



GREENER CONSTRUCTION SAVES MONEY: INCENTIVES FOR ENERGY EFFICIENT BUILDINGS ACROSS INDIA

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Sun rising over typical commercial and residential
high-rises in Mumbai, Maharashtra, India



India's growth over the past decade has led to economic progress and dramatic urbanization. India's continued economic development depends on providing more affordable, clean, and reliable energy and lessening the strain on current supplies, presenting an opportunity to real estate developers who can lock in energy and cost savings by building green. Investing in energy efficiency across India's urban areas is key considering that cities contribute about 62 percent of GDP in India, which is likely to increase to 75 percent by 2021.¹ Further, India's building stock is expected to triple in the next 17 years as part of the urbanization process.² Building greener now before floor space triples is necessary to save significant costs and energy and avoid expensive retrofits later on.

India has shown leadership in developing efficient buildings, increasing its green floor area from just 20,000 square feet in 2004 to more than 1.35 billion square feet in 2013.³ To move the rest of the market, India has taken an important step by creating an Energy Conservation Building Code (ECBC), which contemplates incorporation of efficient technologies, materials, and construction techniques into new and renovated commercial buildings (potentially also including high-rise residential buildings). Buildings that comply with the ECBC may be up to 60 percent more efficient than standard buildings in India.⁴ States are at various stages of implementing the ECBC to raise minimum efficiency, and both public and private stakeholders are offering unique incentives to encourage building green and make efficiency pay for developers.

As our recent issue brief, *Building Efficient Cities: Strengthening the Indian Real Estate Market Through Codes and Incentives*, makes clear, most developers encounter common barriers to building green. However, solutions and incentives exist to overcome most barriers, enabling developers to take advantage of energy efficiency's savings and benefits and construct green cities across India. Government officials—from central to state and local levels—can and should work with real estate developers to develop policy and regulatory incentives, and effective compliance mechanisms, to shift India's buildings market toward cost-saving, energy efficient buildings.⁵

INDIAN CITIES' URGENT NEED FOR EFFICIENT BUILDINGS

The country must adopt widespread efficiency measures in buildings in the near term to protect India's economic growth, energy security and climate.

- **Growing energy needs to fuel the country's development in urban and rural areas:** India is currently the fourth-largest consumer of energy in the world.⁶ If the country's average annual growth is to meet its target rate of eight percent through 2017, India must increase its production of commercial energy by nearly 41 percent over its 2012 level.⁷ India plans to accomplish this by adding more than 88 GW of generating capacity by 2017, 79 percent of which is expected to be from coal- or lignite-fired sources.⁸
 - **Energy security is threatened by the widening gap between coal supply and demand:** The country's planned energy expansion cannot and should not be met by limited coal supplies that are now more difficult to extract. Further, without improved reliability of electricity, India will continue to rely in part on diesel back-up generators during power cuts, which are dirty and expensive to run.⁹ There are significant opportunities to save energy and therefore increase energy security by scaling energy efficient construction of new and existing buildings across Indian cities.
 - **Building energy use causes significant climate impacts and is growing rapidly:** Commercial buildings cause a significant portion of India's rising carbon emissions, while climate change poses significant threats to the population. Commercial buildings consumed nearly 90 terawatt-hours of electricity in 2010, which will increase significantly if floor area triples by 2030 as projected.¹⁰ India's commercial buildings are responsible for emitting nearly 78 million tons of carbon dioxide annually.¹¹
- Ensuring that India's buildings are energy efficient is a cost-effective option with both economic and environmental benefits. McKinsey & Company values the global building efficiency opportunity at more than Rs. 41 lakh crore (\$700 billion) by 2030 and estimates that India could save nearly Rs. 83,000 crore (\$14 billion) per year by investing in energy efficiency—an amount equal to current spending on health and education combined.¹²

SHIFTING THE MARKET: INCENTIVES AVAILABLE TO INDIAN REAL ESTATE DEVELOPERS

The following incentive mechanisms and opportunities can help developers overcome barriers to building green to achieve higher levels of energy efficiency, locking in cost and energy savings.

