

Reviewing Adoptability Potential of Green Building Policies of India

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Abstract

Insignificant (25% of world average) carbon footprint of India has doubled in last 15 years, indicating an alarming future overburdened with the threat of climate change, over-population and intense urbanization. To find a greener and sustainable route for this inevitable trend, this paper scrutinizes the success factors and barriers for the acceptability of national green building grading tool GRIHA. It was analyzed to offer limited tangible benefits to commoners and hence unable to positively influence the actual unplanned development in peri-urban areas. A plausible solution was searched from 26 successful green initiatives of Singapore which have overcome the hurdles of over population and multi-ethnicity. And the beneficiaries are mainly individuals or private sectors initially attracted by tangible gains but later as the sustainability drive gained momentum, incentives were less decisive. It is recommended that in India incentive-based efforts should also overcome the human barrier of common myths about green buildings.

Keywords: building rating tool, GRIHA, singapore green movement, sustainable development, tangible incentives

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INTRODUCTION

Since Rio Earth Summit of 1992, India has taken several social, economic and environmental initiatives^[1] to promote sustainability though its carbon footprint is only insignificant (25% of world average). However, this figure has doubled in last 15 years. In 2011 itself, there is 6% increase in CO₂ emission making India the 4th global CO₂ emitter country after China, USA and EU.^[2,3] It indicates an alarming future which will also face the threat of climate change, over-population and intense urbanisation. As such growth is inevitable; it is high time to channelize this trend in a greener and more adoptable route. Studies show that buildings consume energy during erection as major

construction materials, namely, cement, iron and steel are associated with very high embodied energy.

During operation, buildings consume about 76% of electricity in India and residential buildings dominate the market. Hence, this is of paramount interest to construct new buildings with a green perspective as well as to include the existing building stock in the mission. However, as residential buildings are mostly owned by individuals rather than corporate or public sector, attracting the private owners from various strata towards the green movement mainly with intangible social benefits is a challenging task.

This paper scrutinizes the adoptability of green strategies in residential sector of India mainly covered by government approved grading tool GRIHA (Green Rating for Integrated Habitat Assessment).

INDIA IS BUILDING SECTOR IS GREEN OR GREY?

India is very low per capita energy consumption is mainly due the fact that about 70% of Indian population residing in rural areas has limited scope of consumption.^[4] But by 2020, 40% of people will live in cities^[5] as India's construction industry is showing a very rapid annual growth rate of 9.2% compared to the global average of 5.5%.^[6] Presently building sector is the third largest consumer of energy in India, but it will soon overtake the national energy demand which has an annual growth rate of 4.3%.^[7] Residential sector will have major share in construction and hence highest demand for energy.^[8] In this context the green initiatives for building sector in India can be noted as follows.

GRIHA

Since 2007 a rating of 1– 5 is given to residential, commercial, industrial and institutional buildings based on various parameters, namely, (a) site selection and site planning; (b) building planning and construction; (c) building operation and maintenance; (d) space utilisation; (e) water usage; (f) embodied, end-use and renewable form of energy and (g) health and well-being. The evaluation costs around ₹ 64000 for up to 5000 sq.m. and an extra amount of ₹ 3.75/sq.m above 5000 sq.m.^[9]

LEED India

Based on LEED-NC USA,^[10] this rating system applies to new construction of commercial, institutional and G+4 or taller residential buildings. A 4-stage rating is done both at preliminary stage and upon completion. Points are earned for (a) sustainable site development; (b) water

savings; (c) energy efficiency; (d) materials selection; (e) indoor environmental quality and (f) innovative design.^[11]

Energy Conservation Building Code or ECBC

It is mandatory for commercial buildings or building complexes with a connected load of 500 kW or greater or a contract demand of 600 kVA or greater. The code is also applicable to all buildings with a conditioned floor area of 1000 m². or greater.^[8]

National Building Code or NBC

Conservation and sustainable development are focussed through space design, services (natural and artificial lighting, HVAC, plumbing, etc.), materials, construction technologies and usage.^[12]

