

Agenda 21 for Sustainable Construction in Developing Countries – The Indian Case

Kirtee Shah

KSA Design Planning Services and Ahmedabad Study Action Group(ASAG)
51/A Thakore Baug Flats
Navragpura
Ahmedabad 38009, India
Email: asag@ad1.vsnl.net.in

1. Introduction

This paper is one of the nine position papers commissioned, three each from Asia, Africa and Latin America, by the International Council for Research and Innovation (CIB) as part of the Action Plan for the Implementation of the CIB Agenda 21 on Sustainable Construction and to further its proactive approach on the subject. The purpose is to bring into reckoning special conditions, needs and perspectives of the developing countries to balance a perceived developed world bias in the sustainable development discourse.

This paper attempts to present the Indian case.

With over a billion people in half a million villages and nearly 3800 cities and towns, massive poverty, fast industrialization, rapid urbanization, growing economy, democratic polity, the special nature of the independence struggle under Gandhi's leadership (a champion of sustainable development and a committed practitioner of sustainable practices) and forty years of socialist orientation and planned economy followed by a decade of economic liberalization, structural adjustment and globalization, India's choice of development path, and its performance in it, has a bearing on the global sustainability concept. It is specially so as India has the strength of traditional wisdom, pressures posed by the size, diversity and complexity of its population, geography and society and a political philosophy and economic blueprint suggested by Gandhi for independent India. For India, having chosen the conventional and seemingly unsustainable development model, the question is: if a country like India, with its conditions, history, heritage and leadership does not take the alternative course, is the alternative development model utopian? And can utopia save the globe from the real danger posed by the current unsustainable development model?

The Indian construction industry, an integral part the economy and a conduit for a substantial part of its development investment, is not only poised for growth on account of industrialization, urbanization, economic development and people's rising expectations for improved quality of living, it is also bracing for modernization that calls for improved productivity and higher competitive edge. Its main challenges are fast growth in response to increasing demand for goods and services; technological upgrading for speed, quality, cost reduction, and substitution of manual labour; modern management practices for greater profitability and a 'modern', clean image; and technical skills, financial strength and organizational competence to meet domestic and international competition and capture a part of the international market. The construction industry, steeped in traditional technology and largely informal labour practices, is in a hurry to change both its image and content.

Sustainable construction, it must be admitted, is neither the vision nor the immediate goal of its modernization thrust. It is growth, efficiency, productivity, greater share in the market and profit. Improved performance on the environmental front (reduction of pollution or substitution of high energy consuming materials), or on human aspects (better tools and working conditions for the construction workforce), is mainly a welcome by-product, useful in public relation rhetoric, not more. Nothing could describe graphically the mental block on the human side of construction practice more than what one recently saw in a reconstruction project in wake of the January, 2001 earthquake in Gujarat. During the reconstruction of a village, with 350 houses constructed by a commercial contractor and funded



jointly by four international humanitarian aid agencies, there were no facilities for some hundred migrant, unskilled construction labourers, who would probably stay on the site for over a year, in a remote place, under a blazing sun. No shelter, no toilets, no water, no crèche. And the work is not even for profit, it is charity!

The challenge of sustainable construction, therefore, is more than changing tools, technology or energy consuming materials, it is changing the mindset, the attitude. Because the world view of the practitioner is that the environment or labour safety and welfare is a luxury of the more affluent, more advanced, and more profitable. For the undeveloped, survival and growth and not sustainability are the main issues. The prime concern is the price they pay, not others. And issues like ecological balance and saving the globe for future generations are for the intellectuals, philosophers and thinkers; not for a pragmatic material manufacturer or the worldly-wise contractor or estate developers.

Sustainable construction is a necessity for sustainable housing, sustainable settlements, sustainable cities and sustainable development. The environmental crisis is for real and can't be wished away. The construction industry, which contributes so much on the damage side, must be prepared and equipped not only to mend its ways but also to make a positive contribution. Productivity and profits are essential. But the concepts should be wide enough to include the environmental and the human side.

Sustainable construction is too vast and complex a matter to be addressed fully in its multiple backward forward linkages. This paper, therefore, makes no claims on depth of treatment or comprehensiveness of coverage. It is selective and the omissions are both unintended and deliberate.

2. Sustainable Development, Settlements and Construction

2.1. Sustainable Development

The concept, "Sustainable Development" is perhaps one of the most significant gifts of the 20th century to human kind in search of peace, harmony and well being. The World Commission on Environment and Development defined sustainable development as "Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs" and its successful pursuit on four interdependent principles related to meeting human needs, maintaining ecological integrity, attaining social sufficiency, and establishing social equity. This definition views development as much more than material progress; it links micro to macro, present with future, human to nature, and material to spiritual; values natural resources as social capital; points out limits to growth, the finite nature of the globe's resources, and it emphasizes its judicious and responsible use and equitable sharing; it puts ecological balance and environmental vulnerability in perspective and emphasizes the link with human activity. Sustainable development puts economic growth in the framework of lasting human happiness.

The sustainable development concept is not new to India. The ancient religions, be that Hinduism, Buddhism or Jainism, have taught respect for the nature, restraint on want and material goods, sharing with others, caring for the future, respect for all life forms and economic pursuits in harmony with the environment. Principles of sustainable development are interwoven in the people's culture, tradition, behaviour, and living patterns. Vegetarianism preached by Jainism is based on respect for all life forms. Reverence for rivers (the river Ganges is mother to Hindus) and cows reflect an understanding of interdependence of the eco-system. And elevation of trees as local community deities and their 'puja' points provides not only to respect for the environment, but also a method for its preservation.

The most articulate advocate of sustainable development in the modern context in India was undoubtedly Mahatma Gandhi, not only a political leader in India's struggle for independence but also its spiritual leader. Gandhi not only had a vision for independent India's development, he also had a philosophy, strategy and tools for it. His vision of development was sustainable development.

Gandhi knew poverty at first hand. He recognized that 80 per cent of India's population was rural and that they faced problems of health, sanitation and livelihood. He pleaded that development priorities should be focused on them and



their villages. He asked Nehru, India's first Prime Minister, "why must India become industrial in the Western sense? Western civilization is largely urban. Small countries like England and Italy may be able to urbanize their societies. A big country like America cannot do otherwise. But one would think that a big country like India, with a teeming population and an ancient rural tradition that has hitherto answered its purpose need not—must not—copy the Western model. What is good for one nation is not necessarily good for another differently situated. One man's food is another man's poison."

If that is how Gandhi saw "development" in the Indian context eighty years ago, critics of the modern development see more poison in how it is happening and what it does now globally. The Kauntaun Declaration, "Our cities, Our Homes: A Citizens' Agenda" adopted by a cross section of activists in the Asia Pacific Region says, "This disturbing reality is in large part a legacy of the ideologies and institutions of the twentieth century, and in particular of the dominant neoliberal economic development model of unfettered economic growth, unregulated markets, privatization of public assets and functions, and global economic integration that has become the guiding philosophy of our most powerful institutions. This model spawns projects that displace the poor to benefit those already better off, diverts resources to export production that might otherwise be used by the less advantaged to produce for their own needs, destroys livelihoods in the name of creating jobs, and legitimates policies that deprive persons in need of essential public services. The model advances institutional changes that shift the power to govern from people and governments to unaccountable global corporations and financial institutions devoted to a single goal: maximizing their own short-term financial gains. Its values honour a compassionless Darwinian struggle in which the strong consume the weak to capture wealth beyond reasonable need. It creates a system in which a few make decisions on behalf of the whole that return to themselves great rewards while passing the costs to others. For them the system works and they see no need for change. The many who bear the burden have no meaningful voice".

E.P. Schumacher was one of the first economists to question the nature of economic growth taking place in the West. He asked, "How can one argue that the American economy is efficient if it uses 40 per cent of the world's primary resources to support 6 per cent of the world's population without any observable improvement in the level of human happiness, well-being and peace?" Schumacher lobbied for a more holistic, people-centred view in economics. He felt that in trying to be scientific and quantitative, economists had ignored people's needs and motivations, cultural influences and spirituality.

Dr. Kamla Chowdhary in her essay "Economic growth, ethical and ecological concerns" has called for a new development paradigm. This would recognize that economic growth by itself is not development, nor are higher standards of living as measured by material goods. Catching up with the West, and therefore the Westernization of the world, is also not development. The new paradigm must be based on a more moderate demand on the earth's resources and their more equitable distribution. Moving to a simpler lifestyle; evolving development strategies and processes that express local conditions, aspirations and control over resources; considering religious and spiritual issues when formulating the new paradigm; and changing existing institutional structures are some of her key observations.

Ever since independent India embarked on the Prime Minister Nehru's path of economic development and social progress through centralized planning (borrowed from socialist Russia in the early '50s) and capital intensive industrialization in preference to Gandhi's model of economic growth through labour intensive sustainable agriculture practices and village republics, debate on sustainable development has been a feature of public policy and academic dialogue. Following the liberalization, structural adjustment and global integration of the Indian economy in 1991, the debate is even sharper, with the privatized and globalized economy, environment and society providing arguments for and against the current model of development. While the debate continues on the options, in the corridors of power, whether the ruling government is right leaning BJP or socialist Congress or Marxist CPM, there is not much argument on the direction. Fast and comprehensive economic reforms, greater privatization and globalization are the panacea for further and higher growth and speedy and effective poverty alleviation. Sustainable or not, turning back on the development model is considered neither practical nor wise.