BUILDING RATING SYSTEMS

Building rating systems recognize newly constructed or retrofitted buildings that achieve high levels of energy efficiency. In addition to lower operating costs and other benefits, as highlighted in our case study *Saving Money & Energy: Case Study of the Energy Efficiency Retrofit of the Godrej Bhavan Building in Mumbai*, building efficiency champions benefit from the brand recognition, leadership, and market competitiveness that come with such ratings.¹³ The number of certified green buildings in India has exploded over the past four years, from ten million square feet of green certified buildings to more than 1.35 billion square feet.¹⁴

The Ministry of New and Renewable Energy (MNRE) awards the Green Rating for Integrated Habitat Assessment (GRIHA) certification, a five-star rating system based on a building's various sustainability features.¹⁵ The Indian Green Building Council (IGBC) awards the Leadership in Energy & Environmental Design (LEED) India certification, which range from "Certified" to "Platinum" based on efficient features.¹⁶ Both GRIHA and LEED require third-party verification before certification—a critical component to ensure efficiency savings and thereby maximize the potential benefits of these ratings programs. The Bureau of Energy Efficiency (BEE) also issues a five-star rating system based on the actual performance of a building, normalized for its operational use and climatic zone.¹⁷

- **Looking ahead:** Building ratings programs need to undergo continuous improvement to keep rewarding higher caliber buildings. Better verification after the building is completed to measure actual energy savings and ensure compliance with certification requirements would also strengthen the rating system. Finally, ratings programs should push to increase participation by a broader segment of India's real estate market beyond the current market leaders and champions to increase the proportion of building stock that meets these high standards.

Building Spotlight: Infosys

Infosys, a global consulting and technology firm, was awarded the LEED India 'Platinum' rating by the IGBC for its Software Development Block 1 (SDB 1) building in Hyderabad, Andhra Pradesh. The SDB 1 uses innovative radiant-cooling technology—the first in a commercial building in India—thereby setting higher standards for energy efficiency in Indian building systems design. It was built using a holistic approach to sustainability in five key areas: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.



THE INFOSYS SDB 1 BUILDING IN HYDERABAD, ANDHRA PRADESH, RATED LEED INDIA 'PLATINUM.'

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REBATES ON PROPERTY PREMIUMS AND TAXES

A number of municipal corporations are beginning to offer tax and premium rebates for buildings that meet certain minimum conditions under existing rating programs. For example, the Pimpri Chinchwad Municipal Corporation (PCMC) in Maharashtra, has made a conscious effort to optimize resources in the built environment through the GRIHA platform. The PCMC offers rebates on premiums paid by developers and also offers property tax discounts based on the number of stars the building achieves through GRIHA certification. Other cities in the state of Maharashtra, including Nashik and Navi Mumbai, are developing property tax-based incentives for green buildings too.

Building Spotlight: Ganga Skies

The residential project Ganga Skies by Goel Ganga Developers in Pimpri Chinchwad, Maharashtra received a 3-star provisional certification of GRIHA. At the project's early stages, GRIHA helped the project to achieve energy efficiency savings through the overall construction process, material waste reduction and resource efficiency, reducing costs by eight percent. The Ganga Skies project benefited from the developer premium and property tax rebates offered by the PCMC.

- **Looking ahead:** Municipal governments across India can offer similar rebates to lock in energy savings, reducing energy demand as urbanization continues. Participating cities can also consider expanding the program by increasing the types of buildings eligible for these premiums and property tax rebates to diversify the landscape of efficient buildings.

ENERGY SERVICE COMPANIES

Energy Service Companies (ESCOs) help building owners develop and finance energy saving projects, frequently by paying for the energy upgrades upfront. For a fixed long-term time period, the owner then pays the ESCO for their energy, often capped at their pre-retrofit costs, and the ESCO pays the utility for the energy actually used. Because of the energy savings of the project, the ESCO can use the difference to pay for the financing of the project and make a profit while removing the barrier of efficiency's high upfront cost for building owners.

Although Indian ESCOs have successfully implemented some energy efficiency improvement projects, the ESCO market has yet to take off in India, due, in part, to the weak legal framework for contracts enforcement.¹⁸ Although involvement by the Bureau of Energy Efficiency (BEE) has helped to support ESCOs, they have not yet been able to significantly penetrate the market.

- **Looking ahead:** Increasing awareness among developers and companies of the benefits of the ESCO model and how it can support a building's construction or retrofit, and even take on some of the payback risk, would expand the network and reach of ESCOs. A well-defined, standardized, transparent EPC contract format would help boost ESCO operations and promote full-service financing models that include lenders, equipment manufacturing and installation, and energy saving monitoring and verification.