Environmental Impact Assessment (EIA) and Clearance

For 29 categories of developmental activities involving investments of ₹ 50 Crores and above, this is mandatory for builders to obtain an EIA clearance and comply with a set of requirements drawn from ECBC and NBC.^[1]

After considering the basic structure of these norms, it can be conclude that both GRIHA and LEED-India are voluntary in nature and hence they are recommendations not mandates. Unfortunately in most of the Asian countries including India the concept of green buildings is in nascent stage and implementation plans are underdeveloped.^[4]

These rating tools and ECBC are yet to cover existing building stock. ECBC does not include industrial, government or institutional buildings with high energy demand. Absence of implementation and monitoring strategies along with verification clauses and penalties for non-compliance of ECBC has significantly

reduced the effectiveness of the code.^[6] Construction market considers EIA clearance to be a time and resource consuming process due to the absence of normative guidelines. Apart from these factors, lack of government incentives, technical expertise and suitable green materials or equipment is the main hurdle to make Indian buildings green.^[4]

TECHNICAL AND SOCIAL ADOPTABILITY OF GREEN BUILDING SYSTEMS

While comparing the adoptability of green building guidelines, Potbhare *et al.* (2009)^[13] reported that in 2007, certifications under BREEAM of UK (1990), CASBEE of Japan (1998) and LEED-NC of USA (2000) were noted as 600, 7 and 12,659, respectively. This clearly shows the success of LEED-NC over the other two. The authors argue that this success is attributed to LEED's inherent characteristics of easy understanding, flexible credit choice, online available information, reference manuals, wide coverage, marketing to include private and public sectors apart from the research community. These attributes are desirable for any green building rating systems. In fact marketing of green technology or products should be pursued with much greater enthusiasm compared other marketing strategies, as it has an environmental and social impact.^[14]

Acceptance of green building guidelines depends also on various social attributes such as skill of professionals and environmental awareness or education level of the society in general.^[15-18] Components of society expected to adopt these guidelines are:

- (1) Government (Central, state or local kevel govt./semi govt. organizations, political leaders).
- (2) Profit and non-profit organizations: MNCs, large business houses,

community/environmental bodies, manufacturers, suppliers, educational institutions, media, NGOs, etc.

- (3) Individuals: General contractors, engineers, architects, owners, developers, consultants, consumers.

Among these groups, government is the provider or policy maker and others are adopters or are at receiver's end. Hence, government has prominent roles to play for promoting green initiatives, such as:^[19,20]

1. Subsidies and tax benefits.
2. Capacity building to increase general awareness.
3. Provide funding and research data to NGOs.
4. Provide information and promote the guidelines through mass media.
5. Monitor and penalize actions that hinder the adoption of these guidelines.
6. Enforce special laws and regulations.

Here, the first four are voluntary and co-operating in nature while the rest are coercive regulations. Studies on 1151 Spanish construction firms indicated when environmental policies are adopted voluntarily, more innovative and proactive measures emerge compared to imposing policies forcefully.^[21] Tomer and Sadler^[22] have expressed similar preference as 'commitment approach' to environmental policy over command and control policies. Incentives were found to work better than penalty clauses in other sectors also such as dairy farming,^[23] human resource development,^[24] etc. Being the provider, such incentives are supposed to come from government agencies.

However, in a questionnaire survey in order to find the social acceptability of green guidelines in India, it was reported that architects, engineers, green building consultants, educators and researchers have much higher participation than government officials (4% response). This

indifference is reflected in lack of government initiative or interest in promoting sustainability drive in India.^[13] The very limited scope of green incentives in India is discussed in the next section.

GREEN INCENTIVES IN INDIA

Keeping aside the intangible benefits of healthier environment, conservation of scarce natural resources or prestige, tangible benefits such as monetary gain or more buildable area are delineated here. Considering the fact that large scale promotion of GRIHA will help in getting the new buildings constructed on the concepts of green building design suitable for Indian conditions, national level incentives under GRIHA with the assistance of MNRE (Ministry of New and Renewable Energy) are namely {TERI, 2013}.

Incentives for Architects / Design Consultants

1. ₹ 2.5 Lakhs for projects up to 5000 m² of built-up area and 3-star rating or above.
2. ₹ 5 Lakhs for projects with more area but with 4-star rating or above.

