' model). The interrelationships across all phases in the property lifecycle are critical to achieving a sustainable built environment.

Development of projects in a sustainable manner requires a coordinated and holistic approach, wherein sustainability principles and approaches need to be applied to projects. However, sustainable development is not the domain of any individual profession. Rather, this entails application of principles across a vast array of professional services. Principles of sustainable development are applicable across all life-cycle stages of projects.

- At the project conceptualization stage, project envisioning would need to consider what technologies may need to be adopted for making the project energy efficient or sustainable. This would involve project cost estimation and financial viability assessments.
- At the design or planning stage, principles of sustainability in design would need to be applied, both at the building design and area planning levels. Subsequently, technology application during construction stages would require a fair degree of knowledge about latest energy efficient technologies.
- Post construction facility management, too, would require knowledge towards operations and maintenance of energy efficient technologies to ensure that benefits of sustainable design and technologies are appropriately drawn.

With the above in perspective, it is evident that knowledge of sustainable development would need to be mainstreamed in the development process at almost all levels of the project life-cycle. Whilst a property or construction professional may not be a specialist in sustainability, it is important that they possess a level of sustainability competency and understanding this allows the recognition of an issue and intervention where necessary. RICS therefore defines 'Sustainability interventions' to an understanding of the concerns and risks regarding sustainability and the practical solutions to mitigate these.

47 Sustainability and the RICS property lifecycle

This research seeks to quantify the demand for professionals with specialization towards sustainable development, which may be needed at varying stages of the project life-cycle. For this estimation, three core professions of civil engineering, architecture, and planning have been considered where professionals would need to possess a thorough understanding of 'sustainability interventions' and be equipped to give advice on this matter, within their own realm and contribution in the development process. The most important facet of sustainable development is its involvement in almost every aspect of development. A comprehensive understanding of sustainable development may entail a paradigm shift of the way we address and go about the development process. However, for this paradigm shift to happen in a holistic manner, intervention will begin with smaller specific areas, and mature to specializations within this specialized profession. As the scale and number of these specialized interventions increase, the overall process of paradigm shift will gather momentum till the time we reach a phase when sustainable development principles become the accepted rule and foundation of all developments. Moreover, since this is an ever-evolving process with innovation driving technological advancements, professionals in this discipline will need to be constantly aware of the changes in this profession.

One of the key indicators that this paradigm shift has begun is that at this point of time; sustainable development professionals are generally preferred for aspects of environmental engineering, environmental planning, knowledge of and familiarity with energy efficient technologies, and cost estimation and implementation of such technologies. However, specialized domains are also emerging within this specialized profession. There are specialized universities that offer Masters and Doctoral level programs in the areas of Public Policy and Sustainable Development, Infrastructure, Environmental Studies, Natural Resources Management, Water Resources Management, Geoinformatics, Plant Biotechnology, Climate Science & Policy, Renewable Energy Engineering & Management, and Business Sustainability and Development Practices, among others.

Discussions with the industry experts revealed that there is considerable shortage of professionals such as Energy Environment Specialists, Energy and Environment audit/ due diligence professionals, MEP professionals, Energy and Sustainable Management Professionals, among others. Reasons identified for this shortage were lack of adequate professional and academic courses, along with lack of integrated approach to design and implementation.

8.4.1 Estimation of demand for core professionals specialising in sustainable development

Quantitative demand for sustainable development in the period of 2010-20 has been estimated based on the number of professionals as part of every team that needs to be aware of sustainable development principles, processes, and technologies, and their application in various stages of the development lifecycle:

- At the first level, the total requirement of civil engineers for development during the period 2010-2020 is considered on an annual basis.
- At the next level, percentage of these professionals is estimated who need to be aware of sustainable development based on discussions with industry experts,
- This ratio is applied to the total requirement of civil engineers to identify the number of civil engineers required who must be aware of sustainable development,
- This process is repeated for the other core professions, namely architects and planners,
- Requirement of all professionals is then summed to arrive at professionals

Table 8.6 **Estimation for core professionals with knowledge of sustainable development (in '000s)**

	2010	2011	2012	2013	2014	2015	2020
Demand for Civil Engineers specialising in sustainable development ('000)	270	273	276	278	281	284	300
Demand for Architects specialising in sustainable development ('000)	65	65	65	66	66	67	69
Demand for Planners specialising in sustainable development ('000)	24	24	24	25	25	25	27
Total demand for professionals specialising in sustainable development ('000)	**359**	**362**	**365**	**369**	**372**	**376**	**396**

However, it may be noted that the above assessment displaying the estimated requirement is limited to core professionals only, and going forward this aspect is likely to be addressed at the level of non-core professionals as well.

8.4.2 Qualitative assessment of core professionals with skill sets in sustainable development

With the evolving nature of this discipline, demand for all professionals related to built environment is likely to increase multi-fold in the coming years as the profession in India leap-frogs the learning curve in this global environment. Industry experts have observed the following qualitative skill-set gaps towards sustainable development:

Table 8.7 **Key Skill Shortages: Summary**

Key Skill Shortages	Summary
Inter-linkages	Inadequate knowledge of inter-linkages between Energy-Economics-Environment to enable holistic solutions
	Inadequate knowledge related to fundamentals and advanced energy conservation principles and renewable energy
	Limited knowledge of diversity and sensitivity to ecosystems and their correlations with energy consumption patterns
	Limited knowledge of macro-economic policies, their correlation with environmental and energy aspects, including legislations, initiatives, and incentives, and governance and regulatory mechanisms
	Inability to integrate different knowledge domains to enable sustainable development and infrastructure management
	Lack of knowledge related to mainstreaming sustainable development principles in coordinated design and planning
Technologies	Inadequate practical knowledge related to application of energy-efficient technologies in varying eco-systems
	Limited knowledge related to energy audits in context of emerging technologies
	Limited knowledge related to use of geo-informatics for natural resource management
	Limited understanding and knowledge related to principles and processes related to green-certifications
Carbon Credit Trading	Limited understanding of global framework for carbon credit trading
	Inadequate knowledge of carbon sequestration processes
	Limited knowledge of carbon finance and transaction processes

8.5 Professionals Specialising In Land Acquisition

Land acquisition has always been a very sensitive aspect of built environment. Nevertheless, land acquisition conducted at the right price and at the right time without controversies forms the backbone of any successful project, whether it is infrastructure or real estate, and generates the momentum for timely urbanization. However, given sensitivities involved with this aspect, land acquisition and land bank creation in India has remained as an unregulated and unorganized activity.

Although not part of research scope, discussions with industry experts have highlighted that the activity of land acquisition would require professionals that may be broadly categorized under two heads:

Land Transaction Agents

Land transactions are affected by land transaction agents and real estate brokers, wherein they work with land owners and purchasers to fructify transactions. However, there is no formal education framework that trains professionals specifically for land transactions. One of the reasons for this could be the diversity of land laws across India (since land is a "State" subject). Consequently, it is learning-on-the-job in which these transaction agents learn about different types of title ownerships, land revenue records and systems, transaction processes including registration and mutation, and transaction structures including joint ventures and investments.

Major skill set shortages observed are general lack of knowledge about clearances and government procedures related to land acquisition. From the perspective of various industry experts, it is observed that there is inadequate knowledge related to land revenue records, land-related laws, and governance structures and mechanisms related to land transactions, which further relates to limited knowledge related to finer nuances of land acquisition.

An important skill-set that require attention has been identified as that of land valuations. It has been indicated that land transaction agents should be knowledgeable of valuation techniques and principles, as this would help in rationalization of transactions.

Respondents have also indicated that the sector of land acquisition and land bank creation being highly unorganized, there is further scope for improvement of ethical performance. Lack of standards and training on this aspect has been indicated as important areas of concern. Liaison skills related to land transactions, too, have been indicated as a major skill-set shortage by majority developers.

