

“BUILDING”

An Energy Efficient India

A Capstone Project



“Building”

An Energy Efficient India

AN ANALYSIS OF ENERGY EFFICIENCY POLICY INSTRUMENTS
IN THE BUILT ENVIRONMENT

Demonstration of Professional Competence

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Summary

With this world evolving everyday, it is definitely bringing growth and development at a decent rate shifting the natural course of our surroundings, aka climate change but with threat comes opportunities which is helping the world take climate action through various agreements. As they say great things are done by a series of small things brought together, this is what my research hopes to help with. A sustainability organization in the capital of India, New Delhi aims to initiate a program focusing on energy efficiency of commercial buildings in New Delhi and hopefully my research of different policies -

Regulatory

Economic

Voluntary

focusing on energy efficiency in the built environment in different cities in America can be a stepping stone and help the organization formulate their new pilot program.

I bring forward insights from my case studies both that were extremely helpful in the transformation phase to the ones that had hindrances which helped me organize my recommendations into a plan. The recommendations are based on one step at a time principle involving different levels of co-benefits and thus turning into an integrated system eventually. The recommended plan of action after the leveled recommendations is inspired from John Boyd's OODA loop which in this case was a perfect fit for the decision making process.

This research aims to make this complex yet simple topic of energy efficiency in the built environment intelligible to the real estate community, large property owners and tenants, engineering and architecture firms, environmental organizations, non-profit groups, labour unions, and other industry experts in New Delhi and other parts of India.





NEW YORK
Rishika Shrivastava



HOUSTON



CHICAGO

INTRODUCTION

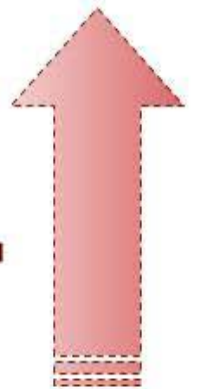
During the past century, rapid strides made by economies worldwide towards development and industrialization have led to an increase in the global carbon footprint. This is demonstrated by the paradigm shift in the attitude of countries party to the ongoing climate action agreements. The Conference of Parties, known as COP, is the decision-making body responsible for monitoring and reviewing the implementation of the United Nations Framework Convention on Climate Change. It brings together the 196 nations and territories – called Parties – that have signed on to the Framework Convention. The COP has met annually since 1995. The 21st Session of the COP (COP21), held in Paris, France, in December 2015, was historic in its outcome – the first international climate agreement¹. On 12 December 2015, 196 Parties to the UN Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement, a new legally-binding framework for an internationally coordinated effort to tackle climate change. The Agreement represents the culmination of six years of international climate change negotiations under the auspices of the UNFCCC².

Secondly, the 2030 Agenda for Sustainable Development Goals is a plan of action for people, planet and prosperity. Its 17 Sustainable Development Goals (SDGs) and 169 targets was adopted on 25 September 2015 by Heads of State and Government at a special UN summit. The Agenda is a commitment to eradicate poverty and achieve sustainable development by 2030 world-wide, ensuring that no one is left behind³. The adoption of the 2030 Agenda is a landmark achievement, providing for a shared global vision towards sustainable development for all. These global agreements reflect the seriousness of countries towards the challenges posed by climate change as well as the way the consequent damages are being discussed and addressed around the world. This renewed ambition to adopt the Paris Agreement, along with the 2030 Agenda for Sustainable Development as key blueprints for the future we want, is a giant gap towards our commitment to combat climate change.



INDUSTRIALIZATION

CARBON FOOTPRINT



DEVELOPMENT



7 AFFORDABLE & CLEAN ENERGY

Ensure access to affordable, reliable, sustainable and modern energy for all



The success of these agreements, depends to a great extent on our adoption of clean energy and energy efficiency which brings us closer to achieving the Sustainable Development Goal 7 - Ensure access to affordable, reliable, sustainable and modern energy for all which includes the following targets:

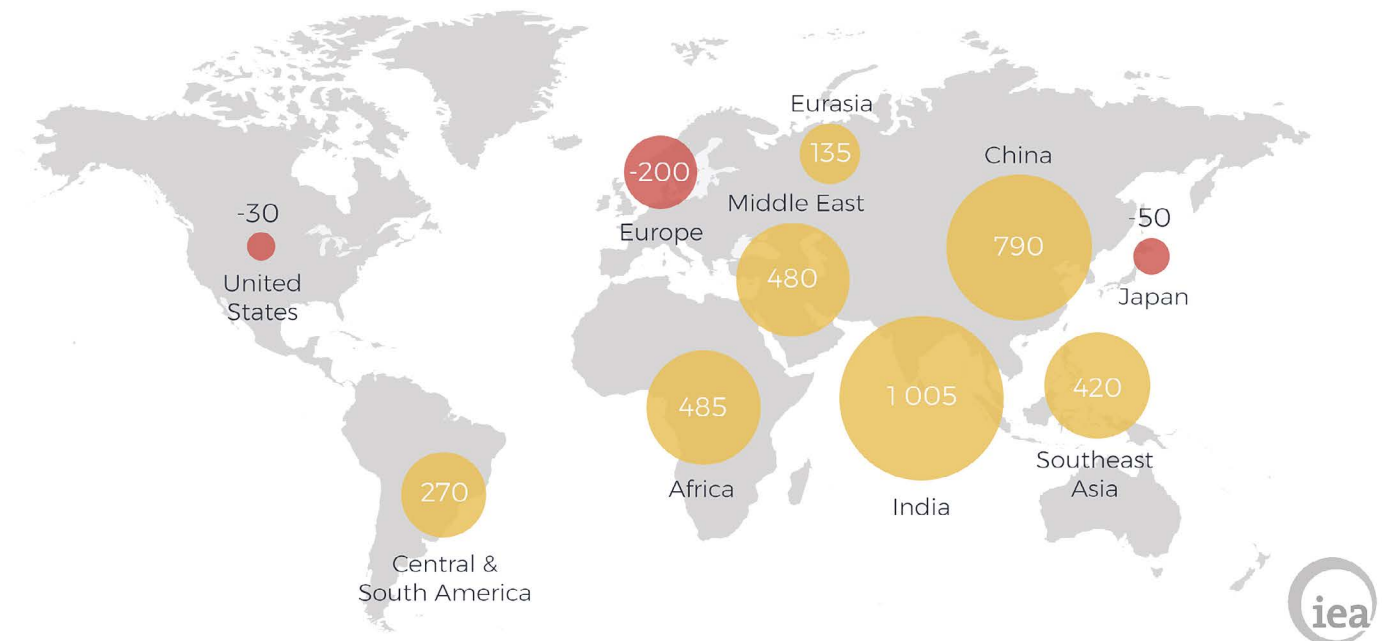
- 7.1 By 2030, ensure universal access to affordable, reliable and modern energy services.
- 7.2 By 2030, increase substantially the share of renewable energy in the global energy mix.
- 7.3 By 2030, double the global rate of improvement in energy efficiency.

TARGET	7-1	TARGET	7-2	TARGET	7-3
UNIVERSAL ACCESS TO MODERN ENERGY		INCREASE GLOBAL PERCENTAGE OF RENEWABLE ENERGY		DOUBLE THE IMPROVEMENT IN ENERGY EFFICIENCY	

Nations agreed in Paris in 2015 to limit the global average temperature rise to as close as possible to a maximum 2 degrees Celsius. This requires reducing energy-related carbon dioxide emissions by more than 70 per cent by 2050 compared to 2015 levels, which can only be achieved with the massive deployment of renewable forms of energy such as wind, solar and hydro, combined with energy efficiency.⁴ This is important not just for universal energy access but for each goal and commitment we as global citizens have set for ourselves.⁵

Global demand for energy continues to rise, led by developing countries such as India and China, which indicates an expanding global economy.⁶