Capital Subsidy for Installation of Solar Photovoltaic

Under MNRE's scheme on Solar Photovoltaic Systems/Devices for Urban Areas, capital subsidy will be given for solar photovoltaic if it caters to at least 1% of total connected load for interior lighting and space conditioning.

Incentives to Urban Local Bodies

A one-time incentive of ₹ 50 Lakhs to municipal corporations and ₹ 25 Lakhs to other urban local bodies for the following purposes:

1. Giving rebate in property tax for GRIHA rated buildings.
2. Enforcing GRIHA rating compulsory for all new buildings under govt. & public Sector.

3. Signing MOU with GRIHA Secretariat in presence of MNRE for mass promotion of green buildings in their area.

Promotional Activities

A grant up to ₹ 2.00 Lakhs for each activity is given to agencies for organizing workshops, seminars, training programmes, National Advisory Council meetings, publications, awareness campaigns, etc.

Institutional Awards/ Incentives

1. An annual award of shields or certificates is given to 5 star rated buildings.
2. Cash prize of ₹ 50 Lakhs to municipal corporations and ₹ 25 Lakhs to municipalities/ other urban local bodies (one each to them) for taking the best initiative is promoting green buildings in their areas.

From the provider's (here government agencies) point of view, the efforts may be praiseworthy, but it must explain why the consumer – mostly including individual owners of residential property must embrace it? It is also evident that tangible incentives for developers or owners are limited to photovoltaics and tax rebate of GRIHA-rated buildings in urban areas. On contrary, Indira Awas Yojana for rural poor recommends use of green or local materials and technology,^[25] but carries no extra benefit over non-green options.

Hence, it can be concluded that, present urban sprawl propelled by individual owners or developer which is taking place at fringe areas of cities are nowhere covered by green incentives. Moreover, vernacular houses catering to more than 70% of the country's population are slowly losing their local or rather climate responsive character and hence their green potential. For example, from 2001–2011, thatched houses in rural India have

declined substantially from 27.5–20.7%, while proportion of houses with concrete roofs has hiked from 11.9 to 18.5%.^[26] To prevent such unplanned urbanisation, it is of paramount interest to raise awareness among common people and attract them through tangible incentives. It is more effective than mandates especially in Indian scenario as here strict implementation of bylaws is not always feasible.

INCENTIVES THAT WORK – A CASE STUDY OF SINGAPORE

In this regard, the green movement of Singapore is reviewed as the country has already reduced its per capita CO₂ emission from 15.6 metric ton in 1990 to 8.0 metric ton in 2007^[2] in spite of the hurdles of high population density, limited natural resources and multi-ethnicity. This is primarily due to the strong supports from Inter-Ministerial Committee on Sustainable Development provided strong supports.

These can be broadly classified as^[20]:

1. Priority in procession the permit and plan review, sometimes with a requirement for posting a bond to guarantee the result.
2. Tax incentives, particularly property tax abatement for certified projects.
3. Increased floor-to-area (FAR) ratios, allowing a developer to build more area than allowed and make more profit.

The various government organizations actively participating in the sustainability drive in Singapore are listed as follows and various funds or grants offered by them are briefly noted in Table 1.^[27] This list excludes incentives for sustainable transportation.

A*Star

Agency for Science, Technology & Research (www.a-star.edu.sg)

BCA

Building and Construction Authority (www.bca.gov.sg)

CEPO

Clean Energy Programme Office (www.rita.nrf.gov.sg)

EDB

Economic Development Board (www.edb.gov.sg)

EMA

Energy Market Authority (www.ema.gov.sg)

EWI

Environmental & Water Industry Development Council (www.ewi.sg)

MND

Ministry of National Development (www.mnd.gov.sg)

NEA

National Environmental Agency (www.nea.gov.sg)

Nparks

National Parks Board (www.nparks.gov.sg)

PUB

Public Utilities Board (www.PUB.gov.sg)

SPRING

Standards, Productivity & Innovation for Growth Board (www.spring.gov.sg)

URA

Urban Redevelopment Authority (www.ura.gov.sg)

Table 1. List of Active Sustainability Grants in Singapore.