Land Surveyors

Land surveyors, on the other hand, are slightly more organized. Land surveying, as a subject, is formally taught to architects, planners, and engineers as part of their curriculum in degree courses. Moreover, this subject also forms part of curriculum for diploma courses in civil engineering. Shortage of these professionals with adequate skills has been indicated by the industry.

Moreover, with various state governments moving towards computerization of land records with the objective of reducing title related disputes, need for land surveyors is only likely to increase in the coming years. Industry experts also observed that there is limited exposure and knowledge of latest land and building surveying techniques amongst these professionals, which would be needed to enhance their efficiency and productivity levels.

9.0 Workers

This chapter focuses on growth trends observed historically for skilled and un-skilled labour along with forecasts of estimated growth of this workforce in the coming years.

Workers, largely employed in construction sector, within the built environment majorly comprise of following:

- **Skilled workers** – includes Supervisors, Technicians, Foremen and Tradesmen
- **Semi-skilled and Unskilled workers** – includes Semi- skilled workers[48] Helpers and Construction Labour

46 As defined by Construction Federation of India

Table 9.1 Types of Skilled Workers

Land Surveying and Mapping	Civil – Structural Work	Civil – Finishing Work	Mechanical	Electrical
• Land Surveyors • GIS Data developers	• Mason (brick and concrete layers) • Carpenter • Steel Fixer / Bar Bender • Scaffolders • Wall Painter • Laboratory Assistant • Surveyor Assistant	• Finishing carpenter • Painters and decorators • Plumbers • Floor and Marble setters • Rigger / Signalman	• Machine and crane operators • Draftsmen • Underground cabling • Earthing • Meter reading	• Electricians • Electric welding • Gas cutters & welders

Skilled workers include a variety of technical and non-technical workers operating as supervisors, foremen and tradesmen, who play an important role within the built environment. A variety of trades and skilled workers are required in the sector and these include Crane operators, Electricians, Welders, Masons, Plumbers, Carpenters, draftsman, bar benders, steel shutterers, marble cutters, brick and concrete layers, scaffolders, painters, plant and machine operators, etc.

In the year 1995, number of skilled workers was approx. 2.24 million, which rose to approx. 3.27 million by the year 2005 depicting a CAGR of approx. 3.84%. Assuming this CAGR to continue, this figure for the year 2015 is estimated to be approx. 4.76 million and for the year 2020 is estimated to be approx. 5.75 million.

Industrial Training Institutes (ITIs) and Industrial Training Centres (ITCs) constituted under Ministry of Labour, are the training institutes which provide training in technical fields related to engineering. Various State Governments and Union Territories operate some 5,459 ITIs with a total capacity of 749,510 training seats.[49] Out of this, nearly 49% i.e. 370,880 seats are established in some 1,907 government ITIs, and the residual 378,630 are in some 3,552 private ITIs.

Figure 9.1 Number and enrolments in ITIs in India, 2008 Distribution of number of ITIs

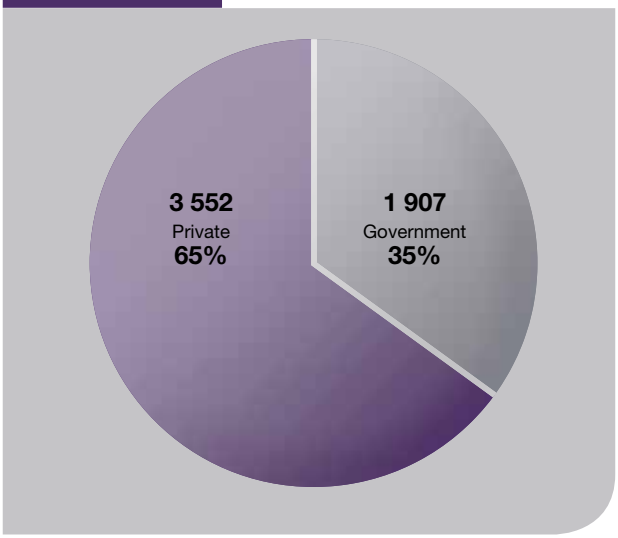
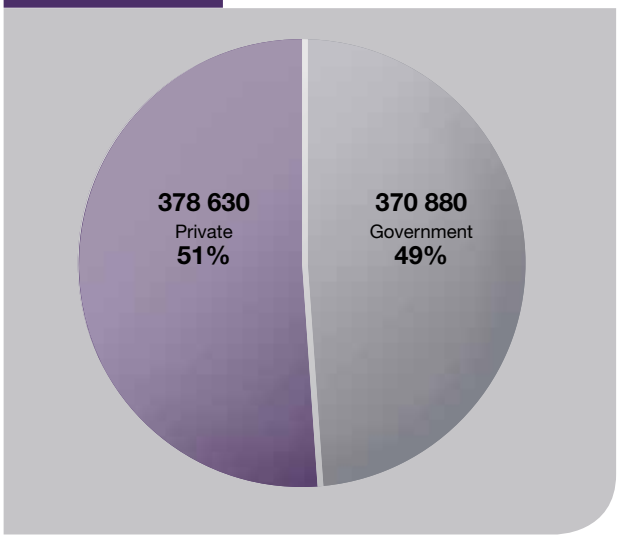


Figure 9.2 Number and enrolments in ITIs in India, 2008 Distribution of ITI Seats



49 IAMR Yearbook 2009, Manpower Profile, Pg 89

The number of vocational training institutes in India has shown a rapid increase over years with the current growth, however, being mostly driven by private training providers. The maximum number of institutes is in Karnataka followed by Tamil Nadu, Maharashtra and Andhra Pradesh. However, the maximum number of seats is in Andhra Pradesh followed by Maharashtra, Tamil Nadu and Gujarat.

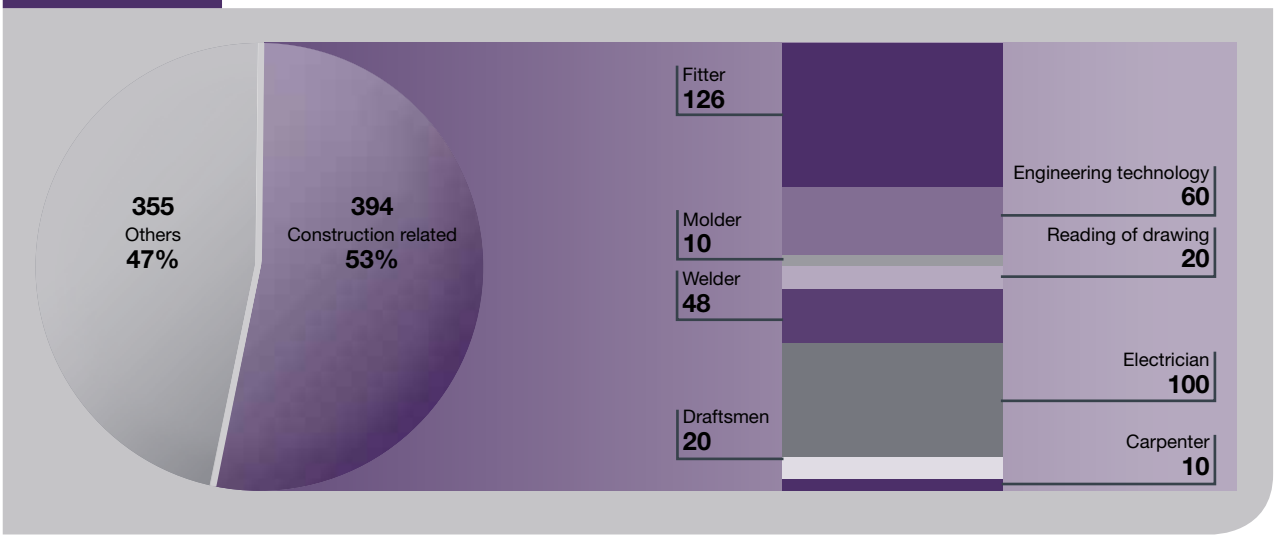
Various courses relevant to buildings and construction sector in ITIs are

- plumbing (12 months),
- Mason (12 months),
- carpenter (12 months),
- electrician (24 months),
- civil draftsmen (24 months),
- surveyor (24 months) and
- Few new courses started under Craftsmen training scheme (CTS) in 2003 such as building maintenance, interior decorator and architectural assistant.