Snapshot: Success of the ESCO Model Internationally

Despite a slow start in India, ESCOs have been successful in encouraging efficiency in other countries such as the United States, where ESCOs have annual revenues of \$3.6 billion.²⁰ In China, aggressive efficiency goals have allowed for five times the number of ESCOs as the U.S., many of which are subsidiaries of firms in the US and Europe.²¹ ESCOs in Brazil tend to be small or medium sized engineering or consultancy firms, and typically focus on lighting retrofits.²² ESCOs typically target the commercial sector, but have recently entered the industrial sector.

FLOOR SPACE INDEX ALLOWANCES

Many states in India and other municipalities around the world have limits on the Floor Space Index (FSI) or Floor-Area Ratio (FAR), a measure of the built-up floor area of a building relative to the size of the plot it is built on. In some areas, high costs can be paid to exceed this limit. To incentivize developers to build green, a portion of this extra FSI is given to developers of efficient buildings for no cost, increasing the value of their properties.²³

The Noida region outside Delhi allows GRIHA-certified gold or platinum (4 or 5 star) rated buildings that have plots exceeding 3,000 sq. meters to exceed the FSI limit by one to five percent.²⁴ Similarly, the city of Bhubaneswar and states of Punjab and Kerala have announced additional or free FSI allowances for buildings that meet a stipulated minimum green building rating.²⁵ In Pune, the Municipal Corporation offered buildings with qualifying solar or wind power equipment two additional FSI or a discount of 50 percent on paid FSI, although this program has since been discontinued.²⁶

Building Spotlight: Mahindra Towers

The Mahindra Towers office building in Mumbai successfully worked with an ESCO to complete an energy efficiency retrofit focused on its lighting system. As a result of the retrofit, Mahindra Towers reduced its monthly power consumption by 10 percent, saving 470,403 kilowatt-hours (kWh) per year and Rs. 40,09,965 (\$67,952) from March 2009 to March 2010. With an initial investment of Rs. 15,90,000 (\$26,944) for the retrofit, Mahindra Towers had an impressive payback period of less than half a year. The Mahindra Towers retrofit demonstrates how working with an ESCO to implement energy efficient measures is practical and profitable in India's rapidly transforming building market and provides replicable practices for cost and energy savings.¹⁹



MAHINDRA TOWERS POST-RETROFIT.

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- **Looking ahead:** City and state governments implementing the FSI need to promote a better understanding of its benefits and mechanics to encourage more developers to take advantage of the program. Officials should also strengthen the FSI and make the program more attractive by addressing the barriers developers have encountered to date. For example, Noida authority rules mandate a ratio of parking spaces that correlates with the constructed FSI. Since excavating for parking can add more cost than the free added FSI is worth, it is currently not always profitable to take advantage of this incentive.

A Closer Look at FSI's Potential Savings

An FSI of x indicates that the total floor area of a building is x times the gross area of the plot on which it is constructed. In Noida, efficient building projects can currently qualify for an FSI of 3.5 (up from the base FSI of 2.75).

Therefore, calculating the extra free 5 percent of permissible FSI, developers would get an additional FSI of $0.05 * 3.5 = 0.175$ for green building design. Depending on the property value of floor space in different locations, this multiplier translates into increased revenues from either selling or renting floor space.

Taking the smallest eligible plot as a conservative estimate, green builders now get 875 sq. meters (9,418.42 sq. feet) of additional floor space for free.²⁷ The price of a square foot of floor area ranges from Rs. 2,000 to Rs. 12,000 in Noida, which means builders can garner additional revenues ranging from 1.8 crore to 11.3 crore (\$292,000 to \$1.8 million).²⁸

SPECIAL ECONOMIC ZONES

In 2000, India announced its Special Economic Zones (SEZs) policy, creating geographical regions dedicated to providing world-class commercial and manufacturing infrastructure and attracting larger foreign investments in India to encourage Indian exports. SEZs are designated duty-free enclaves, and are deemed foreign territories for the purpose of trade operations, duties and tariffs. The IGBC, in partnership with the Ministry of Commerce and Industry, developed a voluntary Green SEZ rating system to facilitate the creation of environmentally-friendly SEZs.²⁹

Spotlight: GreenSpaces

GreenSpaces is a 1.75 million square feet LEED certified Platinum Green Building and government-approved SEZ IT Park, located in Faridabad near New Delhi. It is India's first LEED Platinum SEZ and was granted this status as a live demonstration of the feasibility of building green in the Indian context.³⁰

- **Looking ahead:** Further incentives can reward SEZs for energy efficient design, such as making green certification a prerequisite.

