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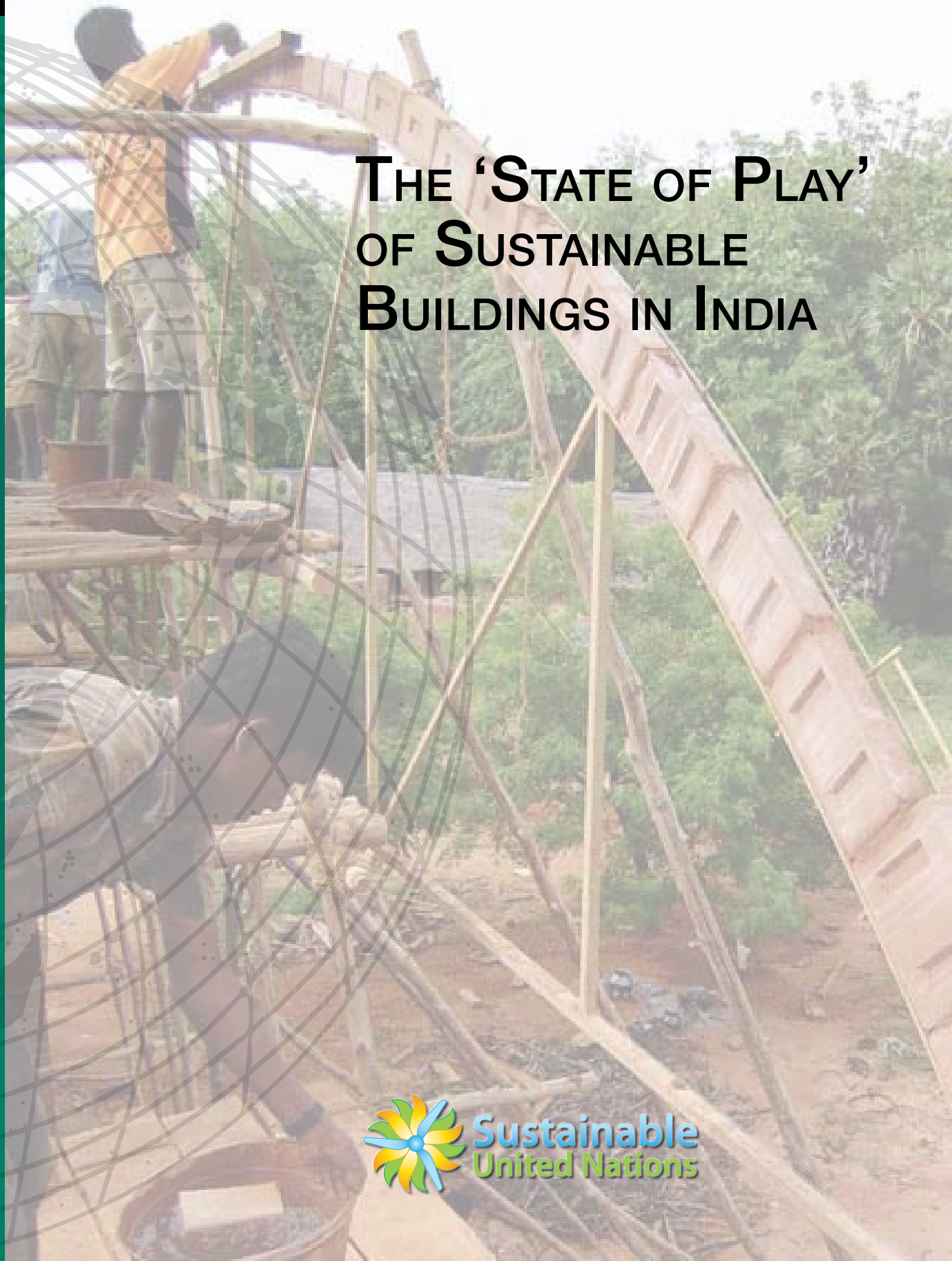
Promoting Policies and Practices for Sustainability

The 'State of Play' of Sustainable Buildings in India



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The 'State of Play' of Sustainable Buildings in India

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* Note: The 'State of Play of Sustainable Buildings in India' section has been prepared by UNEP-SBCI and does not necessarily represent the views of TERI.

About The Energy and Resources Institute (TERI):

A dynamic and flexible organization with a global vision and a local focus, TERI was established in 1974. While in the initial period the focus was mainly on documentation and information dissemination activities, research activities in the fields of energy, environment and sustainable development were initiated towards the end of 1982. The genesis of these activities lay in TERI's firm belief that efficient utilization of energy, sustainable use of natural resources, large–scale adoption of renewable energy technologies and reduction of all forms of waste would move the process of development towards the goal of sustainability.