The Government of India has made a considerable investment in skills development of young people through setting up the ITIs. Historically, they have been established with the major aim being to speed-up the process of industrialization in this country. This, however, determined the rather limited range of national vocational qualifications, the majority of which are basic industrial trades, while the non-engineering trades necessary for development of, for instance, the services sector, continue to be under-represented.

Observing seating capacity in trade courses for craft instructors provided by Advanced Training Institutes (ATI) and Craftsmen Training Institutes (CTI), it is evident that approx. 40.45% of the seats are allotted to courses related to building and construction sector.

Figure 9.3 **Breakup of number of seats in construction related fields in CTIs and ATIs (2008)**



9.2 Semi-Skilled And Unskilled Workers

Construction labourers are significant and indispensable contributors to the construction and real estate industry and largely supplied by petty contractors and sub contractors. A majority of construction workers are either illiterate or have little schooling; as a result workers are typically trained on the job. Most unskilled workers are so raw that not only do they need to be taught how to use a ruler, lay bricks, paint walls and mix cement, but also how to use an elevator.

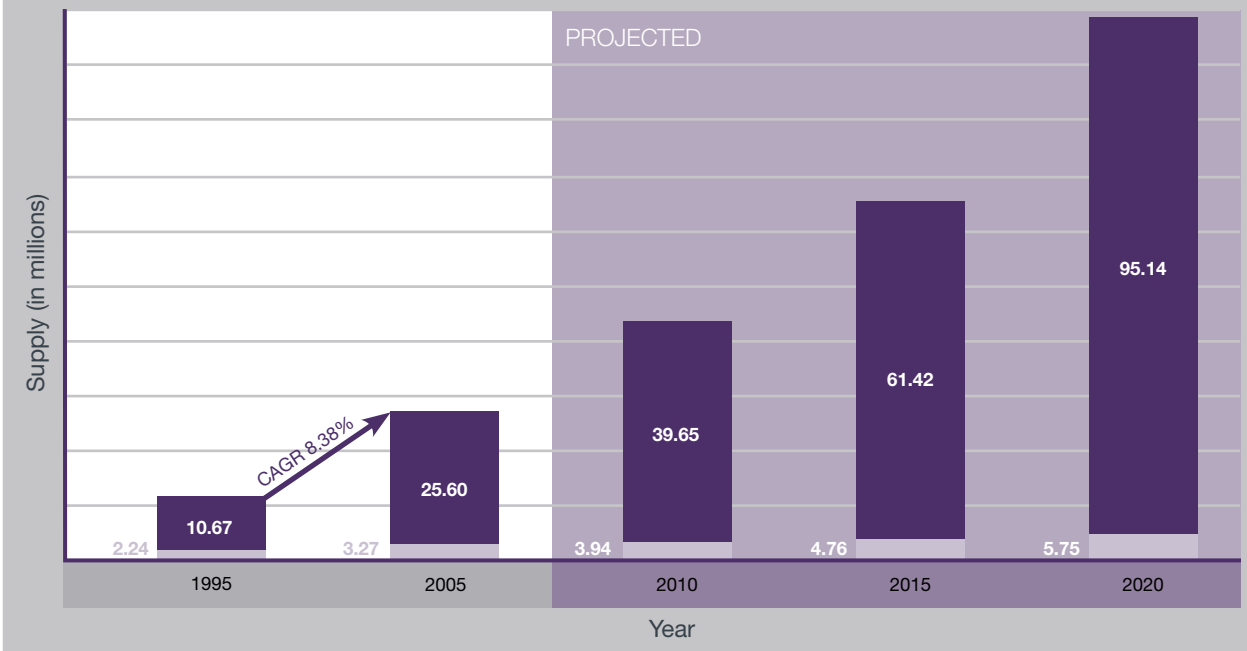
In the year 1995, number of unskilled construction labourers was approx. 10.67 million, which rose to approx. 25.60 million by the year 2005 depicting a CAGR of approx. 9.15%. Assuming this CAGR to continue, this figure for the year 2015 is estimated to be approx. 61.42 million and for the year 2020 is estimated to be approx. 95.14 million.

Increase in the unskilled construction labour is also dependent upon the urbanization rate of India which is 2.54% per annum. It is assumed that there shall be a migration level of 2.54% from rural to urban owing to employment opportunities in construction sector in urban cities and areas; however this is much lower than the CAGR of unskilled construction workers and hence is assumed to be factored in the growth rate, which is 9.15%.

9.3 Estimating Number of Workers

Historical data on construction workers demonstrates that of the total labour workforce, 80 – 90% is comprised on unskilled workers. As per 1995 statistics indicated in Report of the Working Group on Construction for the 11th Five Year Plan, skilled workforce comprised a mere 17.35% of the construction workers which further went down to 11.32% in 2005. Projecting the growth rate since 1995 till 2005, number of construction workers in India has been estimated

Figure 9.4 **Cumulative number of skilled and semi-skilled/unskilled workers (in millions)**



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
Skilled workers (millions)	3.27	3.39	3.52	3.66	3.80	3.94	4.09	4.25	4.42	4.59	4.76	5.75
Semi and unskilled workers (millions)	25.60	27.94	30.50	33.29	36.33	39.65	43.28	47.24	51.56	56.27	61.42	95.14
Total workers (millions)	**28.87**	**31.33**	**34.02**	**36.95**	**40.13**	**43.59**	**47.37**	**51.49**	**55.98**	**60.86**	**66.18**	**100.89**

Source: Report of the Working Group on Construction for the 11th Five Year Plan; and extrapolation of data

10.0 Conclusion and Recommendations

This chapter summarizes the findings of the study followed by key recommendations to improve on the quantum and quality of skills in the built environment in India.

There appears to be very little doubt that India is poised for considerable level of growth in the coming years. Growth of India's GDP is expected to be robust in the next 5 – 10 years. Collectively real estate, construction, and infrastructure sectors are likely to contribute significantly towards this growth.

However, supply of professionals catering to demand for real estate space as well as infrastructure to meet the needs of growing urban population has been found to be acutely short. It may, therefore, be concluded that Indian built environment may face a situation where adequately trained and skilled professionals of varying disciplines are not available.