Name of scheme	Agency	Details of scheme
Energy efficiency		
Energy Efficiency Improvement Assistance Scheme (EASe)	NEA	50% (up to S\$62 million) of qualifying cost over a 5-year period to conduct detailed energy audit by accredited Energy Services Companies (ESCOs). For companies in manufacturing and building sector.
Design for Efficiency (DfE)	NEA	80% (up to S\$6 million) funding for large consumers of energy to conduct workshops to design more energy efficient facilities.
Grant for Energy Efficient Technologies (GREET)	NEA	50% (up to S\$62 million) of qualifying cost to invest in energy efficient equipment or technologies. For the Singapore-registered owner or operator of industrial projects with a payback of 3–7 years.
Accelerated Depreciation Allowance Scheme (ADAS)	NEA	Tax incentive to replace old inefficient equipment by energy efficient equipment. Its capital expenditure is written-off in one year instead of three.
Singapore Certified Energy Manager (SCEM) Training Grant	NEA	Subsidized fee for training in energy management. For engineers or managers of manufacturing facilities or buildings who wish to become energy managers.
Clean energy		
Clean Energy Research and Test-bedding (CERT)	CEPO	Gives opportunities for companies to develop and test clean energy applications and solutions using government buildings and facilities in Singapore.
Energy Research Development Fund (ERDF)	EMA	Up to S\$5 million per project to implement new and innovative energy solutions for projects submitted through the Smart Energy Challenge (SEC).
Solar Capability Scheme (SCS)	EDB	30% of total capital cost (up to S\$1 million) for installing solar technologies for new private commercial and industrial buildings. The building must have minimum Green Mark Gold Plus rating by BCA and installed solar system installed of min. 150 kWp.
Green buildings		
Building Retrofit Energy Efficiency Financing (BREEF)	BCA + funding agencies	Up to S\$5 million loan at interest rate of min. 3.5% for 18 months to 8 years is given to existing building owners and ESCOs to conduct energy retrofit such that building can get at least Green Mark certification.
Green Mark Incentive Scheme for Existing Buildings (GMIS-EB)	BCA	50% (up to S\$3 million) cost of energy efficient instrument installation and related professional services. 50% for cost of “health check” or energy audit to find the efficiency of HVAC system. Only for private commercial buildings with (a) min. gross floor area of 2000 sq.m.; (b) central chilled water HVAC system and (c) a valid Green Mark rating.
Green Mark Incentive Scheme – Design Prototype (GMIS-DP)	BCA	70% of the qualifying costs (up to S\$6 million) for developers and building owners to engage consultants for environmentally sustainable design such that through workshops and simulation, energy efficiency is embraced from the early design stage.
Green Mark Gross Floor Area Incentive Scheme (GM-GFA)	BCA + URA	Additional floor area up to 1% – capped to 2500 sq.m. for Green Mark Gold Plus rated buildings. Additional floor area up to 2% – capped to 5000 sq.m. for Green Mark Platinum rated buildings.
Skyrise Greenery Incentive Scheme (SGIS)	NParks	Enhanced version of Green Roof Incentive Scheme (GRIS), 2009. Funding up to 50% of cost for installing green on existing rooftop or walls.
MND Research Fund for the Built Environment	MND + BCA	30% (up to S\$ 2 million) qualifying cost of R&D project on sustainable development, BIPV, etc.
A*STAR-MND Joint Grant	A*STAR + MND + BCA	For any research proposals in green building technologies – jointly conducted by research organizations and private industry.
Sustainable Const. Capability Dev. Fund (SC Fund)	BCA	Up to 50% of the total qualifying cost for adopting sustainable construction methods and materials (demolition waste or other recycled materials).
Water and environmental technologies		