A case in point - Narmada Bachao Andolan

The most prolonged and visible - at times emotional - debate on sustainable development in post independent India, which highlighted issues related to ecological balance, environmental degradation, social equity, people's rights, and resettlement/rehabilitation policy, is triggered by the Narmada Bachao Andolan, a protest movement lead by a group of determined, articulate and informed social activists, who are opposing construction of a large dam on the river Narmada. The multi objective project - hydro power, irrigation, drinking water -- involving four large Indian provinces- Gujarat, Maharashtra, Madhya Pradesh and Rajasthan - and a huge investment, is almost 45 years in planning and construction. The delay is primarily attributed to opposition by the NBA. The social activists and the affected communities are pitted against the contractor lobby, the state power and popular support in at least one state (Gujarat). Though the apparent issue is construction of the dam -- also its height- the focus of the debate is not sustainable construction, it is sustainable development. Whatever the outcome - whether the height is lowered, the dam is completed or not-- there is no escaping the fact that this one construction project has done more to heighten awareness on issues of sustainable development than any other in the past 50 years in India. Following this controversy no big development project will escape scrutiny in form of environmental impact, social cost, economic feasibility, implications on the settlements and livelihood of the poor and viability and acceptability of resettlement and rehabilitation plans and packages. Though no one has as much as each mentioned sustainable construction in this long debate, the suggested alternatives – hundreds of small, dispersed, low-cost dams, planned, constructed and operated by local communities - is a significant step in sustainable construction for sustainable development.

2.2. Sustainable Settlements

Cities, we are told, are engines of economic growth. We have now learnt that they not only produce growth, they are also produced by growth. The quality of growth (not only quantity), the means by which we achieve growth (whether in ecological harmony or in a polluting manner), the nature of growth (whether exploitative or just, whether creative or destructive), the texture of growth (whether equitable or imbalanced) and substance of growth (whether leading to contentment, durable happiness and peace or greed, strife and violence) determine, to a great degree, the nature and quality of our cities.

Historically cities are the products of many forces and influences. Whereas the industrialization that triggered urbanization in Western Europe and North America in the 19th and early 20th century is still casting influence on urbanization processes in the developing world, there is little doubt now that the most dominant influence shaping current urbanization trends and modern city development are the forces of economic globalization and the development model accompanying it. Integration of the global economy, characterized by an increase in trade in goods and services, increased investment by transnational corporations, and an explosion in financial and exchange rate transactions, while expanding choices by creating more goods and services for consumption, is affecting fundamentally, and often negatively, the conditions of production and employment. Liberalization of national economies and their global integration, privatization, structural adjustment, corporatisation of business, and free rein to market forces, while spurring economic growth, promoting technological transformation and ensuring high level of prosperity and affluence to a select few, are also observed to deepen poverty, widen inequality, causing exclusion and marginalization, promoting wasteful consumerism, undermining national sovereignty, weakening state authority, destroying the environment, depleting natural resources, tilting investment balance in favour of cities and within them to big cities, causing cultural alienation and seriously damaging people's capacity to find solutions rooted in their culture, social norms, value system and traditional wisdom. How the developing world copes with these forces and factors will largely determine how humane, livable and just its cities will be.

While quoting statistics to establish that half of the world is now urban, the tendency is to ignore that, by the same token, half of the world is still rural. In fact, more rural than urban in Asia and Africa where development challenges are the most difficult ones (70% of India, for instance, is still rural; a staggering 700 million people!). In view of the growing urbanization trends, increasing contribution of cities to the national economic growth, and complex problems



of environmental management, resource mobilization, infrastructure provision and governance the cities face, focus on cities is timely and unavoidable. However, it needs to be recognized that poverty, lack of basic services, unemployment, under-employment, deficient infrastructure, paucity of investment resources, declining contribution of agriculture in the GDP and consequent marginalisation of populations economically reliant on agriculture, inadequate housing, recurrent natural disasters, social and economic inequality and persisting structures of exploitation continue to afflict rural areas. They together constitute a formidable "push factor" for rural to urban migration. Stable and economically viable rural settlements will ensure manageable urban growth. Viable and sustainable rural development strategies, therefore, should constitute an integral part of fashioning a new urban future. Villages cannot remain as suppliers of food and raw materials and dumping grounds for rotting urban waste. They have a role to play and should be allowed and facilitated to do so.

The debate on sustainable settlements and cities, limited in nature and confined to special groups, is relatively recent and partly triggered by the Habitat II Conference in Istanbul and, to an extent, by its preparatory process. With over 700 million people in half a million dispersed and small villages, a high population growth rate, depressed rural economy, high incidence of poverty, unemployment, inadequate services, brain drain, migration, illiteracy, and lack of development in general, the question is: Can villages survive? Are they viable in the globalising world? Can quality of rural life be improved to a satisfactory level? The main sustainability issue in the rural context is the inadequacy of "development".

In the urban context, it is the nature of development. With 300 million people in over 3750 urban centres already, poverty induced rural to urban migration, a rate of urban growth that would place almost half the country's population in cities and towns by 2025; a looming urban crisis due to population explosion, growing consumerism, environmental degradation, strained services, urban poverty and weak governance, the questions is: are cities sustainable? Fast growth and rapid deterioration in the cities, some of them facing grave environmental crisis, are raising issues on sustainability of urbanization, the present form of urban growth and city development, and posing questions on causes, remedies and future.

2.3 Sustainable construction:

A broader, comprehensive and inclusive definition of sustainable construction must embrace much more than just the process of constructing buildings and structures like houses, bridges, roads, ports, silos and factories in a "sustainable manner". Both the process and the product must be seen in its backward forward linkages. Construction involves large investment. Its impact on economy, productivity, employment, financial and property markets, therefore, is important. Construction occupies land and uses minerals, water, technology, chemical processes and energy in production of building materials and use. Therefore its impact on the environment must be considered. A large labour force- both skilled and unskilled- is employed in construction work and users of the end product of the construction process are human societies. Therefore the social aspects of construction are important. The institutional framework governing construction process and product has a substantial bearing on the quality, output, and cost and, therefore, the institutional factors are important too. Construction being a process and made of many parts, sustainable construction should include sustainable design; sustainable planning; sustainable financing and investment; sustainable materials; sustainable tools, technology and methods; sustainable ownership and use; sustainable professional and labour practices; sustainable institutions and, of course, sustainable product—with 'sustainable' to include that which protects nature and environment; reduces pollution; conserve resources and shares it equitably; saves energy; treats people fairly and in a just manner; respects knowledge and tradition; and vulnerable.

Whose concern, if not priority, is sustainable construction in India? Who are the stakeholders and who among them are raising issues and working on alternative strategies for sustainable construction? Are the governments and public sector agencies, the biggest promoters and financers of construction work aware, confronting issues or resistance, developing concepts, formulating policies, offering incentives, creating support institutions? Are private construction firms, big or small, concerned, aware, active? Are professionals – architects, planners, engineers, and supervisors interested? Do the material manufacturers, big and small, have a holistic perspective on sustainability? Are



construction workers- skilled and unskilled-aware? What are research and academic institutions, social activists, environment and housing NGOs doing on sustainable construction?

To say that there is no awareness or action is simplistic. The stakeholders are engaged in many ways. Material manufacturers are looking for energy saving and cost effective technologies. Environmentalists are highlighting environmental pollution and related issues. The national research establishments have research programmes and budgets. Serious professionals are trying out alternative designs, materials and construction techniques. The governments are framing policies (to restrict use of wood in construction, for instance), providing incentives to use industrial and other waste in material production and encouraging alternatives for non-renewable materials. NGO's are experimenting and demonstrating pilot projects. Things are happening. However, short term cost reduction rather than long-term sustainability is the prime concern. Considering the large volume of investment in public and private construction; polluting and energy intensive methods of building materials production and use; low levels of technology development; unorganized and untrained nature of work force and potential for environmental damage by unsustainable technologies, materials and practices, interest and awareness on sustainable construction are limited, efforts are marginal and symbolic and impact is negligible. Issues related to construction sector are many and complex. However, sustainable construction, as things stand today, is not seen as a priority concern or issue.

A vast diversity in the volume and nature of construction work, institutional arrangement, size of investment, and nature of construction practices suggest that the trends, issues and response in sustainable construction be examined separately for rural and urban sectors. Though part of the same whole and linked in multiple ways, the parameters guiding construction industry, work, and practices in the urban and the rural sectors are so different that only a separate examination can ensure proper treatment. Agricultural versus industrial, dispersed versus centralised, small versus big, manual versus mechanized, informal versus formal, old versus new technology, low-cost versus high-cost, utilitarian versus trendy, uniform versus diverse, low versus high and community versus contractor are some of the characteristics of rural urban differences in construction practice. The most significant difference, in the sustainability context, is that while rural construction still retains a number of sustainable practices, the urban construction sector seems to be moving fast on the unsustainable tracks. While sustainable rural construction requires protection, preservation and upgrading (for quality and performance) of the existing system, in the urban sector, the task is more difficult as it entails reversal of trends and transformation of the systems.

With the popular perception and image of the construction industry as unorganized and largely informal at the lower end, construction work as low status; construction practitioners (contractors) as unscrupulous and unethical; real estate developers as irresponsible and unaccountable; construction business as risky sustainable construction as defined here, is a far cry, an utopia. Before setting eyes on too high a goal of sustainable construction, the concerned people would prefer greater emphasis on safe and quality construction cost reduction ethical practices better tools technology and work conditions for the workers, and greater accountability to the clients, financiers and users.

This paper attempts both as they are interlinked. Sustainable construction presupposes quality product, transparent process, and client accountability.

3. India: A General Economic Profile

India, a country of striking contrasts and ethnic, linguistic, social and cultural diversity is a federation of 27 states (provinces) with their own administration and legislatures and 7 Union Territories governed by the union government. Thirteen states have a population in excess of 20 million people, six have more than 60 million, three have 80 million and one has a population of 140 million. These states have vastly different natural resources, geographic conditions, ethnic composition, religious orientation and economic and social performance. India has 16 officially recognized languages.



The World's second largest country with population of over 1000 million, India is the fifth largest economy in the world and enjoys the second largest GDP among the emerging economies. In 95-96, India's GDP was Rs. 9856 billion (US\$295 billion) at current prices the per capita income is US \$ 350.