Change in primary energy demand, 2016-40 (Mtoe)
World Energy Outlook 2017



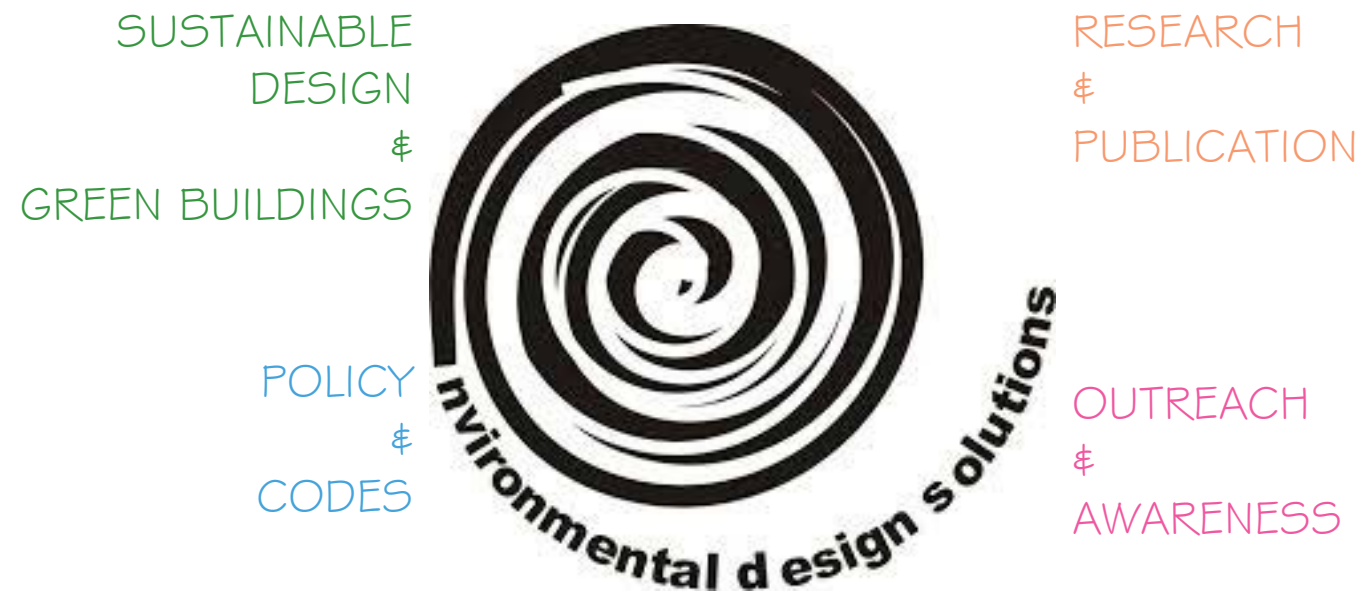
Although development in the energy sector has improved energy access for people, the negative environmental impacts that result from heavy reliance on fossil fuels are compelling most governments across the world to seek more sustainable options to meet the ever-growing energy demand. Governments are now rethinking their respective energy policies and have begun to embrace various forms of clean energy, such as renewable and nuclear energy. While energy is not an end in itself, it is a critical ingredient in all economic endeavours essential for the provision of all human needs including adequate sustenance, shelter and healthcare.⁷

While policy interventions around clean energy take place at their own pace and time, the International Energy Agency (IEA) a Paris-based autonomous intergovernmental organization established in the framework of the Organisation for Economic Co-operation and Development (OECD) in 1974 in the wake of the 1973 oil crisis. The IEA acts as a policy adviser to its member states, but also works with non-member countries, especially China, India, and Russia. The Agency's mandate has broadened to focus on the "3Es" of effectual energy policy: energy security, economic development, and environmental protection. The IEA has a broad role in promoting alternative energy sources (including renewable energy), rational energy policies, and multinational energy technology co-operation.⁸ The organization proposes an alternate approach where comprehensive policy can complement cheap renewable energy and limit warming to safe levels by electrifying transportation and industry using renewable energy and expanding energy efficiency measures.⁹

Furthermore, many policy makers consider energy efficiency to be a priority for achieving various energy goals, including improved energy security and energy access, reduced air pollution and fuel poverty, employment growth and industrial competitiveness.¹⁰ Also, scenarios for achieving CO2 emissions reductions recognize that energy efficiency will play a critical role.¹¹ Energy efficiency also has significant synergies with renewable energy; together they can achieve more than the sum of their parts. For example, energy savings help renewable energy to meet a higher share of energy demand at a lower cost and open up new markets. It is becoming increasingly clear that energy efficiency needs to be central in energy policies around the world.

All of the core imperatives of a comprehensive energy policy – reducing energy bills, decarbonisation, air pollution, energy security, and energy access – are made more attainable if led by strong energy efficiency measures. As the world transitions to clean energy, the adoption of energy efficiency can make the transition cheaper, faster and more beneficial across all sectors of our economies. At present, there is no realistic, or affordable energy development strategy in progressive economies that is not led by energy efficiency.¹²

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Environmental Design Solutions [EDS] is a private sustainability advisory firm focusing on the built environment. Since its inception in 2002, EDS has worked on over 250 green building and energy efficiency projects worldwide. The diverse milieu of its team of experts converges on

- Climate change mitigation policies,
- Energy efficient building design,
- Building code development,
- Energy efficiency policy development,
- Energy simulation and
- Green building certification

Back in 2001, Anamika Prasad saw a gaping hole in the profession — a dearth, so to speak, of analytical expertise for designing energy and environmentally conscious buildings in India. This lacuna offered the alumnus of SPA (B.Arch, Delhi) and Arizona State University (Masters) an impetus to start Environmental Design Solutions (EDS) — but only after investing more than a decade working with a few global cutting-edge architecture firms. Soon she was joined by Gurneet Singh (architecture graduate from Chandigarh College of Architecture and Masters from International Institute of Information Technology, Hyderabad) and Tanmay Tathagat (also from SPA, with a Masters degree from the Arizona State University) as directors.