Financial Incentives

While policy incentives from Urban Local Bodies (ULBs) or the central government are one part of the story, financial institutions also offer incentives to encourage energy efficient construction in India. Some of the key groups supporting energy efficiency in the financial sector are banking groups such as Bank of Baroda, ICICI, Industrial Development Bank of India and State Bank of India. These banks offer project financing to carry out audits, upgrades or retrofits to corporations or ESCOs. Larger groups like the International Finance Corporation (IFC) and the Asian Development Bank provide financing to smaller banks or financial institutions to further fund energy efficiency upgrades. Details on the financial incentives being provided not only in India but internationally can be found in the ASCI -NRDC report, *Constructing Change: Accelerating Energy Efficiency in India's Buildings Market*.³¹

OTHER HIGHLIGHTED INCENTIVES

The country offers a variety of other incentives as well at the municipal, state and national levels.

State-level Incentives and Codes:

- **Haryana:** The Department of Renewable Energy bears 50 percent of energy audit costs and grants monetary awards for excellence in energy conservation.
- **Punjab:** The Punjab Energy Development Agency and the Indian Institute of Architects collaborated on a draft adaptation of the ECBC that would apply to large residential buildings.
- **Uttarakhand:** A draft ECBC has been submitted for notification.
- **Maharashtra:** Expedited environmental approvals are provided for green-certified buildings.³²
- **Andhra Pradesh:** Adopting the ECBC as mandatory in 2014 with innovative compliance mechanisms.

City-level Incentives and Codes:

- **Noida:** Developer-friendly policy allows green-certified buildings to be taller and thus more valuable.
- **Ahmedabad:** Developing a scheme that would allow city to implement parts of the ECBC now while building capacity to manage further implementation.
- **Hyderabad:** Architects can receive monetary incentives for designing GRIHA-rated buildings.³³
- **Pune:** Allows buildings with solar or wind power to be taller and thus more valuable, providing a significant incentive to developers.

On the central government level, the Ministry of Environment and Forests (MOEF) gives priority for obtaining environmental clearance to buildings meeting the criteria of rating programs, including GRIHA and LEED India.³⁴