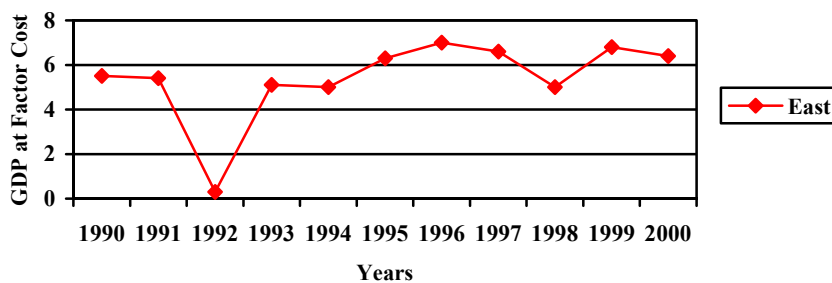
With GNP per capita of US\$ 350, India ranks 27th in the list of low-income countries (WDR 1997). Of the 175 countries for which the UNDP's Human Development Index is compiled, India ranks 138th based on life expectancy at birth of 61.3 years, an adult literacy rate of 51.2% and an educational enrolment ratio of 56% (HDR, 1997). Of the children below 5, some 63% suffer malnutrition (WDR 1997). This is partly due to the low status of women, which is also expressed in a sex ratio as low as 927 women against 1000 men (Census 1991) and a literacy rate of 36% for women and 64% for men (HDR 1997). Thirty five per cent of households living below the poverty line are female headed and poor women suffer higher levels of mortality and malnutrition.

Despite a strong industrial base, over 3700 urban settlements, and a large pool of trained manpower, India, with over 700 million people in half a million villages, is predominantly rural and with agriculture accounting for about 35% of GDP and 70% of employment, India is predominantly an agriculture economy. However, the structure of the economy is changing with manufacturing and service sectors accounting for nearly 60% of the national product now.

India has the largest number of poor people- below the poverty-line population—in the world. According to the World Development Report (1997) the percentage of people living on less than US \$ 1 (one) a day was 52.5%, meaning thereby that about 470 million people survived on a very low income. In its report to the World Summit for Social Development in Copenhagen in 1995 the Government of India presented that 39.9% of the Indians lived below poverty line. The United Front Government used 36% as baseline for its anti-poverty strategy for the Ninth-Five-Year Plan (1997-2002)

In the post independence era, the development strategy followed by the state led to an over-extended public sector responsible for half of the country's gross investment. This created severe financial imbalances. Protectionism isolated the country from the rest of the world with the result that India's share of world trade declined from 2% in the 1950s to less than half of one percent in the late 1980s. The strategy also discouraged production for export, created recurrent shortages of foreign exchange, and made balance of payments extremely vulnerable to external circumstances. By stifling economic growth the pace at which poverty could have been reduced also lagged.

India's Growth Performance



* Source: India Country Report 2000-2001 by Construction Industry Development Council, presented at the 6th Asia Construct Conference, Malaysia, September 2000

By the early 1990s, India was in the midst of severe fiscal and external imbalances, which generated double-digit inflation and put the country on the verge of defaulting on its external debt obligations. In June 1991, the country changed its course, by stabilizing and liberalizing the economy, effectively ending four decades of central planning. The new government's reform agenda focused on the five key areas of investment, trade, financial sector, taxation,

and public enterprises. Within a decade, economic liberalization, structural adjustment and global integration has not only changed the economy, it is rapidly changing, for good or bad, the Indian society as well.

India's economic recovery has been remarkable. Initially, growth declined sharply in response to the devaluation and contractionary fiscal and monetary policies adopted in June 1991 to address the foreign exchange crisis India was facing then. Helped by reforms, relaxation in fiscal policies, and an unprecedented sequence of good monsoons, growth accelerated to 5% in 1992-94, 6% in 1994-95, and 7% in 1995-96. Driven by exports and investments and accompanied by an increase in domestic savings, economic recovery has reduced pressure on inflation and external accounts.

Economic growth has been accompanied by an increase in productivity. One of the main objectives of India's reform program was to make the industrial sector more efficient and increase its export orientation by dismantling bureaucratic controls over investment and production decisions, giving greater role to entrepreneurial decision-making and increasing competition. Consequently, industrial recovery has been especially strong, particularly for capital goods. The stabilization and economy-wide reforms also provided a favourable environment to agricultural growth which is responsible for about 35 percent of India's GDP and 70 percent of its employment.

At US\$2 billion in 1995-96, foreign direct investment is 15 times higher than it was before the economy was liberalized, doubling every year since 1991. Portfolio investment has stabilized at around US \$2-3 billion, about 10 percent of world portfolio investment in the emerging markets.

Table 1 - Main Macroeconomic Indicators: GDP and Components

	1996	1997	1998	1999	2000
GDP at real prices (INR in Trillions)	9.38	9.99	10.49	11.2	11.92
GDP at current market prices (INR in Trillions)	12.06	12.86	14.27	15.24	16.47
GDP growth (%) (Real Prices)	7.0	6.0	5.0	6.8	6.4
Primary sector (INR in Trillions) (mining, agriculture etc.)	8.11	8.43	9.41	10.09	10.8
(%) Growth	+ 4.1	+ 3.95	+ 11.62	+ 7.2	+ 7.0
Manufacture Sector (INR in Trillions)	0.75	0.84	0.90	0.94	1.02
(%) Growth	+ 12.0	+ 11.0	+ 8.5	+ 4.4	+ 8.5
Service Sector (INR in Trillions)	1.50	1.69	1.86	1.94	2.16
(%) Growth	+ 15.0	+ 13.0	+ 10.0	+ 4.3	+ 11.3
Construction Sector (INR in Trillions)	1.70	1.90	2.1	2.27	2.48
(%) Growth	+ 6.25	+ 12.0	+ 12.0	+ 8.1	+ 9.1
Demographic Indicators					
Population (Millions)	963	980	998	1016	1033
Population growth rate (%)	1.81	1.79	1.82	1.8	1.75
Total labour force	28	30	31	31	31.5
Labour force growth rate (%)	7	7	3	0	0
Financial Indicators					
Short term interest rate (%)	18-20	18-20	18-20	17-18.5	17-18.5
Long term interest rate (%)	10-13	10-13	10-13	10-12.5	10-12.5
Changes in consumer price index (%)	8.40	7.2	6.10	4.20	5.8

The base year (1993-94)

Source : CSO (Central Statistical Organization)

4. Profile of the construction sector in India

Construction is a vehicle for the growth of civilization. It builds structures that sustain a nation's economy. In India's national plans construction constitutes 40% to 50% of the capital expenditure on projects in various sectors such as energy, transport, irrigation, communications, defence, the social sector, rural and urban infrastructure, etc. It contributes about 5% to the GNP and is employment intensive.

4.1 Socio-economic impact

Housing and construction render a significant contribution to the economy in form of enhancement of GDP, income and employment generation. Construction activity accounts for about 50% of the development outlay in India. A study by the Indian Institute of Management in Ahmedabad to evaluate the impact of investment in housing on GDP and employment, ascertained that a unit increase in the final expenditure in construction generates national income five times as high and induces overall employment generation of nearly eight times the direct employment in construction. Over 32 million workers (unskilled, semi-skilled and skilled) are directly involved in construction work. Additionally, there is secondary employment in ancillary industries, building materials supply, real estate development, fittings, furnishing, consumer goods, etc.

India's construction industry today faces enormous challenges posed by the massive size of the country's plans, the need for project exports to countries who demand quality performance, and a growing domestic consciousness of the need for quality, speed and efficiency. The new liberalization and globalization policies is opening up construction activity to the private sector and thereby a new era of international competition within the country. With an average annual growth rate of around 6% and focus on infrastructure development in support of industrial growth, the construction market shows fresh vibrancy. The growth of the domestic construction industry has been over 10 % and expected to show an upward trend.

The overseas business is almost three decades old for the Indian construction industry. With a vast, technically trained and experienced manpower and managerial skills acquired through execution of domestic projects, the industry made a mark, especially in the Mid-Eastern/Far Eastern parts of the world.

The Seventies saw a boom in overseas construction and related activities involving deputation of technically qualified manpower, trading of construction materials produced in India, export of engineering services, and attractive employment opportunities for skilled construction workers (masons, carpenters, plumbers). With the slowing down of the oil boom, the volume of business in the Middle East dropped substantially. However, the opportunity loss has been made up, to an extent, by an increased tempo in domestic work.

With the opening up of the Indian economy and due to major project funding by international development agencies, the institutional, legal and information barriers to the entry of foreign contractors has been removed. Presently there are over 75 construction companies of foreign origin operating in India. Such companies are mostly joint venture companies or wholly owned subsidiaries of their foreign principals. Almost all the companies are engaged in core construction related to highway, power, petrochemicals, fertilizers and other EPC contracts.

The strength of the industry rests on a substantial pool of qualified and experienced technical manpower and managerial cadre, an abundant and inexpensive labour force, and well established engineering practices. The weakness of the industry is its limited access to the latest technologies, insufficient mechanization, an inadequate system of construction financing and lack of suitable infrastructure, and inadequate training facilities for the construction work force. At the lower segment, construction and material production activity remain unorganized and informal with the attendant disadvantages—absence of institutionalization, scarcity of capital, old tools and technology, untrained work force, unsafe and unhygienic working conditions, unstable employment and exploitative wages, and gender bias.

Despite opening up the economy, the public sector continues to be the largest employer in construction. Public housing, core industrial development, transportation, energy, power and other areas continue to be run and operated by the state, state owned companies, or the authorities established by the state. Private sector construction and engineering companies are therefore dependent on the state for their business. The scene, however, is changing as several sectors have been opened to the private sector participation. The mineral industries, traditionally under mixed control, haven't changed much. Greater participation of the private sector is meant to attract capital, entrepreneurship and managerial resources

With the economic liberalization, the private construction sector is given an important role in nation building. Requirement of funds, latest technology and greater efficiency have assumed importance. The construction of roads and highways, docks and harbours, power plants and petrochemical plants are now open to the private sector. Several projects on Build, Own and Operate (BOO) or Build, Operate and Transfer (BOT) basis are under execution by the private sector, apart from projects based on full ownership. A majority of such projects are joint venture business where partners of multi country origin are involved. Housing and real estate development, however, is an area in which foreign participation is not permitted, though the Indian private construction sector is actively involved.