Tathagat reminisces, “EDS started off with offering design assistance and energy modelling as part of some of the first few certified green buildings in the country.” The firm soon became an indispensable part of collaborative design teams, integrating passive design, energy efficiency, daylighting, mechanical system design, and overall thermal comfort for hundreds of buildings in the first five years of EDS’s existence, and their work accounted for over 70% of the buildings certified green in those years.

EDS has extensive experience in providing sustainable solutions at both, the macro level of policy advisory and planning, as well as a micro level of developing standards and labeling for products and appliances. The scope of EDS projects range from international and national level policy and code formulation to building-level integration of energy-efficiency parameters. EDS team has worked on developing the Energy Conservation Building Code [ECBC] in India and supporting several other international building energy code development, training, impact assessment, and implementation. EDS has the experience of data collection & analysis, benchmarking, energy savings analysis, GHG impact assessment, and developing large scale implementation programs.

EDS’ work supports the global endeavour towards a sustainable environment primarily through the following broad categories:

Sustainable Solutions for the Built Environment.

Strategy Consulting for Policy & Codes, and Research.

Outreach, Communication, Documentation, and Training.¹³

To add up to their list of developments in the built environment, they are planning to propose a program for a range of energy efficient buildings.

RESEARCH QUESTION

The aim of this research is to analyse commercial building energy efficiency policy instruments in order to produce a useful resource for the client, bringing them closer to their plans of initiating a new program development for energy efficient buildings or considering enhancing current ones in collaboration with BEE. During the process I will be -

Analysing the following energy efficiency policy instruments:

Regulatory - Regulatory policy is about achieving government's objectives through the use of regulations, laws, and other instruments to deliver better economic and social outcomes and thus enhance the life of citizens and business.

Economic - An economic policy is a course of action that is intended to influence or control the behavior of the economy. Economic policies are typically implemented and administered by the government.

Voluntary - Voluntary approaches are schemes whereby firms make commitments to improve their environmental performance. They cover arrangements such as public voluntary programmes, negotiated agreements or unilateral commitments.

Where also, I will be bringing attention to their implementation process along with the challenges and strengths of these programs. As for any city, the challenge is to find the combination of policies that will most improve the energy efficiency of its building stock, thereby playing a part in the global fight against climate change, hence aiming to provide few recommendations considering the positive and negative aspects of the evaluated programs after the overall analysis. Finally, hoping this resource helps enhance policy efforts of EDS in the capital of India, for initiating a new program bringing them closer to their plans of developing a policy for energy efficient commercial buildings ending up with a mandatory city level regulation to reduce building based GHG emissions and moving forward with their climate action in the country.

OBJECTIVES

- To classify and evaluate the policy instruments of New York City focusing on the commercial building sector and covering the progression of these programs from start to end and strengths/weaknesses of these policies.
- To critically assess the energy efficiency policies being followed in New Delhi for energy efficient commercial buildings and its drawbacks.
- To make recommendations from the above mentioned analysis for a proficient and valuable resource for the advancement of energy efficient program in New Delhi.