Name of scheme	Agency	Details of scheme
Water Efficiency Fund (WEF)	PUB	50% (up to 50,000) of the feasibility study cost. 90% (up to S\$ 15000) of the water audit cost including water meter installation. Extra 90% (up to S\$ 15000) of the upgrading /installation cost for remote metering 50% (up to S\$ 5000) of cost for organising community-wide water conservation campaigns and programmes. 50% (S\$ 1 million) of the capital cost for recycling/alternative water source facilities.
Incentive for Research and Innovation Scheme (IRIS)	EWI Dev. Council	Funding to develop new environmental and water technologies (EWT). 100% fund for institutes of higher learning (IHL), public sector agencies and non-profit research organization. Up to 70% for companies and for-profit research entities.
TechPioneer Scheme	EWI Dev. Council	70% (up to S\$10 million) of total qualifying costs for users adopting new EWT.
Fast-Track EWT Incubator Scheme (Fast-Tech)	EWI Dev. Council + EDB	85% (up to S\$500000) of qualifying cost over two years to start-up EWT companies which are mentored by specialized incubators.
Innovation and Capability Voucher (ICV)	SPRING	S\$5000 voucher for small and medium enterprises to collaborate with research organizations for testing innovative ideas or products in EWT. It also includes productivity, HR development and financial management in the same field/
Innovation for Environmental Sustainability (IES) Fund	NEA	Part of qualifying cost (up to S\$2 million and max. for 3 years) for companies to implement research projects on environmental protection and public health. The projects must be at the application and test-bedding stage.
Waste minimisation		
3R (Reduce, Reuse, Recycle) Fund	NEA	Up to 80% (max S\$1 million) of the qualifying costs for organisations to implement waste minimisation and recycling projects.
Environment Technology Research Programme (ETRP)	NEA	Seed fund up to \$2 million over max. period of 3 years for R&D type waste management programs given to IHL researchers, public sector agencies, profit and non-profit organizations.
Greenhouse gas reduction		
Quality for Enterprises through Standards (QUEST) Programme	SPRING	70% (up to S\$ 42000) of total cost (includes consultancy, equipment, training, contracting, certification, etc.) for quantification GHG emission for the company. 70% (up to S\$ 70000) of similar total cost for quantification and reduction of GHG emission for the company.
Clean Development Mechanism Documentation Grant	NEA	50% (up to S\$ 1 million) of the qualifying cost to companies for engaging a carbon consultant to develop a new methodology and project design document (PDD). Up to 30% fund for PDD using an existing approved methodology.

From Table 1, it is evident that different government bodies have provided tangible monetary supports for various activities, such as new construction, refurbishment, research, product development, awareness generation, etc. These schemes covers almost all aspects of sustainability, namely, energy efficiency, clean energy, green buildings, water and environment, waste minimization and Greenhouse gas reduction. Most importantly the beneficiaries are mainly individuals or private sectors who initially joined the

scheme for some tangible gain but later on, once the green technologies started paying back, it was considered as a bonus.

That means once the sustainability drive has gained momentum, it will keep moving on whether the incentives exists or not and with time the idea spreads to rest part of the society, but it should be again noted that it is the cash incentives that started the spark.

CONCLUSION

This paper has discussed in details the success factors and barriers for promoting green building guidelines. It was observed that for successful penetration of sustainability drive throughout the Indian society, tangible incentives are must. Recently, such incentives have started here. For example, Andhra Pradesh govt. gives tax rebate for buildings with larger setbacks, solar power, waste water /rain water harvesting and extra parking space. Such rebate can reach up to 50% in Pimpri Chinchwad area of Pune for GRIHA rated buildings.

In Ghaziabad, projects with minimum 3-star GRIHA rating earn 5% extra FAR. At national level, State Bank of India offers reduced rate of Green Home Loan.^[9] But green concept needs to overcome the human barrier of common myths such as:

1. Green buildings are costlier (First cost is little higher but life-cycle cost is low for holistic designs. Cost of green products are decreasing and manufactures are getting enticement);
2. Green buildings are air-conditioned (Importance of other building elements such as facade, lighting, water usage, etc. should be considered instead of blindly using energy simulation software's designed for air-conditioned buildings);
3. (3) Green buildings take more time (It is not during construction, but in refined designing process and statutory approval of any non-conventional design). Such paradigm shift cannot take place overnight, but if incentive-based efforts become persistent, a greener India is very much possible in near future.

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