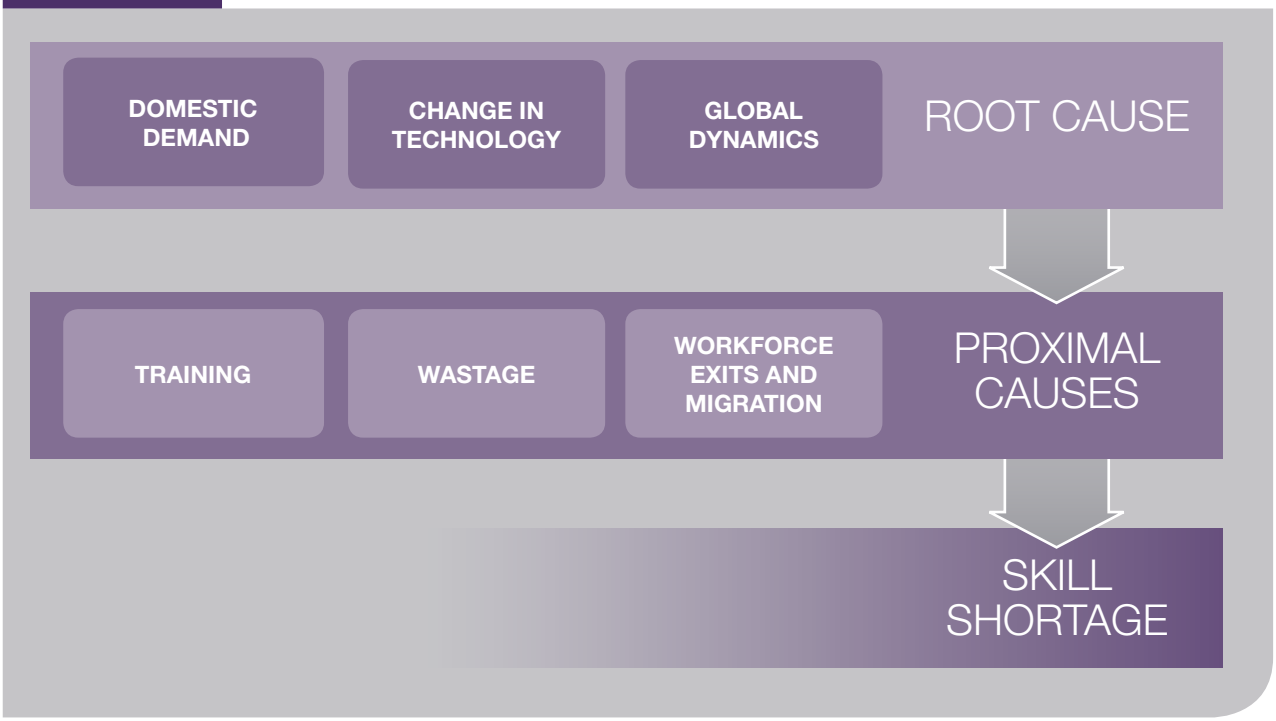
10.1 Causes Of Skills Shortage

Skill shortages are present globally and are most common at times of high economic growth and low unemployment. Skill shortage[50] has been defined as follows – *"A skill shortage exists when the demand for workers for a particular occupation is greater than the supply of the workers who are qualified, available and willing to work under the existing market conditions."*

There are two major drivers of skill shortages: the immediate or most apparent drivers known as **Proximal Causes**, and underlying drivers known as **Root Causes**. While the importance of one cannot be stated over the other, it is essential that both be kept in perspective while working towards addressing these skill set shortages.

"The shortfall is not in specific knowledge domains, but more in the ability of connect different knowledge domains to carry out sustainable development and infrastructure management activities. This calls for courses that integrate, for instance, construction management and the certification of buildings"

Figure 10.1 Drivers of Skill Shortage



50 As defined by Bureau of Transport and Regional Economics (BTRE) working Paper no. 68

10.1.1 Proximal Causes

Proximal causes are those that are apparently directly related to skill shortages. Some of the proximal causes that were identified during the course of this study may be categorized under the following heads:

- Training
- Wastage
- Workforce Exits and Migration

Training

Lack of adequately trained professionals entering the real estate and construction sector can be considered as the most critical reason for existing skills shortage.

Even as the demand for real estate and construction has gone up drastically in recent years, the supply of graduates passing out of related educational courses such as engineering, architecture and planning has not kept pace. Some of the reasons attributed for this shortfall as identified by industry experts are:

- Shortage of colleges, courses and seats therein, that teach disciplines such as civil & mechanical engineering, urban and town planning, transport planning etc.
- Quality of education imparted in new colleges considered sub-standard with inadequately experienced faculty
- Orthodox academic structures with limited room to adapt to innovation and market needs

Also, whilst the quality and complexity of real estate and infrastructure has been advancing, the education set up for professionals specializing in different facets of building and real estate apparently has not been given due attention. Unlike in other developed economies where there is specialized education in fields such as – real estate development, building surveying, construction management, real estate finance and investment, and quantity surveying, among others., academic qualifications of most professionals working in Indian built environment are limited to those of engineering, architecture and planning, with these aspects being built-in as part of their curricula rather than being considered as full-blown specializations. There are very limited institutions offering specialized disciplines, which may need to be augmented to ensure release of adequate supply of skilled professionals in the built environment.

This research has highlighted the need to recognize that education and training is required for specialized fields within building and construction. For example, civil engineers require additional training related to building engineering, real estate and quantity surveying.

Some of the issues that are embedded within these proximal causes are as follows:

- Civil engineers are not trained for building engineering
- No specifically-designed quantity surveying courses
- Other disciplines acting as planners
- Lack of integrated approach to design and implementation
- Absence of specialized courses
- There is no proper institution for safety training
- The shortfall is not in specific knowledge domains, but more in the ability of connect different knowledge domains to carry our sustainable development and infrastructure management activities. This calls for courses that integrate, for instance, construction management and the certification of buildings
- Current courses offered in traditional degree programmes are unable to deal with the challenges of a multidisciplinary problem set that infrastructure and development projects present
- Courses that specialize in integrating sustainability with existing framework of project management and project finance need to be designed. Pedagogically, these need to be active
- In case of architecture course, physical infrastructure planning –particularly city level water supply, drainage and sewerage planning needs to be adequately addressed.
- No college in India offers courses specialising in HVAC, fire fighting, plumbing and public health and no professional training courses designed to cater to these needs. Shortage of colleges for landscape architecture course, electrical engineers lack overall/holistic understanding

"Less interest in civil engineering over last 5 yrs, with a number of them going in for management courses"

Wastage

Wastage refers to number of people trained in relevant skills but not working in that occupation. The prime reason for this cause is that better pay scales are offered in other fields, which, in turn, lead to shortages of professionals in the field of built environment. Although these professionals would be able to best utilize their skills in built environment, better incentives and career development opportunities in other fields such as IT, management and banking, lead to wastage of manpower trained for this sector.

For instance, there are many civil engineers working the field of management, administration and finance, after completing other higher degree courses, consequently leading to depletion of available professionals in the built environment.

Although these professionals understand their skills and may come back if offered better incentives and career opportunities, they are presently not utilizing their skills and performing new skills. This aspect is highlighted by various professional firms and construction companies as one of the major causes of core profession skill shortages in India.

Workforce exits and migration

This refers to number of people permanently leaving the workforce, including retirement as well as migration to other places outside India. Impact of this aspect on the built environment is not readily discernible from the Indian perspective since it is couched within the aspect of wastage. However, industry professionals have observed that loss of professionals, either to other professions or other countries, will have an impact on the quality of skill-sets within India since these professionals would ordinarily possess higher skill-sets to be considered for global opportunities. Consequently, this aspect would need consideration to ensure that quality human resource trained for the built environment be retained in India to the extent possible. Although migration plays a relatively minor role in augmenting the supply of skills in the skill shortage areas and easing skill shortages, there may be scope for addressing future skill shortages through well-targeted increases in facilitating in-migration of skilled professionals.

"Use of latest tools and techniques is necessary e.g. remote sensing, internet, imagery system, disaster mitigation and management"

10.1.2 Root Causes

While proximal causes present the immediately apparent reasons for skill sets shortages, there are underlying causes identified as below:

Domestic Demand

Skill shortages are observed when the national economy is at its peak and demand for related professionals is highest. In India, since the growth of Built Environment is anticipated to be quite high in the short to medium term, there is high demand for related professionals and construction workers. The past decade marked a period of focus on information technology and related engineering sectors, which led to a shift of focus of aspiring students to these sectors thereby neglecting construction and related sectors.