INSERTION POINTS

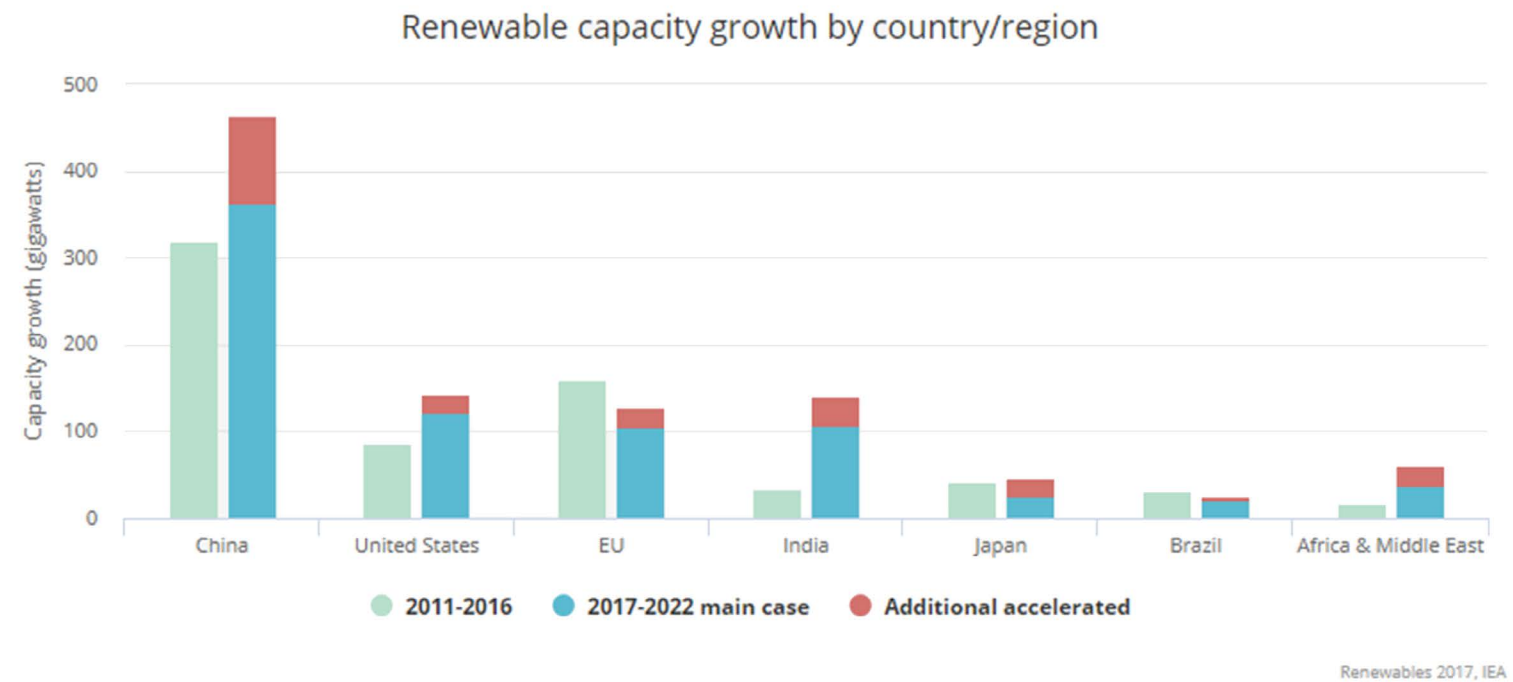
Energy efficiency is the measure of energy services delivered relative to energy input. Energy efficiency is gained when more energy services are delivered for the same energy input, or the same amount of services are delivered for less energy input.¹⁴

Buildings consume about 40% of the overall energy consumption, worldwide and correspondingly are also responsible for carbon emissions. Since, last decade efforts have been made to reduce this share of CO₂ emissions by energy conservation and efficient measures.¹⁵ Commercial buildings are among the major consumers of energy in any country¹⁶; energy consumption is a complex issue due to a wide variety of uses and energy services, therefore the energy demand needs to be understood. To manage the environment sustainably, the role of the built, and particularly the urban environment is crucial. While buildings provide the essential infrastructure for civilization and our need for shelter, they also create an ecological threat in terms of resource consumption and depletion, air quality, and pollution of soil and water.¹⁷ Considerable effort across policy, academia and industry has therefore gone into improving the energy efficiency of buildings. In spite of these efforts CO₂ emissions are continuing to rise, with the International Energy Agency (IEA) suggesting that emissions are on track to double by 2050.¹⁸ It is essential to act now, because buildings can make a major contribution to tackling climate change and energy use and also, the advantages of energy efficiency are well reported, with positive impacts on society, the environment, health and wellbeing, and the economy.¹⁹

Energy-efficient technologies and solutions can offer one of the most cost-effective ways of reducing energy costs, improving energy security, reducing local air pollution and mitigating climate change.²⁰

“ Efficiency involves reduced energy consumption for acceptable levels of comfort, air quality and other occupancy requirements, including the energy used in manufacturing building materials and in construction.”²¹

Although India has made rapid strides towards renewable energy by significantly increasing progress as far as solar and wind power is concerned,