In addition to the general growth of the construction market, the repair and maintenance sector is also experiencing steady growth. Work, however, is executed by the respective owners and often neglected. The need for professionalisation of the sector and professional agencies is growing. Training of professionals in this specialized stream is an area where the Indian construction industry seeks to cooperate with foreign companies. With the present facilities, it is estimated that the total volume of work required to be executed is of the order of US \$ 300 million per year. Much of it requires specialized working. With the increasing costs of establishing new facilities, owners are paying attention to the matter and the sector is poised to grow fast.

India has a large number of technically qualified engineering professionals and one of the largest pools of engineering companies specializing in various streams of construction. The majority of these companies are in the private sector, although some of the large ones are wholly or partially state owned. The quality of engineering services provided by these companies is rated high locally and internationally, though supplementary inputs are needed to make them of international quality. During the past few years a number of foreign engineering companies have started Indian operations, especially on EPC (Engineering, Procurement and Construction) projects. The strength of the engineering companies is competitive costs, which are substantially lower than their overseas counterparts.

With a view to effect the much needed improvement in efficiency, quality, speed and economy in construction, a Working Group of the Planning Commission recommended to set up an apex national body to take a balanced view on construction related matters and evolve appropriate strategies. The Construction Industry Development Council (CIDC) is the response. It has been established to bring about systematic improvements, which would minimize time and cost overruns and achieve quality construction in projects. The CIDC functions as a nodal agency for the growth, development, modernization and professionalisation of the construction industry as a whole. CIDC is designed to cover all stakeholders including architects, engineers, contractors, consultancy organizations, manufacturers of construction plant/ equipments/ materials and others involved in planning and execution of construction projects. It is also assigned to evolve norms for the regulation/ self-regulation of professional agencies. The Construction Workers Training Institute at Hyderabad established by CIDC and the National Academy of Construction are pursuing the mandate to extend skill training to the labourers and professionals.

India has emerged as a new center for construction activities and is attracting many international contractors and engineering companies. A fast growing economy, rapidly expanding middle class (300 million) representing a vast consumer market, rapid urbanization and developing industry, housing and infrastructure are opening vast possibilities for sustained construction business. Existing resources of about 70 large construction companies, 28 000 small and medium size contracting companies and around 75 joint venture companies, employing about 32 million persons, are inadequate and need strengthening. Mechanization of works and modern techniques of



construction are required. The concerned construction companies are mobilizing resources and poised for change in response.

Conventionally the construction workers are divided in two categories: the university qualified managerial and supervisory man-power, and workmen having on-the-site work experience with little or no formal education. For the training of the workman the system in vogue is that of an informal Worker's Guild, where the master craftsman trains the raw worker under him, on an on-the-job-training basis, and with passage of time the individual acquires the necessary skill. This way of training skilled construction workers (especially masons and carpenters) is mainly hereditary, the father training his son. The system has a strong caste basis too. However, with the education system putting premium on white collar jobs (a carpenter's son on school graduation may not know what he would do for a living, but he usually knows what he would not do: that he would not be a carpenter) and the guild system breaking down, the family tradition of training skilled construction workers is almost defunct. Moreover, in the present day context the system is not very relevant, as an average worker is required to be trained in specific disciplines not only at work-sites, but also with formal class room education.

To fill the gap many Industrial Training Institutes (ITIs) have been established by the government and the industry during the past 20 years. The result is less than encouraging in the sense that these ITI products are satisfactory neither in number nor in quality. Declining workmanship standard is a serious concern. The Trade Training Programme, conducted through distant education stream, imparts training through audio-visual and written material while on the job. However, the reach and coverage is limited and the quality of the product not very satisfactory.

Construction financing is an area calling for attention. Inadequate institutional arrangements reflect on efficiency, economy and overall performance of the sector. Large-scale infusion of black money at high interest rates, feared entry of mafia funds in land and construction and its impact on the overall image of the industry are causing concern. With a large portion (between 70% to 80% of the total) of construction work being executed by small contractors who lack a strong financial base and therefore remain weak technologically and professionally, it is difficult to upgrade the image and overall performance of the industry.

The real estate business, popularly defined as developing and selling residential and commercial properties (land, and housing in the form of bungalows, apartments, flats, row-houses, shops, offices, etc.) by the builder/ promoter/ contractor is going through one of its worst crises in the past 30 years. A crisis of confidence between the supplier and the consumer (resting on unprofessional and unethical practices; low quality, illegal, unauthorized and unsafe construction; black money transactions; time and cost over-run; high cost; exploitative profit margin; lack of professionalism, etc.) characterizes the sector. In the past five years both the land and property prices have dropped substantially (between 30% to 50%), the volume of business is stagnant, unsold properties and incomplete projects are causing stress and panic, investor confidence is low, and money flow in the business has dried up. Though the climate is improving gradually and signs of recovery are visible, the mood in the market is one of crisis and stress.

The National Real Estate Development Council (NAREDCO) has been set up to improve the confidence level of investors and consumers in the real estate sector through self-regulatory practices. NAREDCO has initiated measures to improve transparency in the real estate transactions. A Code of Ethics has been evolved. An important initiative in enhancing the comfort level of consumers is the development of a rating system in association with CRISIL to facilitate prudent investment decisions in the real estate ventures.

Recognizing the role of Building Centres as a potential grass-root level technology transfer mechanism, the Ministry of Urban Development and Poverty Alleviation, launched a programme for the establishment of a National Network of Building Centres in 1988. The programme is implemented with organizational and logistic support by HUDCO and envisages opening at least one building center in every district of the country. The current number of Building Centres in the country is 575. Now HUDCO and the Ministry of Rural Development have teamed up to set up additional Building Centres in the district towns for rural areas.



The Building Centres are playing a role in skills upgrading and training of artisans (masons, carpenters, bar-benders, plumbers, electricians); production and marketing of various cost effective components using local resources and sales outlets; employment generation through construction work using relevant technologies in housing and building programmes; and housing guidance, information and counseling for the local population on cost effective technologies.

Orientating the Building Centres towards sustainable construction has the potential to spread the message far and wide to a diverse group consisting of workers, manufacturers and clients. Their role could be demonstration, education and propagation of the idea. Their multifarious activities – training, demonstration, material production and construction-- will provide the opportunity to function as a catalyst for sustainable construction practice.

The increasing volume of construction work is providing growth impetus to the building materials production activity. Besides increased production capacity in the core building materials- steel, cement, timber-- a variety of new materials are entering the market. The projected demand for the period 2001-2006 of cement, steel, timber and bricks for the overall construction sector is 656 million tonnes (415 million tonnes for the period 1996-2001), 100 million tonnes (63 million tonnes in 96-01) and 1350 billion numbers (857 billion for 96-01) respectively. For the period 2006-11 the requirement of cement and finished steel will be up to 1035 million tonnes and 159 tonnes respectively. Over 20% of plastic production (1.8 million tonnes) in India is consumed for various building applications.

During 1996-2001, the residential building sector is estimated to have provided labour employment of 15 million man-years (10.30 urban and 4.70 rural). During this period in the urban areas, the residential building sector is estimated to have employed 3.60 million man-years of masons, 0.78 million man-years of carpenters, 4.70 million man years of unskilled labour and 1.20 million man years of other type of construction labour. The projection for 2006-2011 is 23.78 million man-years and 37.50 million man-years respectively.

The share of construction sector in Gross Domestic Capital Formation (GDCF) declined to 41% in 1994-95 from 60% during 1951-61. In 1994-95 residential, non-residential buildings and other forms of construction accounted for 10%, 10.5% and 19.5% of GDFC respectively. In 1994-95, whereas the share of non-residential buildings increased from 21% to 26% (23% in 1980-81), the share of other forms of construction declined from 56% to 49%.

The housing finance sector has been responsible for some major initiatives in the past two decades. The Housing and Urban Development Corporation (HUDCO), a public sector housing finance company, with a mandate to service mainly the low-income groups and economically weaker sections through the public agencies (Housing Board, Slum Clearance Board) also funds infrastructure projects and funds and promotes Building Centres. HUDCO was the lone player till the Housing Development Finance Corporation (HDFC) was set up in the private sector in early '80s. HDFC services the urban upper income bracket and retail client. With the setting up of the National Housing Bank (NHB) in the '90s, with a regulatory and refinancing role, the banker sector funds are channeled to housing (earlier only the life insurance and provident funds money were available for housing finance). With HDFC in the lead, many housing finance companies have been set up in the private sector. Legal, regulatory and institutional changes along with tax incentives are strengthening the housing finance system. However, access is still limited, especially for the low-income groups and costs are high.

These broad features of the construction industry show its changing character. Growth, mechanization, modernization, and professionalization trends are visible. So is the orientation towards quality improvement, and productivity for a competitive edge. Consciousness on environmental and social issues, though marginal, is also visible. The industry's main thrust, however, is the transition from the informal to formal and from the unorganized to organized.

On the sustainability index, trends are not encouraging. Due to the preoccupation with mechanization, modernization, improved efficiency and higher profits at a fast pace and lower cost, long-term sustainability concerns and issues are not high on the criteria when selecting technique, technology, materials or practice. A transition from informal to formal has a price in the sustainability context. A change over from a slow manual practice to a middle grade



technology, higher speed and mechanization has environmental and energy costs. Excessive profit expectations and the need to win the competition gravitate towards short-term gains, even unsound, unethical practices. The construction industry in India today is primarily shaped by commercial considerations and governed by market forces. At this early stage of international competition in the domestic sector and struggle to gain a foothold in the overseas market productivity, quality and managerial improvement are certainly sought but not many are mindful of the environmental, social or human dimensions. As someone mentioned, "construction is a hard material business. Economic and pragmatic considerations are prime. Soft, issues - social and human, are not for now".

4.2 Impact of construction materials

On account of growing reduction in forest cover from 33% at the time of independence to about 11% now, the central government has issued instruction to use wood substitutes at least in government buildings, since 1993. Demand of wood in the housing and furniture sector alone is about 25% of the total wood requirement.

In recent years besides waste wood particles and flakes other lignocellulosic materials like rice husk, bagasse, cotton stalks etc. are also used as basic raw materials for making panel boards. Due to advances in resin technology, a variety of boards made with different types of raw materials as mentioned above are available in the commercial market, bonded with different kinds of resins which have wide range of applications.