This resulted in shortfall of professionals in the Built Environment, when these sectors began to emerge as priority sectors in the recent past. Keeping in perspective that India is likely to become one of the four leading economies in the world in the not-so-distant future, it is essential that an adequate supply of quality professionals be maintained by enabling a higher degree of enrolments and better career opportunities in these sectors.

Change in Technology

Introduction of a new technology or change in technology has the potential for considerable impact on the skill levels of Built Environment professionals. New technologies mean that the professionals or construction workers may not have the new skills required to work with the new processes. It may induce unemployment as low skilled workers are replaced by workers skilled with new technology. Global competition and new technologies have reshaped skill demands of construction firms, helping to explain the emergence and persistence of skill shortages even where overall demand for skills is static or even declining. It is difficult for firms to up skill professionals or workers quickly enough to meet these new skill requirements. Consequently, it is essential that these sectors be proactively and aggressively monitored for emerging technologies and the need for training programs to upgrade existing skill levels of professionals and workers be identified on a periodic basis.

Constant improvement in technology has resulted in new techniques and tools being adopted for development and delivery of Built Environment. However, current professionals do not have adequate exposure to these emerging new technologies owing to lack of training programs. For instance,

- Lack of institutional knowledge such as new construction technologies that save time and money while delivering better quality products
- Use of latest tools and techniques e.g. remote sensing, internet imagery system, disaster mitigation and management has now become necessary
- No college in India offers courses specializing in areas like HVAC, fire fighting, plumbing and public health and no professional training courses are designed to cater to these needs

Global dynamics

Another major root cause is the highly globalizing environment. This has enabled flow of knowledge and services to a much higher degree. One of the disadvantages of this phenomenon for countries is that it allows for skilled labour to be attracted to various opportunities outside their geographical domain leading to out-migration of skills. Labour market and economy do not exist in isolation and the changes in the global economy may lead to skill shortages. Better job and career opportunities outside India have resulted in out-migration of various professionals, consequently leading to shortage of professionals and construction workers in the Built Environment in India.

"Current courses offered in traditional degree programmes are unable to deal with the challenges of a multidisciplinary problem set that infrastructure and development projects present"

In addition, considerable skill shortages have been observed within the existing supply of professionals (core, non-core, and specialized), which is likely to be exacerbated as the shortfall increases and global standards become benchmarks for development, some of which are presented below:

Table 10.1 **Key Areas of Skill Shortages**

Core professionals

Civil Engineers	Architects	Planners
• Construction Management • Quality Control • Construction Techniques • Building Control and Facilities Management • Tendering Process	• Specialization in sustainability and new technologies • Coordination and Site Management • High-rise developments and large-scale infrastructure • Disaster Management	• Sector Jurisdiction • Infrastructure Planning • Land Management • Specialization in sustainability principles • Real Estate Finance

Non-core and Specialized professionals

Finance Analysts	Lawyers	Valuers	Sustainable Development Expert
• Valuations • Portfolio and Asset Management • Development Approvals and Processes (Real Estate and Infrastructure) • Sector Risk Assessment • Demand Forecasts	• Transaction Structures • Land systems and processes • Finance • Sector Risk Assessment • Development Approvals and Processes(Real Estate and Infrastructure)	• IFRS Standards • Limited knowledge of methods and approaches for valuation • Transaction understanding • Demand forecasting techniques • Inadequate exposure to real estate laws	• Inter-linkages between energy, economics and environment • Advance energy conservation principles and renewable energy • Integration of different knowledge domains • Energy conservation technologies in Indian context

10.3 Impact Of Existing Skills Shortage

Industry has already begun to be adversely impacted by the shortage of professionals that possess the adequate skill-sets for undertaking various activities efficiently. In the context of higher economic growth in the coming years, these skill-set shortages are only likely to be exacerbated in future in case remedial measures towards increasing new supply and up-skilling existing workforce are not taken on a priority basis.

Impact of skill shortages on economy and the built environment is not well defined, but is likely to result in:

- recruitment difficulties, the situation where firms find it difficult to recruit and retain staff
- increased cost of human resource, adversely impacting the development costs and profitability of operations
- skill gaps, where existing staff do not have the skills required to complete tasks efficiently in a time bound manner
- sub-standard quality of construction as compared to the global products
- lower production and the delay of new projects

It is evident that remedial measures need to be positioned at the earliest to ensure that bottlenecks are not observed in the growth path anticipated for India. It is, however, essential to understand the causes of these skill-sets shortages prior to identifying remedial measures. The following section summarises the reasons for existing shortage of professionals and skill sets as identified during discussions with industry experts and based on Consultant's past experience.

10.4 Recommendations

Based on the primary surveys conducted as part of this research, some steps or initiatives that may be undertaken to address skill-set shortages, have been highlighted below.

A majority of responses have indicated the need for more training programs (17%) and development of additional specialized courses (17%) as most important steps for addressing the existing and future skill set shortages.

In addition, these respondents have also indicated a need for reorienting current educational courses to align them with evolving global standards, and enhancing these courses to include a higher level of exposure to practical aspects related to development of the built environment.

Another important aspect highlighted was the need to promote tie-ups with international institutions imparting quality education related to built environment at the global level. This initiative is expected to provide for opportunities to leap-frog the learning curve from the perspective of India as this will allow professionals to be exposed to current global standards.

Based on the skill gaps identified as part of this research and consultation with industry experts, a two pronged set of recommendations has been suggested. These recommendations are being laid down to facilitate a holistic approach towards addressing the current and future scenario of skill sets shortages.

- The first set of recommendations aims to highlight specific areas or roles that may be performed by various stakeholders in the built environment, to address the quantitative and qualitative shortage skill sets.
- The second set of recommendations builds on specific areas where acute or high degree of skill gaps have been observed and consequently outlines potential courses, along with recommended subjects, that may be introduced in appropriate formats as part of the future education and professional development framework.