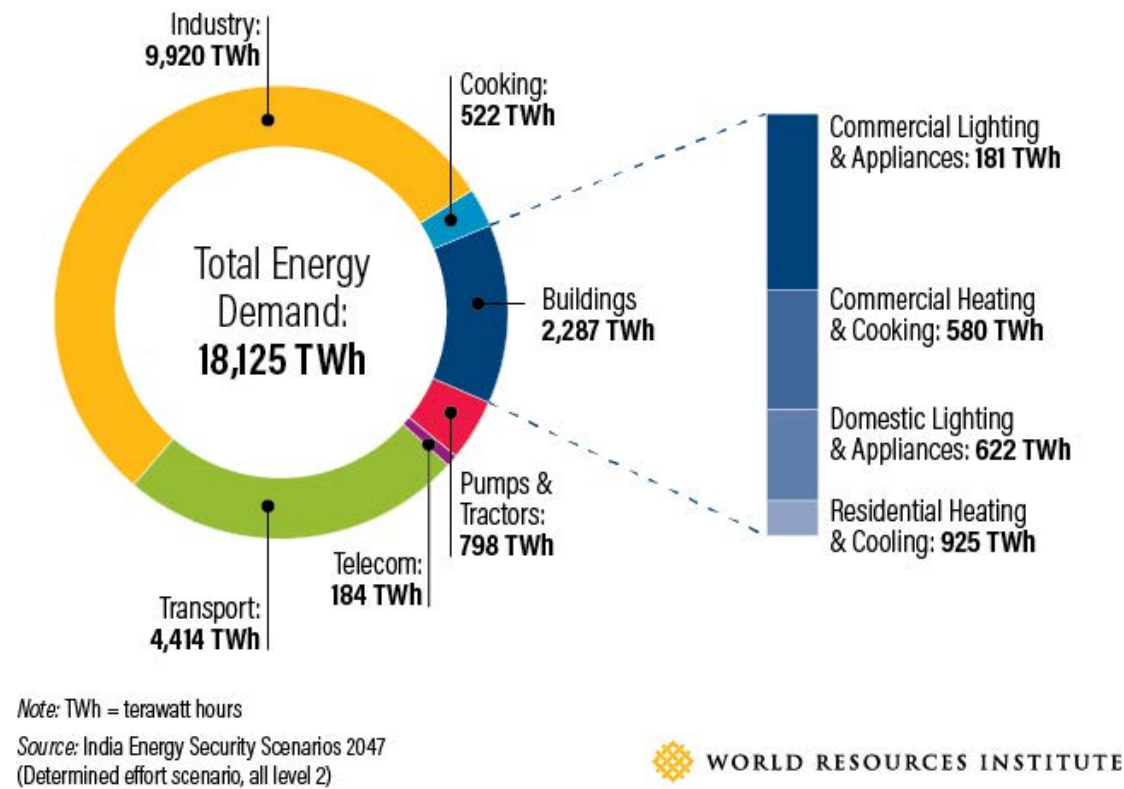


the fact remains that it will remain a predominantly fossil-fuel driven economy in the years to come.²²

Keeping this inescapable truth in mind, the Government of India, along with active support from its citizens, has kick-started a revolution in energy efficiency by introducing scalable and replicable demand side management initiatives. The country has not only established a comprehensive policy for energy efficiency – National Mission for Enhanced Energy Efficiency (NMEEE), but has also executed successful demand side management programmes for consumers and municipal corporations to achieve overall energy savings while gradually mitigating the impact of climate change. The Government’s Unnat Jeevan By Affordable LEDs and Appliances for All (UJALA) scheme is implemented by Energy Efficiency Services Limited (EESL), a super Energy Service Company (ESCO) under the Ministry of Power. UJALA, the world’s largest zero-subsidy LED bulb programme for domestic consumers, is an example of a successful energy efficiency programme, designed to help the country achieve sustainable development by reduction of carbon footprint.²³

India’s buildings are power guzzlers. Residential and commercial structures consumed nearly a third (32 percent) of the country’s total electricity in 2016, according to the latest annual energy statistics published by the Ministry of Statistics, Planning and Implementation. And as Indian cities grow, building energy demand is sure to surge. The government’s policy agency, Niti Aayog, estimates that energy demand from India’s buildings will increase by more than 800 percent in 2047 compared to 2012.

India's Projected Energy Demand by 2047



Under the current standards, the country will face higher energy costs and skyrocketing consumption for decades. At the same time, air pollution will worsen, adding to the impact of climate change and taking its toll on the economy in several ways: it costs human lives, it reduces people's ability to work, it affects vital products like food, it damages cultural and historical monuments, it reduces the ability of ecosystems to perform functions societies need and it costs money in remediation or restoration.²⁴ Managing the demand from building energy use while ensuring high quality of life has been a key challenge for policy makers. Government of India has also highlighted the value of building energy efficiency in mitigating climate change as a part of its climate plan. However, with a period of 30 to 40 years, the expanding inefficient stock of buildings will only end up demanding more energy leading to higher power generation, which is capital and resource intensive. This rising energy demand is a potential opportunity for India to set itself on a course of planned growth in building energy use and India definitely needs better building efficiency policies and programs now.

TARGET CITY

NEW DELHI INDIA



New Delhi is an urban district of Delhi which serves as the capital of India and seat of all three branches of the Government of India. The capital of India is a bustling metropolis that has an amazing mix of modernisation and carefully preserved antiquity with a population of 257,803.