Consumption of plastics in India increased from 450,000 tonnes in 84-85 to 1.88 million tonnes in 95-96 and is expected to touch 8 million tonnes in 2006-07. Average consumption range of plastics in building applications for the period 80-81 to 95-96 is between 20 to 25%. Per capita consumption increased almost five fold in the decade between 84-85 to 95-96, from 0.64 kg to 3.0 kg. By 2006-2007 it is estimated to reach 10.0 kg/capita.

The production of industrially manufactured building materials consumes a high amount of energy. Whereas 1 kg of cement uses 1 kwh/kg, steel plates uses 7.7 kwh/kg. Aluminum, the new trend in urban construction, uses 10 times as much energy (72.5 Kwh/kg.) Aluminium also requires 10 000 cubic meters of oxygen per tonne i.e. 200 times that of steel, which requires 50 cubic meters of oxygen per tonne. In volume, one cubic meter of concrete uses up to 400 to 800 kwh, solid bricks use 1 140 kwh, while earth uses only about 5 kwh per cubic meter. Solid bricks thus need twice as much energy as concrete, which in turn consumes about 100 times as much energy as earth.

Table 2: Energy Costs of Various Building Materials in India

Materials	Basic	Energy (K.Cal)
Cement	Kg	1.93 x 10 ³
Burnt Clay Bricks	1 000 No's	1 020,6 x 10 ³
Surkhi	Kg	0.330 x 10 ³
Quick Lime	Kg	1.51 x 10 ³
Mild Steel	Kg	6.3 x 10 ³
PVC	Kg	27.75 x 10 ³
Sheet Glass	m ²	6.3 x 10 ³
L.D. Polyethylene	Kg	5.2 x 10 ³
Burnt Clay Roofing Tiles	1 000 No's	1 060 x 10 ³
Sand-lime bricks	1 000 No's	665 x 10 ³
Wood Particle Board	Kg	0.74 x 10 ³
Linoleum	m ²	39.8 x 10 ³
Sanitary ware	Kg	7.8 x 10 ³
Stoneware pipes	Kg	5.07 x 10 ³
Aluminium	Kg	34.3 x 10 ³
Clay-Fly ash bricks	1 000 No's	5.53 x 10 ³
Bloated Clay Aggregate	Kg	1.27 x 10 ³
Gypsum (Calcinated)	Kg	0.3613 x 10 ³
Crushed aggregate	Kg	0.051 x 10 ³

Source:

INDIA. Use of Energy by Households and in the Production of Building Materials. XIth Session of UNCHS

Choice of Appropriate Building Materials

The “appropriateness” of a building material or construction technology can never be generalised. The following questions show some of the main factors which determine appropriateness:

- Is the material produced locally or is it partially/entirely imported?
- Is it cheap, abundantly available, easily renewable?
- Has it been produced in a factory far away?
- Does it require special machines and equipments or can it be produced at lower cost on the building site? (Good quality and durability are often more important than low procurement costs).
- Does its production and use require high-energy input and cause wastage and pollution? Is there an acceptable alternative material which eliminate these problems?
- Is the material and construction technique climatically acceptable?
- Does the material and construction technique provide sufficient safety against common natural hazards (e.g. fire, biological agents, heavy rain, hurricane, earthquake)?
- Can the material and technology be used and understood by local workers or are special skills and experience required?
- Is repair and replacement possible with local means?
- Is the material socially acceptable?
- Is it considered low standard?
- Does it offend religious belief or sentiment?
- Does it match with the materials and construction in nearby buildings?

Source: Roland Stultz and Kiran Mukerji. *Appropriate Building Materials. A Catalogue of potential solutions.* SKAT, ITDG, GATE.

5. Sustainable Rural Settlements and Construction:

Rural India, with over 700 million people scattered in half a million villages across the length and breath of the country, is still a good example of sustainable settlements. Though tractors, hybrid seeds, chemical fertilizers, roads, electricity and television are transforming the scene, energy consumption is low; ‘consumerism’ compared to the urban counterparts is moderate; waste is limited and recycled; due to absence/limited industrial activity air-noise-water pollution is under control; respect for nature is part of culture and religion and resource conservation is both a necessity due to scarcity, and a tradition built on social norms. If India could find ways to improve the quality of rural living, especially of the poor, without changing its character it would be a winner in the sustainability race.

However, things are changing rather fast and probably for the worse. A part of the damage is on account of urban development with its large “footprint”. Watercourses carry untreated urban industrial affluent and sewage to pollute rural water supplies. Surface wells are drying up and the groundwater table is dropping due to excessive pumping in urban centres. Forests are fast being depleted to sustain urban consumerism. The balance of urban-rural hinterland relationship remains exploitative on part of the cities. If villages look more ‘sustainable’, under-development is possibly the price. The irony, however is that despite paying that price, without raising their standard of living, villagers are forced to carry the burden of unsustainable urban development. Rural environmental sustainability is inextricably linked to the pattern of urban development.

Rural construction activity in Indian retains its unorganized, informal character. A portion of residential houses is self-built, self managed, and self or community financed, using local skilled workers with mud and brick, thatch or clay tiles. Relatively better-off sections (rich farmers, teachers, shop keepers cooperative managers, money lenders) build pucca, reinforced cement concrete roofed houses by small local contractors and occasionally use institutional

finance. Infrastructure (link roads, water works, etc.) and community buildings (schools, dispensaries, cooperative buildings) financed generally by the government and built mainly through developmental channels (including the Public Works Department) and the tendering system, are constructed by urban based small or medium contractors. Occasionally big urban contractors build industries in the public and private sector. An informal system, small volume, traditional technology, local skills and materials, slow pace, small contractors, simple design, and moderate quality are other features. Material production – bricks, mud, and tiles—is almost always a small enterprise. The industrialized materials cement steel, glass, and asbestos sheets are sourced from the district town. Local carpenters and masons are traditionally- as against formally-trained, lowly skilled and usually manage other skilled jobs such as plumbing, bar-bending and even design. Trained architects or engineers are usually absent. Tools are conventional. A male dominated industry, women provide unskilled labour.

Though change is visible in the shelter sector too, production and supply arrangements in rural housing still retain many of the practices which could be termed sustainable. A large portion of rural housing stock is self-built, self-managed and community financed. Traditionally, the government, public agencies and the formal private sector have played a marginal role in production and supply of rural housing. Unlike cities, neither a master plan to regulate development nor building bylaws to guide construction exists. Until recently, public or private housing finance agencies offering loan facilities for land or construction were not present. Neither trained professionals - architects, engineers- nor real estate developers or big contractors operate in rural areas. Houses in a typical Indian village are self-built (or self-managed) using locally available materials and skilled/ unskilled labour; meant mainly for family use (not for rental purpose); and financed through family savings and informal credit. Rural housing in India is still primarily a "people's process".

The National Housing Policy assesses the rural housing situation to be qualitatively different from the urban. The absence of the commercial private sector in production and supply, and an increasingly prominent role played by the state sector programmes and agencies in social housing are two main features of the current rural housing scene. Generally speaking, an underdeveloped housing and real estate market leaves a house builder in control of the production process: the household's level of access to housing components—land, finance, materials skills, technology and services—determining the product quality. An owner controlled rural house is typically incremental in nature, built within means and suitable to the family's functional needs, socio-cultural aspirations and aesthetic taste. A participatory 'social production process' involves family members in construction, observes community rules, respects neighbour's concerns and generally produces an environment friendly, 'consensus' product. The contrast with a developer built apartment in a big city is glaring.

A number of factors (economic, cultural and institutional) influence production processes and product quality in rural housing. These include mainly the following: a depressed agricultural economy: low income and high incidence of poverty; increasing commercialization and monetisation of the rural economy; changing social relations affecting mutual-help and self-help practices; declining access to bio-mass materials such as wood; increasing alienation from traditional construction materials and practices; limited exposure and access to new building materials; exodus of skilled labour to cities; underdeveloped housing credit system and institutions; tenure insecurity in land; depleting common property resources; scarce professional services; non-availability of credit for repair, upgrading and extensions; feudal leadership; the caste system; suppressed status of women; continuing extended family tradition; migration; financially and administratively weak Panchayats (local self government); poor targeting of government subsidy; moderately successful land delivery interventions; limited industrial activity; and generally deficient environmental services and community amenities

These factors determine the demand and supply equation in rural housing and show why land, real estate and housing markets have not developed sufficiently. They represent contours of an under-developed housing delivery system and partly explain the reasons for increasing state sector presence in rural housing. They also show why the rural housing construction system still shows 'sustainable' characteristics.



The new economic environment is changing this scene. The market forces are poised to take over. The 'developer', as we know him, is waiting. Can something be done to retain some of the positive features of the existing social production system? Can the people (owners and users) retain some control of the process and quality of their habitat? These questions beg an answer, as a user-centered, decentralized delivery system appears more suited to the small and geographically scattered Indian villages.

The essential part of the rural housing challenge in India is developing a self-sustaining delivery system. Lack of effective demand, a product of static income and low savings, and absence of a housing credit system are major constraints to its development. Rural economic growth, therefore, is a precondition to developing a sustainable housing delivery system. In the new economic regime of structural adjustment and export led growth, the rural sector could be marginalized. That should change first as the stagnant rural economy is non-conducive to development of the housing market or self-sustaining delivery system. That the economic growth happens in a sustainable manner is crucial for sustainable rural housing and construction.

Considering its backward-forward linkages to the overall economy it is essential that rural housing development is seen in the context of overall rural development, and housing for the poor in the context of rural poverty alleviation. The task of improving conditions of rural living, which must include the creation of jobs, providing physical infrastructure (roads, power, water, sanitation) and social services (school, dispensary, market, etc.), and upgrading/contracting houses has a major construction component with high employment potential. If the investment is directed properly (i.e. in a decentralized and labour-intensive manner) so that employment benefits reach the unemployed and the poor, and local entrepreneurship is promoted, not only will the living conditions improve, poverty will also reduce.