Figure 10.2 Steps to Address Shortcomings of Quality of Human Resources

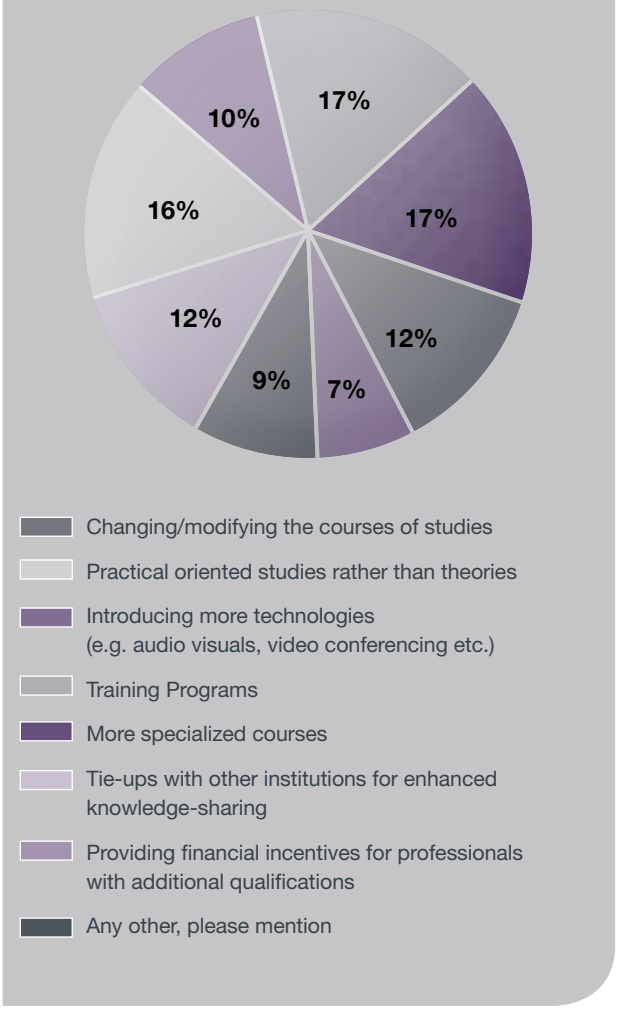


Figure 10.3 Key Stakeholders for Built environment Professionals

Policy Makers	Government	Ministry of HRD, Ministry of Housing and Urban Poverty Alleviation, Ministry of Urban Development, Ministry of Rural Development (Dept of Land), Ministry of Environment, Ministry of Water, Ministry of New and Renewable Energy, Ministry of Power (Bureau of Energy Efficiency), Ministry of Labor & Employment –The Directorate of Employment & Training (DGET) State Governments, Local Authorities.
	Regulatory bodies	**AICTE, UGC, SEBO, RBI, NHB,**
Education & Licencing	Academic Institutions	Architecture, Planning Institutions, Management Schools, Engineering colleges
	Professional bodies	Council of Architecture, Planning PB*, Valuation PB*, Engineering PB*, RICS – all disciplines

		Land Acquisition	Planning & Approvals	Finances	Construction	Sale
Employers	Developers	●				●
	Construction firms			●	●	
	Banks and funds		●	●		
	Consulting firms	●				●

*denotes professional body

10.4.1 Key action areas recommended across various stakeholders

As depicted in graphic below, at present, most of the stakeholders of built environment are largely operating in their respective domains with limited inter-linkages between domains. This has created different silos of knowledge base for different domains limited to respective stakeholder groups, with little understanding or knowledge of other domains.

There is an identified need for active participation by all stakeholders in different ways based on their inherent strengths, apart from understanding the overall structure of built environment. There has to be a cohesive approach which needs to be created in order to tie up the various initiatives and ensure that all the stakeholders get to benefit from the common knowledge pool and bring in best practices from the drawing boards to the implementation side much faster.

Key suggestions on potential roles that may be played by key stakeholders such as Government bodies, private sector firms, academic institutions, as well professional bodies are presented below:

Figure 10.4 Required Active Participation by all Stakeholders

10.4.1.1 Government and policymakers:

Enhance regulatory framework

Encourage skill development through dedicated institutions, better incentivisation and friendly policies

Government and policymakers are very uniquely positioned to address the aspect of skill-sets shortages in the built environment owing to the critical role played them at various levels. Some initiatives that may be considered are as follows:

Improvement in the regulatory framework and enabling policies – Current higher education system in India is regulated by a number of Government bodies, such as University Grants Commission (UGC) and All India Council for Technical Education (AICTE), which have been set up under the purview of the Ministry of Human Resource Development (MHRD).

1. Key recommendations have been made by various advisory committees in the recent past that have advised reforms in the education system to be fast-tracked. These include setting up of **centers' of excellence, and a higher degree of public-private-partnership (PPP) in higher education** to enable fast-tracking release of qualified human resource in the mainstream economy.
2. In addition, Planning Commission, through one of its sub-committees, has recommended setting up a framework for an **independent accreditation and regulation system**, which would allow for empanelment of multiple accreditation and regulation agencies. There is a proposal for setting up National Accreditation Authority for Education (NAAE) as an independent body that would develop standards for all aspects of educational practice, with National Board of Education Regulation (NBER) being an independent board monitoring and facilitating the adherence to these standards.
3. The proposed **'Foreign Institutions Entry and Operations Bill 2007**' when passed may allow and regulate entry of Foreign Educational Institutions (FEIs) to impart higher education in India. It is anticipated that this legislation may help in positioning much needed specialized education and training for the benefit of the Indian built environment sectors.
4. Government may also consider implementing **a training and certification program** that will encourage human resource to participate in these continuing education programs. This will allow them to continually upgrade their skill sets and be recognized in their respective professions for the levels of demonstrated proficiency that they achieve, which will be constantly under review and improvement.

Given the observed magnitude of skills shortage in the built environment, the Government can play the most critical role in addressing these issues by implementing the reforms suggested by various entities.

Strengthening skill development efforts – Given the diversity of institutions associated with the built environment, and the extremely high levels of development anticipated in the near future, a higher degree of coordination may be required within these institutions. The National Skills Development Council (NSDC) for instance would need to play a critical role to bring all stakeholders together and act as the nodal entity that orchestrates the delivery of qualified professionals in a relatively short time frame.

Allocate funds and incentivise skill development in critical areas – Capacity building of urban planners, engineers, architects, and other specialized professionals need to
be given priority including capacity building in green engineering in furtherance of national mission on sustainable habitat.

- To ensure this, the Government through various associated ministries need to revitalize their capacity building programmes by allocating sufficient funds and resources
- Subsidies and incentives should be given for introducing education and training in specialized fields which research has proven to be critical gap areas.
- To ensure development of the various professions related to land, property and construction, the Government must encourage various professional and qualifying bodies in the building industry and constitute training and development institutions where none exist.

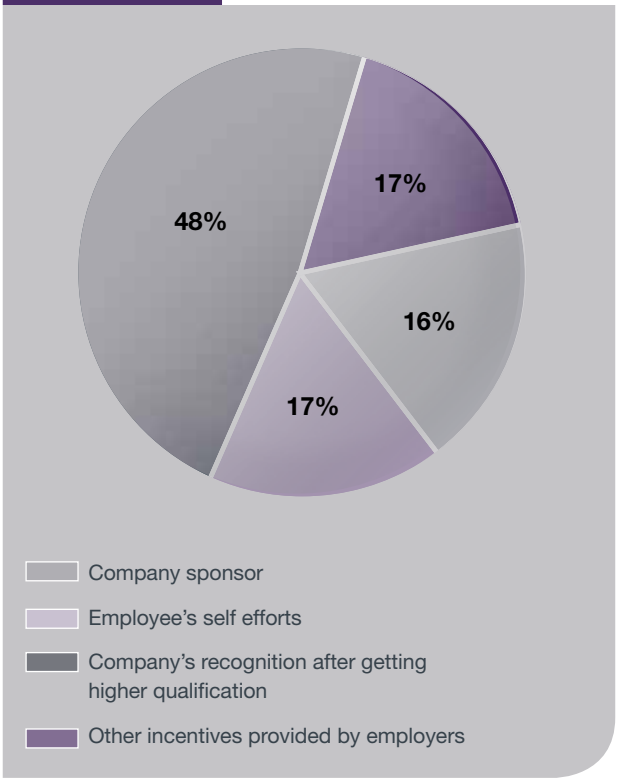
10.4.1.2 Private Sector:

Demand-led employer engagement in skills

Embedding a culture of learning integrating employment and skills

To enable a higher level of learning curve, a demand-driven strategy may be considered which will allow for embedding a culture of learning in the employment domain, thereby enabling integration of skills learnt on the job with emerging best practices and techniques.

Figure 10.5 **Training encouragement**



The figure above presents a summary of responses received from relevant stakeholders related to the efforts being made towards skill up-gradation. Only 17% of the companies surveyed indicated that they sponsor training programs for their employees, while 18% of the total companies surveyed indicated that efforts would need to be made by employees themselves. This is a stark indication of low level of initiatives being undertaken by companies related to upgrading skills related to built environment in India. An interesting point to note is that about 65% of the companies believed in providing incentives, financial or otherwise, after the employee has got additional qualifications and training. This is a clear indication of the market's intent to attract and retain talent.

International best practices have shown that private sector firms, as key employers of professional skills, invest in training their staff, foster a culture of constant learning and development, encourage and train young talent and also offer their contribution in other initiatives towards addressing skill gaps.