Although colloquially Delhi and New Delhi are used interchangeably to refer to the National Capital Territory of Delhi (NCT), these are two distinct entities, with New Delhi forming a small part of Delhi. The National Capital Region is a much larger entity comprising the entire NCT along with adjoining districts in neighboring states.

The foundation stone of the city was laid by George V, Emperor of India during the Delhi Durbar of 1911. It was designed by British architects, Sir Edwin Lutyens and Sir Herbert Baker. The new capital was inaugurated on 13 February 1931 by Viceroy and Governor-General of India Lord Irwin.

New Delhi and surrounding areas were once a part of the Aravali Range; all that is left of those mountains is the Delhi Ridge, which is also called the Lungs of Delhi. While New Delhi lies on the floodplains of the Yamuna River, it is essentially a landlocked city.

The climate of New Delhi is a monsoon-influenced humid subtropical climate bordering a hot semi-arid climate with high variation between summer and winter in terms of both temperature and rainfall. The temperature varies from 46 °C (115 °F) in summers to around 0 °C (32 °F) in winters.

Being the largest commercial city in northern India. It has an estimated net State Domestic Product (FY 2010) of 1,595 billion (US\$22 billion) in nominal terms. As of 2013, the per capita income of Delhi was Rs. 230000, second highest in India after Goa.

In Mercer's 2015²⁶ annual quality-of-living survey, New Delhi ranks at number 154 out of 230 cities due to bad air quality and pollution. The World Health Organization ranked New Delhi as the world's worst polluted city in 2014 among about 1,600 cities the organisation tracked around the world. In 2016, United States Environmental Protection Agency listed New Delhi as the most polluted city on Earth.



ENERGY EFFICIENT BUILDING POLICIES IN NEW DELHI

ENERGY CONSERVATION BUILDING CODE

The Government of India has taken steps to improve energy efficiency in buildings. The enactment of the Energy Conservation Act in 2001 has led to the establishment of the Bureau of Energy Efficiency (BEE) and the development of ECBC. ECBC, launched in 2007, is the first building energy code in India. It applies to new commercial buildings with a connected load of over 100 kW-h or a contract demand of over 120 kV-amperes. ECBC prescribes minimum energy performance standards for the building envelope, heating, ventilation, and air-conditioning (HVAC) system, interior and exterior lighting, and service hot water in each of the five climatic zones in India. It also sets energy efficiency requirements for building electric power and motors. ECBC allows buildings to comply through three methods: prescriptive, simple trade-off, and whole building performance. While the simple trade-off method allows for trade-offs among envelope components, the whole building performance method is meant for flexibility within the entire building system as long as its overall energy performance is equivalent to or better than a standard ECBC-compliant building.²⁷ All large national public buildings are now required to comply with ECBC. ECBC has been adopted in 7 states, Delhi being one and 16 states are in the process of adopting ECBC.²⁸



ENERGY CONSERVATION BUILDING CODE [ECBC]- New Commercial Buildings



Bureau of Energy Efficiency
Government of India

RATING METHODS

In addition to ECBC, there are voluntary programs to encourage the development of efficient and sustainable buildings, such as the Green Rating for Integrated Habitat Assessment (GRIHA), BEE Star Rating, and the Leadership in Energy and Environmental Design (LEED).

GRIHA is a building rating program that is widely implemented in India. It is applicable to new buildings with floor space of over 2500 m². Eligible buildings include offices, retail buildings, institutional buildings, hotels, hospitals and healthcare facilities, and multi-family high-rise buildings. The rating system includes 34 criteria in site planning, resource utilization and conservation, building operation, as well as innovation designs. The program is executed by the GRIHA Council, which was founded by the Energy and Resources Institute with the support of the Indian Ministry of New and Renewable Energy. There are currently 700 projects on record that are registered with the GRIHA system.²⁹

BEE Star Rating is a voluntary program to assess and rate energy performance of existing commercial buildings. The buildings are rated on a 1- to 5-star scale based on their operational energy consumption (i.e. energy consumption per unit of floorspace per year), where 5-Star represents the most energy efficient buildings. Currently, there are about 150 buildings rated by the BEE Star Rating program.³⁰

LEED, the green building rating certification system, evaluates a building based on multiple aspects, including sustainability, water efficiency, energy, resources, indoor environmental quality, and innovation, and throughout the building's planning, construction, maintenance, and operation. LEED certification can be applied to all types of buildings, ranging from homes to commercial office buildings. The number of LEED certified buildings increased rapidly in India in the past few years. In 2015, India ranked 4th on the list of countries with LEED certified buildings.³¹