An agenda for sustainable rural settlements and construction should include the following:

- Provide impetus for accelerated rural economic growth in a sustainable manner
- Follow a 'people centred' approach that provides full play to people's social institutions, traditional knowledge, creativity and construction skills. A strategy to encourage, support and assist people's on-going, self initiated housing actions
- Develop an economically viable and institutionally sustainable housing finance system, in tune with the people's economic and social systems
- Develop a house design that provides adequate shelter, an efficient work place, and an economic asset, thereby reducing poverty while improving housing conditions.
- Follow settlement design that uses land optimally, is conducive to incremental growth, receptive to phased installation of services, considerate to the traditional village form and sensitive to social aspects of rural living.
- Develop an approach geared to creating new housing stock besides improving/ upgrading/ renewing the existing housing stock.
- Create a facilitator/ enabler role for the government and its agencies.
- Make imaginative use of investment for short and long term employment creation for local communities
- Provide strategic, targeted and capacity building subsidization
- Encourage the selection, promotion and development of building materials and construction technology keeping in view cost-reduction, maintenance, adaptability, employment generation and environmental preservation.

- Initiate a programme to upgrade on-going and initiate new research in appropriate technology and cost effective, energy efficient, low cost and durable building materials. Also to move research from laboratory to market to people. Especially urgent is the development of water resistant mud plaster, fire resistant thatch, and low cost sanitation. Emphasis should be placed on upgrading and using indigenous technologies and local materials.
- Provide not 'houses' alone but adequately serviced settlements (water, sanitation, electricity, school, health care centre, community building, etc.)
- Encourage gender balance in decision making, ownership, employment and wages, and skill training
- Encourage and support the private sector role in land development, housing finance, infrastructure provision, material production, technology improvement, skill training, design and construction
- Provide gainful employment, tool improvement and skills upgrading for traditional skilled craftsmen
- Provide special rural orientation in training of professionals (architects, engineers, and planners), nurturing the Worker's Guild and training for women in skilled construction jobs.
- Initiate a small contractor development programme
- Introduce disaster resistant technology in a de-mystified, non alienating and people friendly manner
- Provide a role for the village panchayat in decision making, facilitation of construction and provision of services and build the capacity of Panchayat agencies for that purpose.
- Restructre the Indira Avas Yojana and other state subsidy projects
- Encourage an NGO role emphasizing advocacy, demonstration, participatory practice, innovation and sustainable construction

Poverty alleviation, improving overall quality of living, creating jobs, improving agricultural productivity, industrialization and modernization of rural society are some of the key rural development challenges. How this is done will determine how sustainable rural living and rural settlements are. Considering the trends, the way things are going, it is not an option any longer because choices seem to have been made. Gandhi's way of rural self – sufficiency, village republic, economic growth based on sustainable agricultural practices and agro based industrialization, basic education system, recycling-based rural sanitation (not a waterborne sewer system) have either been abandoned or are marginalized beyond recognition. Pesticides, chemical fertilizers, mechanization, and capital-intensive irrigation are the 'modern' ways to improve agricultural productivity. Industrialization is the polluting type, generating little local employment. Basic education is on the margins of survival, surviving through the state subsidy on 'sentimental' grounds. Water game parks, in places where water levels are falling alarmingly is indicative of the development trend. If rural India is headed the way of its urban counterpart it is certainly not due to lack of options. Gandhi showed how it could be done. His option has been rejected consciously despite the fact that Gandhi is relevant even today, in a globalized world, as his model of development is sustainable.

6. Reinventing Mud

Using natural and agro based materials, without much processing, is a tradition in rural areas. Both mud and thatch fall in that category. A large number of houses are built using these local inexpensive materials.



Reinventing earth as a construction material and its rehabilitation/reintroduction as a safe and maintenance free (or reduced maintenance) material in rural India will be an important step in sustainable construction. As some 70 million rural houses are constructed of earth, the material is known, construction practices are familiar and ingredients, being local and plenty, are low cost. Environmental pollution and the high energy consumption that accompany production of conventional building materials and construction process can be reduced considerably by reintroducing earth in the form of compacted blocks or rammed in-situ construction, in place of burnt bricks or reinforced cement concrete.

Earth construction has many advantages over other conventional materials. The construction process requires little energy and causes no pollution. Mud walls provide a comfortable internal living environment as it balances temperature fluctuations and absorbs moisture. Mud is locally available, recyclable, requires no capital (in machinery or building), is suitable for self-help and is low cost. On many counts earth is a versatile and sustainable material.

As a construction material earth, however, has two well-recognized deficiencies: shrinkage cracks after drying and weakness against moisture/water. This requires continuous maintenance, raises questions on structural safety, and lowers asset value of the product. Acceptance is low despite cost and other advantages.

Innovations—in design, detailing, plastering and other surface protection techniques - though researched and known, haven't reached the field. Centre Building Research Institution (CBRI) and others have developed materials and techniques to protect mud walls against moisture and water. They are neither demonstrated nor marketed properly and imaginatively. The market link of the research agencies such as CBRI, which has worked on the subject for over 35 years, is weak. The traditional professionals in mud construction – the Ode community in Gujarat, for instance - are without work and losing their skills and confidence.

Architects, engineers and builders neither know nor value this material. The state agencies implementing rural construction schemes or private contractors don't use or recommend mud for construction. The villagers who aspire to urban ways of living and model their construction on urban styles, now reject mud construction. Mud as construction material survives marginally and symbolically. Paradoxically, both the very poor and the very rich use it. The poor as they have no other option, and the rich in their weekend farm houses as it is 'special' and 'fashionable'.

Experimental projects, mostly by NGOs and research organizations, display potential. Construction using compressed earth- block, cement-soil block, long roof overhangs, clay tile cladding, etc. show ways to strengthen earth construction. However, these projects remain symbolic in nature and marginal in effect. For a common villager mud, though local, versatile and inexpensive, remains weak and therefore not suitable or acceptable for new construction. Institutional factors also weigh against the material. Banks don't accept a mud walled house as collateral and insurance companies don't insure mud structures.

Considering the potential –lower cost and higher ranking in sustainability index-- a serious effort needs to be made to improve the quality and acceptability of mud construction. Both technical performance and social acceptability must improve. It demands a joint effort by research organizations, the private sector, professionals, state agencies, and communities.

A similar situation obtains with thatch as a building material. Like mud, it is local, known, inexpensive and versatile. The fire hazard and durability are main problems. Research work on fire protection and durability has been done in India and elsewhere. Workable, low cost and accessible technology on water proofing of mud and fire proofing of thatch would mean a revolution in rural housing for the poor. That would ensure people the freedom to build, and the rural society a greater option to practice sustainable construction.



7. Urban Sustainability

7.1. Urban Growth

In 1991, 846 million Indians lived in over half a million villages and 3750 towns and cities. Though the country still remains predominantly rural, with 70% of the population in villages, population growth in cities is rapid. In a short span of two decades, with even moderate growth rates of about 3.5% per annum, India's urban population doubled from 109 million in 1971 to 217 million in 1991. By the turn of the century approximately 310 million Indians – 30% of the total – are estimated to live in cities: a staggering four fold increase in 40 years and 600 % growth in 50 years since independence! Currently India's urban population is the fourth largest in the world: next only to USA, USSR and China. It is equal to India's total population at the time of independence.

7.2. Concentration

Though this growth is spread over a number of different sized urban settlements, a large share is concentrated in the metropolitan and other big cities. In 1991, 70 million people, one third of the country's urban population, lived in 23 metropolitan and other big cities. According to an UN projection, in the year 2001, out of the eleven largest cities in the world, with a population size of over 13 million, three cities i.e. Calcutta, (16.53 million), Bombay (16.0 million) and Delhi (13.24 million) were in India. Today, India has 6 mega cities (4 million +), 40 metropolitan cities, 300 large towns (0.1 million) and 3400 medium and small towns.

7.3. Urban Productivity

Over the last three decades the pattern of sectoral contribution to the national economy has changed substantially. In 1950-51, urban India contributed 29% to India's GDP. It increased to 47% in 1980-81, 55% in 1990-91 and is estimated to have crossed 60% in 2001. Urban to rural productivity ratio is 7:2. With the structural adjustment programme and liberalization and globalization of the Indian economy, the contribution of the urban sector to the national output is expected to rise further, making the country's continued economic development heavily dependant on the efficiency of its urban sector.

7.4. Contrast

On the one hand, the cities have become engines of economic growth and centers of culture, art, technology, education and entrepreneurship. On the other, as noted by the National Commission on Urbanization, set up by the late Prime Minister Rajiv Gandhi, "these urban centers have also generated the most brutal and inhuman living conditions with large sections of citizens (almost half in Bombay and Delhi) living in slums and squatter settlements. The over-crowding in slums and desperate lack of water and sanitation lead not only to severe health problems, but to the abject degradation of human life".

7.5. Problems

The rapid and massive population growth in the urban centres coupled with severe resource constraints, weak governance, and managerial inefficiency have resulted in many problems: especially in big cities. Environmental degradation in the form of water, noise and air pollution; housing shortages; rapid growth of slums and shanty-towns; quantitative shortage and qualitative deterioration in the provision of and access to municipal and other basic services (water, sanitation, garbage collection and disposal, education, health care, etc); deficiencies in infrastructure (power, roads, transport, etc.); overcrowding and congestion; social tension; violence and poverty, to a varying degree, afflict many Indian cities.

7.6. Urban Poverty

While the incidence of poverty is greater in rural areas, the nature of urban poverty is different. The situation is particularly difficult in large cities where over one third of city's population is either on pavements or in slums as squatters. The most neglected sections among the urban poor are women and children who are left out of the mainstream development process.



7.7. Services

Potable water supply is accessible to only 84% of India's urban population, that too intermittently and of questionable quality. Sewerage and sanitation services are absent or inadequate for close to 54% of the urban population. Thirty one percent of urban residents have no latrine. Waste collection and disposal is available to only 72% of the population. And electricity is yet to be provided to close to 25% of the urban residents.