This strategy ensures that employees value the efforts taken by their employers for continuous professional development, which in turn, ensures higher retention rates by these firms.

Private sector may be broadly identified as the group of entities such as developers, construction firms, consultancy firms, banks, funds and investors that employ or engage professionals related to the built environment. These private sector firms therefore provide critical links between policy directions and grass-root reality.

Developers

Developers hold an important position in the current built environment fabric in India, as those responsible for delivering the enormous amount of real estate for the growing Indian urban population. Depending on the size and nature of the development firm, it may contract out the 'construction' of real estate or manage this vast function internally. Development firms remain key employers of diverse professionals' skills within the built environment.

Construction Firms

Being focused on delivery of quality products, construction firms are best placed to identify lacunae in technical education and provide inputs for mainstreaming technical education and addressing practical problems related to technology implementation in the Indian context.

Consultancy Organizations

As the third pillar in the private sector, consulting firms have the best-in-class expertise that advises developers and construction firms on a diverse range of built environment issues. These include, but are not limited to, real estate advisory firms, engineering consultancy firms, architectural and urban design firms, landscape architecture firms, planning firms, chartered accountants, financial advisors, and lawyers, among others. Since the nature of these industries requires them to be informed of cutting edge trends and technologies, as well as best practices in planning and implementation, these firms are well equipped to work with other stakeholders to disseminate knowledge to enable quality delivery and enhancing skills of built environment professionals..

Presented below are key recommendations that are applicable to the private sector:

1. Collaboration and knowledge sharing with academia and professional bodies to facilitate development of skill sets in line with demand

To upgrade education standards and bridge the gap between demand and supply of specific skill sets, private sector firms need to work more closely with the academia and professional bodies in various ways:

- Play an advisory role as members of various academic and education standards boards that may be set up to provide inputs in structuring and modifying existing course curriculum in line with practical requirements and emerging global best practices
- Mainstream their knowledge base by engaging actively with academia and professional bodies to develop specific training programs for professionals at varying stages in their careers.
- Share research with the academia to allow them and students to know what is being expected out of them as they enter their professional careers. This will also allow for identification of specific aspects while structuring additional educational courses or modifying existing ones.
- Share real life case studies, both good and bad, as well as best practices that will expose students to practical problems and issues prevalent in the market
- Higher involvement and commitment to practical training through internship and staff exchange programs, so as to enable stronger links with academia.

Such collaborative initiatives will strengthen the industry-academia inter-linkages, with consultancy firms sharing their knowledge and insights with the academia and students on a regular basis.

2. Encourage internships and development of interns

Private sector is also encouraged to attract fresh graduates to their firms and assist in shaping careers by moulding them to industry's requirements. It is also recommended that private sector encourages students to train within their organization and allow them to be exposed to various facets of development right in the formative years of their professional life. At the macro-level, this will ensure that all professionals have improved skills in early years of their professional life. In corollary, it would be advisable to allow for employees on the job to periodically take sabbaticals to concentrate on enhancing their skill sets, either through participation in training and certification programs or educational courses designed specifically for the built environment.

In addition, these firms may consider positioning a formal platform for summer training with educational institutions. Not only will this allow for percolation of practical technical aspects at the education stage of these budding professionals, this will also assist these firms in identifying talent early on that may contribute to their growth in future.

3. Invest in continuous professional training and development of staff

The need for continuing professional development (CPD) and the benefits of continued learning are recognised by most stakeholders. The built environment sector is a complex and challenging environment to work in, with continuous changes in procurement routes, construction methods and a more global working environment. As a consequence, keeping abreast of trends and issues a key requirement for companies and individuals to remain competitive.

Private sector needs to focus on improving skill sets of their teams by encouraging their participation in various training programs. Lifelong learning programmes for existing workforce may be encouraged and suited to particular needs as well as short term customized training programs may be devised to address forward-looking requirements. To impart such continuing professional education, the private sector must consider tie-ups with various educational and professional institutions. Alternatively, in-house training programs must be encouraged to ensure staff is abreast with latest technical know-how.

Given the long term benefits of skill development, adequate finances should be budgeted towards this aspect.

4. Encourage accreditation with professional or qualifying bodies

To ensure professionals maintain and enhance their skills, private firms may seek to ensure that their staff is accredited with respective professional bodies. Such professional association with like minded professionals will go a long way in institutionalizing best practices whilst providing them a sense of achievement in their professional careers. This will eventually assist firms in enabling and maintaining a work culture and environment that seeks to promote quality delivery.

5. Adoption of sophisticated and innovative tools and expertise

An important value-add that may be brought to training and skill-sets enhancement would be the knowledge of sophisticated and innovative tools and technologies that the private sector would be exposed to. This would allow for faster upgradation of India's technical infrastructure, including enhancing productivity of skilled human resource to use technically advanced equipment more efficiently. At the industry level, consultancy firms are uniquely positioned to understand, implement, and advise on adaptation of latest technologies in the Indian environment. They need to leverage this position to disseminate information at various platforms to different stakeholders.

10.4.1.3 Academic Institutions

As academic institutions build the foundation for qualified professionals with adequate skills, their role is pivotal in adopting a dynamic approach to continually improve professional skills. Some steps that may be taken by academia towards improving quality of human resources and skills for the built environment include:

1. Review and update existing course curriculum

Primarily, academia may seek to critically review the adequacy of existing curriculum to address shortages, if any. This would be most effectively done through extensive engagement with the private sector to understand areas which skill gaps are most severe along with identification of modern day concepts that need to be introduced in existing curriculum. Based on an extensive review of existing skill-set gaps, this research puts forward recommendations for such improvement in educational curriculum.

2. Introduce new courses that offer options for specialization

To support the massive need for construction of real estate and infrastructure in the country, there is a need for skilled professionals who are equipped to deliver such large projects, which in turn highlights the urgent need to introduce highly specialised education in various disciplines. Education in the core disciplines of engineering, architecture and planning need to be supplemented with specialised courses that provide professionals with a career path for specialisation, which would also help India develop special skill-sets that the country did not have before.

While these can be very wide ranging, to begin with, this research proposes that there is an urgent need to introduce education and training in the fields of valuation, quantity surveying, construction project management, facilities management, sustainable development including energy efficiency, real estate finance and investment, property and construction law, land surveying, urban and transport planning, among others.

Within most of these disciplines, courses are required across levels including management, supervisory or executive level. Moreover, these could be independent or add-on courses to existing curriculum, wherein students may also interact with industry professionals and thereby be holistically exposed to issues of relevance to their specific fields.

3. Promote careers in built environment

Besides reforms in course curriculum, an equal amount of focus needs to be given to promote the diverse fields and specialisation within real estate, construction and infrastructure so as to attract new talent in this sector. Such efforts to highlight career development opportunities are crucial in overcoming the image barrier that exists currently and position related professions as respectable and rewarding careers.

4. Introduce steps to improve quality of teaching faculty

The educational set up is facing issues with lack of adequately trained teaching staff, lack of industry exposure and lack of initiative taken by faculty members which stems from the fact that the faculty is not paid adequately in accordance with other the high standards of education expected of them. Therefore appropriate corrective action needs to be initiated by the regulators of academic institutions towards this end. Apart from monetary incentives, training and industry exposure for teaching staff and train the trainer programmes are also required.

Also, inviting teaching faculty in highly specialised areas from other developed countries need to be encouraged, such that the domestic faculty and students are exposed to global standards of education and specialised fields.

5. Driving a more global-centric education curriculum for built environment

From the perspective of educational curriculum, academia may review evolving and emerging global requirements, and drive changes in the existing course curriculum to orient these more towards practical applications and emerging technologies. Special courses may be positioned for introducing specializations aimed at addressing key skill set shortages on a priority basis, to enable a transition to evolving global requirements with a long-term vision.