POWERFUL POTENTIAL ENERGY SAVINGS THROUGH INDIA'S ADOPTION OF STRONG BUILDING CODES AND RATINGS PROGRAMS

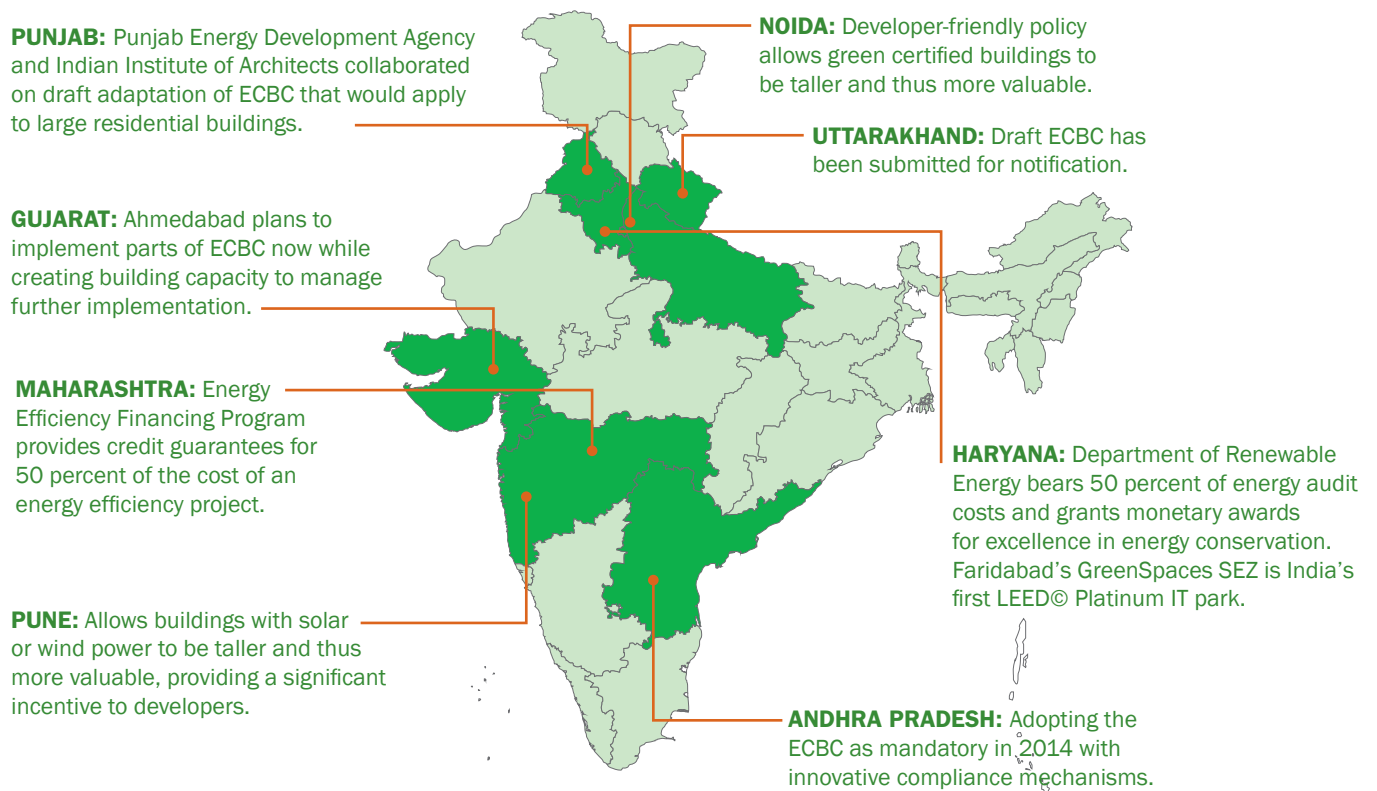
According to new analysis by NRDC and ASCI, stronger building efficiency codes and ratings programs such as LEED and GRIHA in India's commercial buildings would create enormous energy and cost savings by 2030. If states across India adopted the ECBC and developers participated in strong programs for rating commercial buildings, an **estimated 3,453 TWh of cumulative electricity** could be saved by 2030, the equivalent of powering as many as **358 million Indian homes annually** between 2014 and 2030 based on the current annual consumption level for electrified households.³⁵ Additionally, **1,184 million tons of CO₂ emissions** could be avoided by 2030, equivalent to the annual emissions from more than **17 coal-fired power plants** (500 megawatts each) over the same period of time.³⁶

As these huge potential savings demonstrate, widespread adoption of the ECBC in Indian states and greater participation in ratings programs could provide powerful energy savings as demand rises, while fighting climate change.

CONCLUSION

Building efficiency is crucial to India's sustainable growth in the near future. While some developers will be able to self-finance efficiency projects and enjoy their savings right away, incentives can greatly help the broader market move toward higher adoption of efficiency measures at this critical juncture in the expansion of Indian cities. State governments can play a key role in not only motivating more green buildings, but also in promoting post-construction monitoring and verification to ensure buildings are locking in energy savings.