7.8. Resources for infrastructure and Housing

The Rakesh Mohan Committee estimated that the total requirement for urban infrastructure development covering backlog in service provision, new investments and operation and maintenance, for the next 10 years, is a mammoth Rs. 25,00,000 million (US \$ 50 billion). This means a per annum requirement of Rs. 2,50,000 million. (US \$ 5 billion) Additionally, the urban housing sector requires an investment of Rs. 12,13,700 million (US \$ 25 billion) during the next five years to meet the housing shortage of 7.57 million units, upgrading of 0.32 million semi-pucca units and additional construction requirement of 8.67 million units. The overall funding requirement for housing and urban infrastructure development for the cities stands at a Rs. 37,13,710 million (US \$ 75 billion). Against this mammoth figure, in the Ninth Plan Rs. 117950 million for urban development, water supply and sanitation and Rs. 3,40,000 million for urban housing were found. This implies that funding requirement for urban housing fell short by 3.5 times and for urban infrastructure development fell short by more than 10 times the requirement.

7.9. Housing:

The failure to provide adequate (in size and number), proper (in location and design), affordable (rental, hire purchase, or capital cost) new houses, neglect of existing housing stock and inadequate services manifest in many forms: overcrowding, congestion, dilapidation, slums and squatter settlements, pavement dwelling, and a sharp decline in the quality of overall living environment. Rapid population growth; inadequate investment; low income and savings levels of the housing clients; poverty; under developed housing finance system; sluggish supply rate of new formal housing by the public and private sector agencies on account of legal and institutional constraints; inadequately organized real estate and construction sector; high cost and virtually frozen land supply; declining investment in and availability of rental housing, deterioration in rental housing stock due to vacancy and poor maintenance, and active hostility to the informal housing and settlements built by the poor are some of the causes of the "housing crisis" in the Indian cities. The 1991 census projected overall housing shortage of 23 million units : 8.20 million urban and 14.90 million rural.

7.10. Slums :

The slum problem, due to its scale (number of people involved), spread (the problem is confined not only to metro or big cities alone), persistence (no relief in sight, no sign of abatement), visibility (unmistakable landmarks on urban landscape), socio political implications (human degradation, suffering and waste of human capital), and limited success of the containment strategies and past fragmented responses, is begging for attention, fresh approaches and a holistic treatment. It is estimated that on an average 30 to 35% of citizens in big cities live in slums. 40% of slum dwellers are without access to safe drinking water; and over 90% are without access to adequate sanitation.

7.11 Needing a new urban vision

Considering the prevailing conditions and trends in the Indian cities (big cities heading towards a crisis and rapid environmental degradation in the smaller ones) the obvious question is not so much the long term sustainability but the survival of the city. If cities are the future of the country, as indeed they are, the real concern is the immediate future in the existential sense rather than the abstract future of the coming generations in the sustainability context. That is so because while recognizing cities as the engines of economic growth, centres of technology and innovation, crucible of art, culture and knowledge, and also the last refuge of hope and livelihood for the ones trying to escape grinding rural poverty, it is difficult, even for a staunch optimist to draw a rosy picture of the Indian city. Not only because they are saddled with problems, but because there is not much evidence to suggest that a framework (which must include a vision for the future, political will, institutional preparedness, financial and human resources, and technological innovations) to address problems, respond to opportunities and shape the future has evolved. What Dr. Wally N' Dow, the Secretary General of Habitat II called a "revolutionary approach to problem solving" is needed. That indeed is missing. And it is in that context that urban sustainability concept must be examined.



Given the condition in cities and alternative options its special situation offers, India is one country – there are many others in Asia and Africa – which can question the inevitability of urbanization, especially the inevitability of resource depleting, polluting, exploitative and in some ways dehumanizing urbanization. It is essential to recognize that the urbanization we experience and the cities we live in are product of the economic policies we pursue and the development model they promote. It is a result of conscious choices we have made, not divinely ordained. If the policies and the model change, the urbanization trends and cities will also change. There is nothing inevitable about it.

8. Action towards Sustainable Construction

8.1 Conservation of existing building stock

Extending the working life of buildings is a step towards sustainability as it reduces the need to construct new buildings. Timely and regular maintenance is a much-neglected aspect in Indian buildings, as it requires financial resources, tools, organizational infrastructure and skill. One of the more detrimental side effects of the Rent Control Act is neglected maintenance of rented buildings. The frozen rents make it difficult for the owners to invest in maintenance. And the renters tend to neglect it as they have no incentive to maintain the building. Deterioration of old buildings, especially in old city areas, even if owner occupied, and of the rental properties due to poor maintenance and timely repair necessitated a public response in Mumbai city. The Building Repairs and Maintenance Board, a public sector enterprise was set up to repair and strengthen private buildings in poor condition. Though the initiative has been only a moderate success, the idea is sound and deserves replication in other cities. Proper legislation with proper orientation, equipments and tools support, an adequate capital base, institutional financing arrangements, trained professionals to provide design, structural engineering and management services, and contracting agencies will extend the lifespan of the buildings, thereby conserving resources. Removing institutional constraints such as the Rent Control Act and enlarging the role of the private sector are strongly recommended.

The preventive aspects of maintenance include good design, the selection of durable building materials, proper detailing, and good workmanship. And these are not so much the function of cost but attitude.

8.2. Disaster Mitigation Technologies

Protecting buildings from natural disasters is a part of conserving the building stock and therefore a step in sustainable construction. About 1.5 million buildings are estimated to be destroyed or severely damaged by the natural calamities every year. With about two thirds of the geographic area of the country disaster prone--earthquake, flood, cyclone, land slides -- both overall disaster preparedness and disaster resistant designs, detailing, technology and construction could save lives, structures and financial loss.

Publication of the Vulnerability Atlas by the Building Material Promotion and Technology Council (BMPTC) is an important step. Its proper use by the concerned authorities, professionals, and teaching and training institutions will help in disaster preparedness. The recent earthquake in Gujarat, which killed 18 000 people; destroyed or badly damaged over a million houses, public buildings and infrastructure, and caused an estimated loss of over US\$ 3 billion, highlighted flaws in the entire hierarchy of construction system. Modification in building bylaws and code and review of the functioning of the building regulatory authorities; reorientation, training and education of design professionals (architects, structural designers, construction supervisors); greater quality control over construction work by the builders and contractors; greater interaction between research institutions, regulatory authorities and professionals; re-orientation, training and accountability procedures for the contracting agencies; training of skilled construction workers in disaster resistant construction; and comprehensive disaster preparedness plans and their implementation by the government, including community awareness and education, will reduce destruction and damage. Proper disaster preparedness and adequate management of disaster rehabilitation are steps in sustainable construction.



8.3. Land

Sustainable land use is a precondition for sustainable construction: Land, being scarce, non-elastic, expensive and one of the most critical components in construction activity. Land conservation, optimal and creative use, equitable distribution and reuse of brown field areas are aspects of sustainable construction. A creative land ownership and use policy is a key determinant in sustainable construction.

Some of the major distortions in urban development -- high land values, scarcity and unequal distribution—are attributed to land ownership patterns and practices. Failure of India's rather bold legislative effort to correct them through the Urban Land Ceiling and Regulation Act of 1976, which sought to put a ceiling on the land ownership, curb practices in excessive profiteering, land hoarding and speculation, and promote equitable distribution and balanced use, has been a setback for sustainable land use and distribution. The UCLRA's failure is attributed to its anti-market orientation, rather than inept and corrupt administration. With the advent of economic liberalization, privatization, globalization and greater emphasis on role of the market, the state intervention in the land market is no longer a policy orientation. With about one third of the urban population below the poverty line, even greater numbers with low-income, persisting income and wealth disparities and the urban lands' high asset, mortgage and speculative value, it appears rather impossible that the market alone can correct the distortions in distribution.

Equitable land distribution being a critical precondition for sustainable construction, state intervention in urban land is inevitable. Giving secure land tenure to the urban poor and the slum dwellers, though slow in implementation, is a proper direction. Granting land title to the poor slum dwellers is a positive step in sustainable construction. It will motivate the slum population to invest in improving their houses and settlements. The following are some steps that can be taken.

- Due to unaffordable land prices and low-income levels even the secure land tenure scheme will leave a large segment of the urban population out of the land market. A combination of measures including strategies to lower urban land prices by accelerated land development on urban peripheries; increasing income and purchasing power of the lower income groups and access to credit for land purchase; upgrading the land-lease system; project level cross-subsidization through mixed—commercial, residential; low cost-high cost—use, would improve people's access to land.
- Avoiding wasteful use through proper regulatory measures and planning is a step in conservation of land resources and thereby sustainable construction. This stretches from rationalizing building bylaws related to margins to be left around buildings, to relocation of activities from the core city areas which use urban land unproductively - godowns, jails, etc. - to releasing large land areas locked by the sick industries and de-hoarding lands occupied by new industrial establishments.
- Rethinking the zoning regulations and planning practices which separate residential from commercial and industrial, a direct influence of western planning model, is also a step in land conservation. Besides contributing to the urban sprawl, adding to pollution by motorized traffic and productivity losses and fatigue due to time losses in covering distances, roads consume anywhere between 30% to 35% of the land area in a planned settlement. Segregation of industrial locations from the residential has also been seen as a license for air, water and noise pollution of the industrial areas. Coexistence of commercial and residential - a shop on the ground and the residence on the upper floor - is a feature of traditional city planning in India.
- Legislative tools, a regulatory frame work, support studies, and reorientation of professionals and incentives in favour of low-rise-high-density construction is a step in the direction of sustainable construction. The densest urban settlements - in terms of minimum land use per capita-- are not the high-rise buildings, as generally believed, but the low-rise ground floor slums. In the sustainability framework single storey formal construction, is a luxury and wasteful; low-rise - high density construction (three to four storey apartments) is the preferred option. Compared to the high rise structures, which require heavy foundations and structural engineering,

greater disaster resistance, high quality and expensive materials, high energy consumption in use and maintenance- the low rise-high density buildings are the more sustainable option.

- Discouraging – through fiscal disincentive, higher taxation and social practices- single-family bungalows and farmhouses, which cause urban sprawl, is also a step in optimal land use and therefore sustainable construction. Selective densification strategies for sparsely populated and used city areas, which improve land use and efficiency of services, are more sustainable.