10.4.1.4 Professional bodies

The main built environment professions include architecture and landscape architecture; civil, structural, transport, environmental and building services engineering; quantity, building and land surveying; as well as transport and town planning. There are other associated construction industry professionals such as building engineers and facilities managers, concerned mainly with the maintenance and management of buildings, and building construction and project managers.

These institutional structures ensure standards of professional competence, integrity and compliance with regulations. Most institutions also validate academic and vocational courses to ensure an acceptable standard of competence and professional conduct by those entering the professions. The institutions publish professional codes of conduct that explicitly or by implication, seek to balance public good with client interests.

In most countries each is represented by, or within, a professional institution. In India however, since the various built environment professions are still at a nascent stage, the framework of and role of professional bodies is limited. The professional bodies therefore need to take on a much stronger role to lead the development of their respective professions and actively seek the support of the Government for this cause.

Some of the roles professional bodies may perform include

- Define entry standards based on competence levels
- Award professional qualifications upon a detailed assessment of the professional competence
- Conduct regular training and workshops to exchange knowledge and career development
- Initiatives to ensure the profession stays at the forefront and adapts to changing needs
- Collaborative initiatives with industry and academia for skill development
- Periodically monitor and provide updates on skill sets requirements required on short, medium, and long term basis

All these would allow institutions and governments to work towards prioritizing courses towards requisite skills. A collaborative cross body platform may also be created with participation by industry stakeholders and led by the group of relevant professional bodies to map the way forward.

An important area of intervention is the potential improvements in the curriculum being currently adopted by the academia. Towards this end, a two-pronged approach may be adopted.

At the first level, new courses need to be designed keeping in mind the continually evolving nature of the industry. In this highly globalized environment, these additional courses would need to be inclusive of global education standards and domestic market conditions. Aspects related to innovative finance mechanisms, trade and fund flows, institutional structures, global and local taxation policies, and emerging development technologies and their applications, along with the impacts of global economy on the future path of the country with implications for various sectors are just some of the aspects that may need to be included in these new course disciplines.

Simultaneously, existing course curriculum under various disciplines needs to be expanded upon to include new knowledge streams that are currently absent but have found global recognition as key knowledge areas going forward. Based on a critical review of the findings indicated in previous sections, presented below are suggested courses, which may contain, but not be limited to, the indicated subjects.

The full potential of the Indian real estate and construction industry will only be realized once the crucial issues of skilled manpower shortages get addressed. The private sector will find a way to address this as a business opportunity as the demand for it rises from the affected stakeholders, whereas the government and academia need to play the enabling role to support the initiatives.

Table 10.2 **Core Professions**

Building Related Engineering	Architecture and Design	Planning
• **Quantity Surveying:** – Estimation of quantities – Understanding Schedule of Rates – Preparation of bill of quantities – Cost estimation – Tender Documentation – Contract Bid Management Process – Variations Control – Assessment of claims • **Construction management:** – Principles, processes, and systems for construction management – Program Evaluation and Review Technique (PERT) – Critical Path Method (CPM) – Latest techniques and software for construction management – Quality and Cost control – Health and Safety Management – Development audits • **Building Construction:** – Latest construction techniques and technologies – Pre-cast construction technology – Building automation and controls • **Facilities Management:** – Defining the role of facilities managers – Defining facilities management standards and processes – Prevalent and latest technologies being adopted in various facilities – Processes related to rent and lease administration – Public Relations	• **Design specialization in luxury living:** • **Liaison Consultancy:** – Understanding governance procedures, processes, systems, and players, – Relevant government departments according approvals, • **Building Construction:** • **Energy-efficient building design**: – Understanding green building design principles, – Technologies used in energy-efficient buildings; • **Design Integration:** – Principles and processes for services coordination; – Merging structural design with building design; – Role of lighting design in architecture; – Fundamentals of landscape design and its integration in overall layout planning,	• **Infrastructure Planning and Finance:** – Fundamentals of infrastructure engineering, – Integration of infrastructure layout planning with city/project plans • **Planning Techniques:** – Modern planning techniques and processes; – Latest infrastructure technologies and their implications on physical planning • **Technologies for land management:** – Principles of Remote Sensing; – Principles of GIS; Principles of Databases; – Mathematics and Programming; – Geo-data Modeling and Processing; – Principles of Spatial Data Quality; – Base Data Acquisition; – Image Processing; – Visualization and dissemination of Geospatial Data; – Web Technology for GIS and Mapping and Programming

Table 10.3 Non-core Professions

Financial Analysts	MBA Professionals	Lawyers
• **Asset Management:** – Urban growth dynamics – Local economic development – City-level economic profiling – Urban demand forecast techniques • **Global Accounting Standards:** – Introduction to IFRS – Transition Procedures	• **Urban Growth Dynamics:** – Linkages between economic growth and urbanization – Impact of infrastructure projects on urban growth and real estate • **Corporate Finance:** – Sources of finance – Cost of capital – Debt and equity structures in real estate – Relationship between Business Profitability and Real Estate • **Project Marketing:** – Understanding city growth – Understanding locational growth dynamics in context of project locations – Understanding project USPs – Marketing strategies and action plans	• **Real Estate Laws:** – Land Acquisition Act – Rent Control Act • **Finance:** – Fundamentals of finance – Understanding debt and equity – Joint Venture structures – Structures of investment vehicles • **Title Due Diligence:** – Types of ownership – Land title records systems – Government processes and systems related to transactions • **Development dynamics:** – Urban growth dynamics and real estate development – Development and construction processes and systems – Roles and responsibilities of various stakeholders

Table 10.4 Specialized Professions

Valuations	Sustainable Development	Land Acquisition and Surveying
– Methods and approaches; – Title and tenure (including tenure type) review; – Reviewing legal title due diligence reports and lease/rent renewals; – Understanding the methods of property title recording and spatial information systems, including land surveying techniques; – Laws related to real estate; – Role played by government agencies at varying levels; – Local and global accounting standards, principles, and procedures, including local taxation policies; – Planning processes, including development controls and regulations; – Business models for varying businesses, – Demand assessment and forecast techniques, – Development stages and processes (including construction processes); – Financial feasibility analyses; – Project transaction and finance structures; – Investment management, and vehicles; – Arbitration and legal representations, including conflict avoidance and management	• **Sustainable Development:** – **Energy - Environment - Economics inter-linkages** – **Energy:** Fundamentals, and principles of energy conservation; renewable energy – **Environment:** Ecosystems, interdependence of ecosystems; climate change; drivers and inhibitors of environmental damage – **Economics:** Macro-economic policy, econometrics, governance and regulatory mechanisms, sustainable development legislations, policies and initiatives; economics of climate change; infrastructure economics; urban policies; • **Technologies:** – Application of energy-efficient technologies in varying climates and locations – Energy Audits – Principles and processes for energy-efficient Ratings – Geoinformatics for natural resource management • **Carbon Credit Trading:** – Global framework for carbon credit trading – Government approach and policies – Carbon sequestration processes – Carbon finance – Transaction mechanism	• **Land Attributes:** – Types of ownership – Ascertaining land titles – Land records systems and processes • **Defining the context for land acquisition:** – Laws related to real estate and land acquisition – Principle of compulsory purchase – Understanding the concepts of benefits, cost, and opportunity cost – Understanding land value • **Liaison Consultancy:** - – Government processes, systems, and players • **Surveying Land:** – Land measurement instruments – Techniques and methods of land surveys – Technologies for land measurement • **Performance Ethics:** – Code of Ethics (may be specially developed for India) – Understanding relationships, roles, and responsibilities for buyers, sellers, transaction agents, corporates, government bodies, developers, professionals, and others

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