All activities in TERI move from formulating local and national level strategies to suggesting global solutions to critical energy and environment-related issues. It is with this purpose that TERI has established regional centres in Bangalore, Goa, and Guwahati, and a presence in Japan, Malaysia, Russia, Africa and the United Arab Emirates. It has also set up affiliate institutes: TERI–NA (The Energy and Resources Institute, North America) Washington DC, USA, and TERI–Europe in London, UK.

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Executive Summary

The Indian construction industry is experiencing a fast rate of growth with a sustained increase in gross built-up area of 10%[1] per annum over the last decade. Demand for housing, expansion of organized retail, commercial office spaces by multi-nationals, the setting up of special economic zones (SEZs), are all increasing. This is spurred on by increasing per capita income and standard of living.

Energy consumption and associated greenhouse gas emissions will therefore continue to rise unless actions to direct the construction industry towards sustainable consumption and production are taken urgently.

More positively, the practice of green building is becoming more popular in some sectors. The secretariat of India's bespoke green-building rating scheme Green Rating for Integrated Habitat Assessment (GRIHA) has set a target for five million square meters of built up space to be GRIHA compliant by the end of 2012. Further, the Indian Green Building Council also targets to register ninety three million square meters of built up space with LEED India. While important, this alone will not be enough to mainstream sustainable design and construction practices in India. Achieving this requires:

- Bridging the knowledge gap on sustainable building strategies, which exists at various levels within the industry;
- Enforcing implementation of strategies to encourage adoption of sustainable, green and energy efficient buildings; and
- Conducting research and development on technology for lowering costs.

Support and cooperation between all the players of the sector is required. The immediate actions to be considered include:

- Development of a national platform to project individual efforts and exhibit financial benefits of sustainable buildings;
- Undertaking extensive capacity-building

at various levels, including construction of demonstration projects across the country;
- Developing a business model to provide a further impetus to initiatives to minimize the detrimental impacts of construction on the environment and society;
- Introducing a green rating for residential developments and directing real estate developers to adopt this; and
- Developing, enforcing and implementing sustainability performance benchmarking for industry sectors.

This report on the 'State of Play' provides a representative understanding of sustainable building activity in India, which has a unique traditional knowledge, and is a developing country in terms of the modern world. The report explains the state of sustainable buildings and construction in India including best practices, successes, barriers and recommendations for further implementation towards mitigation of climate change impacts.

Considering the wide diversity that exists in the building typology across India, issues and concerns range from addressing low cost, low energy buildings to high cost high energy buildings through various income groups and climatic zones of the country.
The following report has been structured to address the various schemes (i.e. government codes, strategies, policies vernacular and other institutional schools of thought) that co-exist to direct building construction towards a minimum detrimental impact on the environment. Various case studies have been used to explain the indicators of 'sustainability issues' with an emphasis on life cycle and actual performance of buildings.

Seven case-studies of institutional and residential buildings in three prominent climatic zones of India, namely composite, warm-humid and hot-dry, have also been studied. Based on the good practice compliance of buildings, information received and information available in public domain, the case studies from representative climate zones have been identified for the purpose of this study.

The following four approaches, which have been endorsed by prominent practitioners in the field of sustainable and green building design, government bodies, government agencies and private bodies for voluntary adoption by relevant stakeholders, have been taken up for discussion in the report:

1. Vernacular schools of thought
2. Green ratings for green buildings
3. The Energy Conservation Building Code (ECBC)
4. Scheme for star rating of office buildings

These four approaches are described through case-studies which are representative of the 'state of play' for sustainable building in India.

VERNACULAR BUILDING

Vernacular schools of building design are deeply embedded in the traditional wisdom that offered beauty and joy to enhance the cultural milieu of India's built environment. As reflected through the various case studies, each project addresses an integrated approach to design with a special emphasis on climatology, solar passive architecture, bio-climatic design and low energy architecture to achieve appropriate human comfort, low-energy low-cost community development, use of recycled municipal/domestic waste as building material; and a financial model that may be implemented for successful promotion of sustainable building design principles respectively.

The following case studies have been used to further explain the vernacular schools of building design that exists in various parts of India.

1. Torrent Research Centre, Ahmedabad to represent the *Mera Wala* green school of thought;
2. *Sharanam*- a purpose-built training centre for rural development, Tamil Nadu to represent the Sri Aurobindo Society school of thought;
3. *Manav Sadhna* Activity Centre, Ahmedabad to reflect the sustainable community school of thought; and
4. Solar Housing Complex (*Rabirashmi Abasan*), Kolkatta to represent a financially sustainable model for green buildings.

The vernacular schools of thought as described through the various case studies, reflect the specific sustainability priorities, which have been established in specific regions of the country. While '*mera wala* green' seeks to establish common sense solutions with emphasis on Indian 'needs' from local solutions in terms of material use and traditional wisdom; *Sharanam* emphasizes on adopting an integral approach towards development with a special focus on the socio-economic and skill development dimension.