8.4. Employment

A construction method or technique that internalizes employment benefits for the users, especially the poor, is a sustainable construction practice. Coexistence of urban unemployment and inadequate urban infrastructure reflect planning and governance failure. A massive urban public works programme, aimed at improving urban infrastructure and services - especially water supply, sanitation, roads, pavements, electrification, play areas, parks, schools, dispensaries, community centres, etc. - with a dominant construction component, would deal with the twin problem of unemployment/ poverty and inadequate services simultaneously. This, however, must be low cost and low investment in installation and maintenance; decentralized; community rather than contractor focussed; and specially geared to enhance local employment generation. Contribution of the construction activity in direct poverty alleviation and improving quality of living through improved availability and quality of services form part of sustainability in construction.

8.5. Work Force

Productivity enhancing mechanization and modernization, in the form of tool transition, technology upgrading and changes in financing and management practices, in the sustainability context, must consider environmental, macro-economic and social factors: conservation of natural resources, reduction of energy use and minimization of pollution (environment); labour intensive practices (macro-economy), and improving productivity, wages and welfare of construction workers (social). With a large population, massive poverty and high levels of unemployment and underdevelopment, it is vital that construction activity remains labour intensive without losing its competitive edge. This requires selective mechanization, skills upgrading, quality consciousness of construction workers and improvement in their working conditions. A low skill, low confidence, non motivated, poorly paid and exploited construction worker, a normal sight on many construction sites, is a serious threat to sustainable construction.

8.6. Informal Housing

Granting a place to the informal housing and settlements in the urban landscape and recognizing role of the peoples' processes in producing them, are vital to the sustainability of cities and construction. Cities will be unsustainable, if they negate, neglect or remain hostile to the resources, energy, creativity enterprise, and affirmative action of the poor. And construction activity will be unsustainable if it overlooks sustainability principles ingrained in this form of building activity.

People –mostly the poor people—using scarce resources, construction skills, waste and recyclable materials, self-help and mutual aid practices with minimum land occupation, produce slums. Considering the large volume of housing stock, produced low-cost and high speed of construction, and large size of population living in them, the slum is the most important form of construction on any yardstick. Besides producing them in a sustainable way, these houses and settlements are sustainable in the sense that they are frugal in use of water, electricity and other services. The slum settlements in the Indian cities, as elsewhere, represent both the solution and the problem. The process that produces an affordable shelter represents a potential, even a solution (low cost, recycled materials, self help, easy and quick construction, fast supply rate, etc.). The illegal encroachment of public and private lands and unhealthy environmental conditions represent a problem.

Facilitating and supporting the poor's self initiated housing action and providing assistance to improve quality of services and living is a step in sustainable construction. The key to success in housing the poor-both quantitatively and qualitatively i.e. in sheltering the millions and providing need based, appropriate houses - lies in increasing their access to housing components: land, building materials, finance, and services. The state taking responsibility for



land supply; treating all city dwellers as equal in the matter of provision of basic environmental and social services and strengthening the resource base of the local bodies to ensure that; creating properly structured and staffed housing finance and housing development agencies which effectively reach out to and service the poor; making arrangements that accelerate production of low cost building materials and increase supply of reusable, recyclable materials are critical to increasing the poor's access to housing. Viewing provision of housing and infrastructure in the context of poverty alleviation and designing the delivery in a manner that generate gainful employment are important too. An inadequately sheltered citizen, with what it implies in terms of productivity losses, ill health, social stress and human degradation is a cause of urban unsustainability.

8.7. Gender Equality

According women status as owners, recognizing their role as users and respecting their contribution, as producers is a move towards sustainable construction, settlement and development.

Outside the agriculture, manufacturing and service sectors, which together employ more than 80% of women workers, a significant and gradually increasing proportion of workers are engaged in the construction sector. Among the informal sector workers, women doing construction are some of the worst victims of discrimination and deprivation. Working on construction sites is an arduous task. Unlike other industries where women are employed in semi-skilled or sometimes even in skilled jobs, in the building industry they are employed only as unskilled labourers. The job of an unskilled worker is more strenuous in the construction industry than in other manufacturing industries. As casual workers, women not only face insecurity of work but are also paid lower wages compared to their male counterparts. Minimum wage and other legislation are violated. Women face instability and insecurity in work, poor remuneration, discrimination in the payment of wages and virtual absence of enforcement of protective labour legislation. Their work is regarded as unskilled, but they are given no opportunity to acquire skills on the job. Men, on the other hand, learn and up-grade construction skills while working

To improve the working and living conditions of female construction workers, many legislative, organizational and attitudinal changes are needed. These include: stringent monitoring of the observance of existing laws; legal literacy; simplified judicial procedures for legal redress; government intervention in recruitment and registration of workers; improved tools, equipment and technology for greater safety and comfort, importing skills in masonry, carpentry, plumbing and other value added construction skills; and assistance on work sites for non-formal education, legal literacy, health care, childcare, etc.

Improving conditions of work for women construction workers is one part. Making them owners – or co-owners - of the assets being created through the subsidized land distribution and social housing projects is the second part. Such a provision in massive urban and rural social housing programmes will improve their status in the family and society, increase resistance against family violence, and would prove to be an affirmative action in women's empowerment.

8.8. Professional Education

Awareness and concern on sustainability issues and ways to integrate them into one's personal life style, living habits and economic pursuits need to be built in at all levels of education. Global-local interdependence is a cardinal principle of global sustainability. In achieving the goals of sustainable environment, construction and development, the attitude and actions of an individual, family, group and community are important. The basis for sustainable global economic and social system is a sustainable individual and family system. Education prepares a person for life. Consciousness building and training on sustainability should start there: in the primary and secondary school, in college education, and in professional training programmes.

Sustainable construction demands professionals with knowledge and ability to integrate sustainable practices in their work. Properly trained planners, engineers, architects, supervisors, developers, utility specialists and manufacturers, who collectively shape the nature of construction activity, have a lead role to play in this matter.



Planning, architecture and engineering education and practice in India carry a hangover of the colonial past and what is typically called the “western” influence. Despite a glorious past and a great tradition – displayed so eloquently in the planning of Jaipur or Jaisalmar, and architecture of a Bhunga in a Kutch village-- the present system of planning and architectural education prepares the professionals (with a few exceptions) who are alienated from the local context: be that climate, lifestyle, tradition, economy or local needs and resources. The new urban landscape is partly the result of such alienating education, training and western influence. Land use, traffic and infrastructure development plans neglect land scarcity, interaction pattern, preponderance of non-motorized traffic –cycles, pedestrians—in cities, space and service needs of the urban informal sector, general resource scarcity, water scarcity, and reality of the poor. Multi-storey offices with full glass façades, a new status symbol of modern architecture in India and a direct import from the sun starved, cold and artificial energy sufficient West, neglects the local reality of the bright sun, scarcity and high cost of energy, and generally poor record on maintenance. Engineering education- especially civil engineering- is probably more realistic, but rather slack on the human side of the professional need. Vastu Shastra, an ancient science of construction, is not part of the syllabus in architecture or engineering education.

Surprisingly, the professional training institutes are not much familiar with or involved in innovative work being done by the non government agencies—be that working with the poor and rural clients; use of non-conventional building materials and appropriate technology; people centred and participatory planning; cost effective, climate-conscious and tradition sensitive design and construction. This is a double disadvantage as young students and training professionals are denied an opportunity to see, learn from and get motivated by an alternative approach and effort and the NGO sector, usually in need of young, motivated and properly oriented professionals, remain starved of the critical human resource.

With the resource crunch and environmental crisis, the need to make education, especially professional education, more relevant was never as strongly felt as now. More than changing the syllabus and teaching methods, much wider attitudinal reorientation and systemic change are needed.

The positive part is that the need for change is strongly felt and frequently articulated by different stakeholders. Some educational and professional institutes have taken positive initiatives, but it is obvious that much remains to be done for the reorientation of young students and training professionals

With its long reach and wide impact education is critical for the present and the future, for the villages and cities, for the environment and human kind. The built environment, the abode of humans for their life's pursuits, must be conducive to clean, healthy, comfortable, pleasant and aesthetic living. Green trees, clean air and water, birds and animals, gardens and open spaces are as much an integral part of the built environment as skyscrapers, bridges and roads. It is important that they co-exist in a harmonious manner.

Construction is a human activity. All kinds of actors (from the architect to construction labourer to the manufacturer of an air conditioning plants) and factors (tools, technologies, materials, bylaws) influence the process and shape the product. It is important that the players, while pursuing their agenda and immediate goal—speed and profit, luxury and comfort, aesthetics and utility—remain sensitive to the wider picture and make conscious efforts to prevent damage to the environment and society.

India, like everyone else, is in a race to modernize, grow and develop. We, however, have learnt at a high cost, that so-called development could also be destructive. Construction is a vehicle and also an expression of development. Unsustainable development cannot promote sustainable construction.

Unsustainable construction cannot produce sustainable cities and settlements. And unsustainable cities and settlements cannot lead to sustainable happiness-- everyone's ultimate pursuit. We therefore must strive for sustainable construction, sustainable settlements and cities and sustainable development.



9. References

- BMTPC and STEM. **Housing and Key Building Materials in India: A Long Term Perspective 1991 – 2001**. New Delhi and STEM, Bangalore
- Building Materials News (BMTPC)** World Habitat Day 1999
- Minke, G and Mukerjee, K. **Energy Saving Building Materials, Design Principles and Construction Techniques for Tropical Climates: A Paper Presented at the Seminar on Environmental Research, Cairo, Egypt, March, 1994**
- Construction Industry Development Council (CIDC) **India Country Reports 1997 – 1998, 1998 – 1999 and 2000 – 2001**. New Delhi
- Shah, K. 2000. **Sustainable Development for Sustainable Cities**. Presentation at the International Meeting on "Man and City"-- Towards a Human and Sustainable Development at Naples, Italy September, 2000
- Suresh, V. **The Challenge of Housing and Appropriate Technology**. CMD, HUDCO
- Shah, K. 2000. **Urban Poverty in India : Situation, Response and Strategy**. Presented at Citynet, Colombo Plan Regional Workshop on Building Partnerships for Good Urban Governance, Estahan City Iran September, 2000.