Figure 1. Energy Efficiency Advances Across India's Cities and States



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ENDNOTES

- 1 Government of India, Strategic Plan of Ministry of Urban Development for 2011-2016," <http://www.performance.gov.in/sites/default/files/document/strategy/UD.pdf>.
- 2 The Indian Building Code Community, (undated). "Energy Conservation Building Code Helping Home and Business Owners." http://www.ibecc.in/learning-ecbc?q=introduction_ecbc.
- 3 Indian Green Building Council (IGBC), August 2012, <http://www.igbc.in/site/igbc/index.jsp>. Chandrashekar Hariharan. "Green Money," The Hindu, 2013. <http://www.thehindu.com/features/homes-and-gardens/design/green-money/article4884332.ece>.
- 4 Prasad Vaidya, Ranjit Bharvirkar, Alecia Ward, Reshmi Vasudevan, and Koshy Cherail, 2010. "Transforming the Building Energy Efficiency Market in India." <http://www.aceee.org/files/proceedings/2010/data/papers/2029.pdf>.
- 5 Government of India, "Strategic Plan of Ministry of Urban Development for 2011-2016," <http://www.performance.gov.in/sites/default/files/document/strategy/UD.pdf>.
- 6 U.S. Energy Information Administration, 2013. "India." <http://www.eia.gov/countries/analysisbriefs/India/india.pdf>.
- 7 Planning Commission (Government of India), 2013. "Twelfth Five Year Plan (2012-2017): Faster, More Inclusive and Sustainable Growth (Volume I)." http://planningcommission.gov.in/plans/planrel/12thplan/pdf/vol_1.pdf. Planning Commission (Government of India), 2013. "Twelfth Five Year Plan (2012-2017): Faster, More Inclusive and Sustainable Growth (Volume II)." http://planningcommission.gov.in/plans/planrel/12thplan/pdf/vol_2.pdf.
- 8 See id.
- 9 Prasad Vaidya, Ranjit Bharvirkar, Alecia Ward, Reshmi Vasudevan, and Koshy Cherail, 2010. "Transforming the Building Energy Efficiency Market in India." <http://www.aceee.org/files/proceedings/2010/data/papers/2029.pdf>.
- 10 United Nations Development Programme, 2011. "India Global Environment Facility Project Document: Energy Efficiency Improvements in Commercial Buildings." http://www.undp.org/content/dam/india/docs/energy_efficiency_improvements_in_commercial_buildings_project_document.pdf. Planning Commission (Government of India), 2013. "Twelfth Five Year Plan (2012-2017): Faster, More Inclusive and Sustainable Growth (Volume II)." http://planningcommission.gov.in/plans/planrel/12thplan/pdf/vol_2.pdf. International Resources Group, 2010. "Energy Conservation and Commercialization (ECO-III): Total Commercial Floor Space Estimates for India."
- 11 United Nations Development Programme, 2011. "India Global Environment Facility Project Document: Energy Efficiency Improvements in Commercial Buildings." http://www.undp.org/content/dam/india/docs/energy_efficiency_improvements_in_commercial_buildings_project_document.pdf.
- 12 McKinsey Global Institute, 2012. "Mobilizing for a resource revolution." http://www.mckinsey.com/insights/energy_resources_materials/mobilizing_for_a_resource_revolution. McKinsey Global Institute, 2008. "Fueling Sustainable Development: The Energy Productivity Solution." http://www.mckinsey.com/insights/energy_resources_materials/fueling_sustainable_development.
- 13 NRDC, ASCI, Saving Money & Energy: Case Study of the Energy Efficiency Retrofit of the Godrej Bhavan Building in Mumbai, April 2013, <http://www.nrdc.org/international/india/files/energy-retrofit-godrej-bhavan-CS.pdf> (accessed January 21, 2014).
- 14 Chandrashekar Hariharan "Green Money," The Hindu, 2013. <http://www.thehindu.com/features/homes-and-gardens/design/green-money/article4884332.ece>.
- 15 GRIHA India website, available at: <http://www.grihaindia.org/#&home> (accessed 13 December 2013).
- 16 IGBC, "LEED India," available at: <http://www.igbc.in/site/igbc/testigbc.jsp?desc=22905&event=22869> (accessed 13 December 2013). LEED ratings, developed by the United States Green Building Council in 1993, have been adapted to over 140 countries and rated over 10 billion square feet of building space, as of 2012. See United States Green Building Council (USGBC), "About LEED," 25 July 2012, at p. 19, available at: <http://www.usgbc.org/articles/about-leed> (accessed 8 Aug 2013).
- 17 Sanjay Seth, Ministry of New and Renewable Energy. "BEE Star Rating for Buildings." Apr 2011. <http://www.mnre.gov.in/file-manager/akshay-urja/march-april-2011/EN/BEE%20Star%20rating%20for%20buildings.pdf>.