Manav Sadhna Activity Centre demonstrates that a building can become an economic activity to empower the poor and exhibits a potential for becoming a cottage industry for economic self-reliance. With emphasis on the socio-economic aspects of sustainable building design, this vernacular school of thought reiterates the holistic approach followed for sustainable buildings in India. Taking this a step further, the Solar Housing Complex focuses on the financial aspect of sustainability that may be replicated on a larger scale.

In circumstances where it is not possible to address all aspects of sustainable design, environmental and economic concerns take priority in order to direct building construction towards green design. Green rating of buildings as described below encourages adoption of green design strategies rather than a more holistic sustainability approach.

GREEN BUILDING

There are two prominent green rating systems that co-exist in India. One system, Green Rating for Integrated Habitat Assessment (GRIHA), is the national rating system for the country endorsed by the Ministry of New & Renewable Energy (MNRE), Government of India. Another system, Leadership in Energy and Environment Design (LEED), has been launched by the India Green Building Council (IGBC). The Centre for Environmental Sciences and Engineering at IIT Kanpur, the first GRIHA compliant building of India, and the Institute for Rural Research and Development (IRRAD), Gurgaon, which is a LEED India compliant building have been used as case studies to highlight the nuances of the two green rating systems.

Both green rating systems aim to quantify the environmental, economic and socio-economic benefits of green building design with emphasis on sustainable site planning, optimized energy performance, efficient materials and construction practices, water and waste management strategies; and indoor environmental quality. The rating systems also emphasize life cycle cost analysis so that the client has an option of making informed choices when opting for green technologies which may have an initial incremental cost with acceptable pay back periods.

ENERGY EFFICIENT BUILDING

In case it is not feasible for a given building project to be compliant with the green rating system, energy efficiency is addressed as the next major sustainability parameter to be addressed. The Bureau of Energy Efficiency (BEE) provides an option for new buildings to be compliant with the Energy Conservation Building Code (ECBC), which contributes to significant energy savings through the operation of an efficient building, contributing to CO_2 emission reduction. The Fortis hospital building, which is ECBC compliant, indicates the implications in terms of building specifications and benefits from compliance with the code.

Further, the BEE has also developed a scheme for star rating of existing buildings thad meet the energy efficiency benchmarks as established, to further narrow the parameters of sustainability in building design. As discussed in this report, the Reserve Bank of India (RBI) building at Bhuvneshwar has been awarded the first five star rating for being energy efficient.

The report goes on to describe the key barriers and way forward for incorporation of sustainable, green and energy efficient building design parameters in the Indian building sector. It provides an outline of the knowledge gap at various levels, issues pertaining to lack of effective enforcement of policies; and lack of financial incentives, which deter stakeholders from large scale adoption of sustainable design strategies and energy efficient technologies.

'STATE OF PLAY' OF SUSTAINABLE BUILDINGS IN INDIA

Sustainability Challenges for the Indian Building Sector

India has one of the fastest growing construction sectors in the world. New construction spending has grown by as much as 10% in the last five years[2] and built floor area has more than doubled. This increase in construction activity is being driven by rapid urbanization. About 30% of India's 221.1 million households are now in urban areas with the urban population projected to more than double by 2050[3].

Demand for commercial building has also increased dramatically, fueled by a boom in the services sector which has been estimated to have added 53% to the value of GDP in 2008 alone. The amount of built office space is projected to increase from approximately 200 million m^2 in 2009 to 890 million m^2 by 2030, an increase of more than 70%[4]. (The figure in the Eco-III report is 870 million m^2; however these are different from the commercial built up rates projected in the BCC project).

Many new office buildings import typical glass-curtain wall design which increase demand for mechanical cooling in India's predominantly warm climate. Recent studies of the energy performance of commercial buildings in India indicate that manufacturing are also likely to spike over the next decade, increasing the need to consider lower embodied energy approaches to construction.

Energy demand is also increasing in rural India where programs are underway to bring electricity to the more than 400 million people that lack access to basic energy services. Providing such basic services to all of its citizens will require a 3 to 4 fold increase in primary energy supply and a 5 to 6 fold increase in electricity generation over 2005 capacity by 2030[6].

Such factors contributed to the building sectors proportion of total national commercial energy consumption rising from 14% in the 1970's to approximately 33% by 2005, an increase in energy use in buildings of approximately 8% per year. Given that 55% of India's electricity is generated from coal-fired power plants, the energy performance of buildings is an increasingly significant factor in national greenhouse gas emissions[7].

These issues are being addressed by policy makers. As Section 4 describes the new ECBC and BEE programs aim to deliver significant operating energy efficiency gains from India's commercial building sector. Full implementation of the Energy Conservation Building Code for example could reduce energy consumption in new commercial buildings by 25-40%. Further potential energy savings of 25% could be achieved with cost-effective retrofitting of existing commercial buildings[8].