- 18 Jain, Amit. "Unlocking Energy Efficiency Market in India's SME Sector." University of Southern California. Fall 2011. at p. 41, http://www.academia.edu/273919/Unlock_Energy_Efficiency_Market_in_Indias_SME_sector (accessed February 25, 2014).
- 19 NRDC, ASCI, Building Efficient Cities: Strengthening the Indian Real Estate Market Through Codes and Incentives, January 2014, <http://www.nrdc.org/international/india/files/real-estate-efficiency-codes-IB.pdf> (accessed February 25, 2014).
- 20 Jain, Amit. "Unlocking Energy Efficiency Market in India's SME Sector." University of Southern California. Fall 2011 at p. 19, http://www.academia.edu/273919/Unlock_Energy_Efficiency_Market_in_Indias_SME_sector (accessed February 25, 2014).
- 21 See id. at p. 21.
- 22 See id. at p. 25.
- 23 At least nine cities in the US, such as Seattle, Washington, also allow for increased building densities with LEED certification. See United States Green Building Council (USGBC), "Green Building Incentive Strategies," available at: <http://www.slocounty.ca.gov/Assets/PL/Green+Building/Green+Building+Incentive+Strategies.pdf> (accessed 20 Aug 2013).
- 24 Government of India, "Gazette of India: Part II, Section 3(ii)," September 23, 2013, p. 18, https://dda.org.in/tendernotices_docs/oct13/S.O.%202894%20%28E%29%20dated%202023.09.2013_211013.pdf (accessed February 25, 2014).
- 25 Bhubaneswar Development Authority, "Gazette Notification," <http://bdabbsr.in/GazetteNotificationView.aspx>; TERI, "Green Movers," January 1, 2014, http://www.teriin.org/index.php?option=com_featurearticle&task=details&sid=841; Government of Kerala, "Green Building Policy (Draft)," (undated) available at: <http://www.keralapwd.gov.in/keralapwd/eknowledge/Upload/documents/1599.pdf> (accessed February 25, 2014).
- 26 Common Floor, 2013. "Eco-friendly buildings in Pune get FSI benefits." 16 Jan 2013. <http://www.commonfloor.com/news/eco-friendly-buildings-in-pune-get-fsi-benefits-41307>. Accessed 20 Aug 2013.
- 27 0.175*5,000 sq. meters = 875 sq. meters (9,418.42 sq. feet) of additional floor space for free.
- 28 Magic Bricks, "Property Rates Trends: Noida," available at: <http://www.magicbricks.com/Property-Rates-Trends/ALL-RESIDENTIAL-rates-in-Noida>.
- 29 Indian Green Building Council (IGBC). "IGBC Green SEZ Rating System." <http://www.igbc.in/site/igbc/testigbc.jsp?desc=233674&event=233670>. Accessed 20 Aug 2013.
- 30 GreenSpaces. "About Us." <http://greenspaces.in/about.php>. Accessed 20 Aug 2013.
- 31 <http://www.nrdc.org/international/files/india-constructing-change-report.pdf>.
- 32 Sandeep Ashar (Times of India), 2013. "Green building code: No tax cuts, FSI sops for eco-friendly buildings in Maharashtra." http://articles.timesofindia.indiatimes.com/2013-07-01/mumbai/40306587_1_green-buildings-new-code-fsi.
- 33 Hyderabad Metropolitan Development Authority, (undated). "GRIHA Scheme for Promoting Implementation of Energy Efficient Solar/Green Building Programme." <http://www.hmda.gov.in/EBGH/incentives.html>.
- 34 IGBC Presentation, "Green Building Movement in India," Slide 13, available at: http://www.slideshare.net/rohith_ravula/igbc-8726819 (accessed February 25, 2014).
- 35 The average annual household energy consumption for electrified households in India in 2011 was 567 kWh/household. See GOI Central Electricity Authority, "All India Electricity Statistics, General Review 2012 (Containing Data for 2010-11)," p. 144, Table 9.1 (2012); 2011 Census of India, "Figures at a Glance," http://www.censusindia.gov.in/2011census/PCA/PCA_Highlights/pca_highlights_file/India/5Figures_at_glance.pdf (accessed January 14, 2014); World Bank, Residential Consumption of Electricity in India, p. 8 Table 4, (2008): <http://moef.nic.in/sites/default/files/Residentialpowerconsumption.pdf> (accessed January 14, 2014). An alternate source finds that the average household electricity consumption was 778 kWh/household in 2011. See World Energy Council, Energy Efficiency Indicators, www.wec-indicators.enerdata.eu/world.php (accessed January 14, 2014).
- 36 See Clean Energy Resources: Greenhouse Gas Equivalencies Calculator, EPA, www.epa.gov/cleanenergy/energy-resources/calculator.html (accessed December 11, 2013).



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