CASE STUDY

NEW YORK NY



The City of New York, often called New York City or simply New York, is the most populous city in the United States. With an estimated 2017 population of 8,622,698 distributed over a land area of about 302.6 square miles (784 km²), NYC is also the most densely populated major city in the United States. Located at the southern tip of the state of New York, the city is the center of the New York metropolitan area, the largest metropolitan area in the world by urban landmass and one of the world's most populous megacities. Home to the headquarters of the United Nations, New York is an important center for international diplomacy.³²

Situated on one of the world's largest natural harbors, New York City consists of five boroughs, each of which is a separate county of the State of New York. The five boroughs – Brooklyn, Queens, Manhattan, The Bronx, and Staten Island – were consolidated into a single city in 1898. In 2017, the New York metropolitan area produced a gross metropolitan product (GMP) of US\$1.73 trillion. If greater New York City were a sovereign state, it would have the 12th highest GDP in the world.

New York City traces its origins to a trading post founded by colonists from the Dutch Republic in 1624 on Lower Manhattan; the post was named New Amsterdam in 1626. In the 21st century, New York has emerged as a global node of creativity and entrepreneurship, social tolerance, and environmental sustainability, and as a symbol of freedom and cultural diversity.³³

GREENER GREATER BUILDINGS PLAN

The Greener, Greater Buildings Plan (GGBP) implemented by the city of New York is one of the most comprehensive building energy efficiency policies in the world. It consists of four regulatory pieces supplemented by job training opportunities and a financing entity called the New York City Energy Efficiency Corporation (NYCEEC). It includes a requirement that large buildings annually benchmark their energy performance (LL84); that a local energy code be adopted (LL85); that every 10 years these buildings conduct an energy audit and a retro-commissioning (LL87); and that by 2025, the lighting in the non-residential space be upgraded to meet code and large commercial tenants be provided with sub-meters (LL88)

Local Law 84: Benchmarking

The first step to making a building more efficient is to understand how much energy it uses and how its usage compares with that of similar buildings. Therefore, the Greener, Greater Buildings Plan (GGBP) requires owners of large buildings to annually measure their energy consumption in a process called benchmarking. Local Law 84 (LL84), the first law in GGBP, standardizes this process and captures information with the U.S. Environmental Protection Agency's (EPA) free online benchmarking tool called Portfolio Manager. LL84 will give building owners and potential buyers a better understanding of a building's energy and water consumption, eventually shifting the market towards increasingly efficient, high-performing buildings.

In summary, LL84's annual benchmarking process requires the following:

Determine if a building needs to be benchmarked. For a list of "Covered Building" please follow the link and download the file.

Measure the building's energy and water use with an online benchmarking tool.

Submit usage data online annually to the City by May 1.

Violations for Failed Compliance

The City is authorized to issue a violation for any listed building that has not provided a benchmarking report. Failure to benchmark by May 1 will result in a violation and a penalty of \$500. Continued failure will result in additional violations on a quarterly basis and a penalty of \$500 per quarter with a maximum of \$2,000.

Local Law 85: NYC Energy Conservation Code (NYCECC)

As national and state energy laws become updated periodically, New York City's energy laws must also be updated to reflect equal or more stringent regulations. No longer exempting renovations affecting less than half of the building system, Local Law 85 (LL85), the second law in the Greener, Greater Buildings Plan (GGBP), now requires buildings to meet the most current energy code for any renovation or alteration project. LL85's requirement is based on a series of local energy laws, collectively called New York City Energy Conservation Code (NYCECC). NYCECC currently comprises the 2010 Energy Conservation Construction Code of New York State (ECCCNYS), Local Law 85 of 2009, Local Law 48 of 2010 and Local Law 1 of 2011.

Local Law 87: Energy Audits & Retro-Commissioning

The intent of this law is to require buildings to undertake the audits that lead to energy efficiency retrofits, which generally result in major cost and energy savings. Local Law 87 (LL87) mandates that buildings 50,000 gross square feet or larger undergo periodic energy audit and retro-commissioning measures, as part of the Greener, Greater Buildings Plan (GGBP).

LL87 requires large buildings to undergo an energy audit once every 10 years, along with retro-commissioning to "tune up" the building's existing energy systems and ensure efficient operation. The information, which will be compiled in an energy efficiency report, will be broken down into five categories:

- Basic team information
- General building information
- Energy end use breakdown
- Energy conservation measures from the audit
- Retro-commissioning data

In alignment with annual benchmarking, these measures will work to optimize buildings' energy performance.

Local Law 88: Lighting Upgrades & Sub-metering

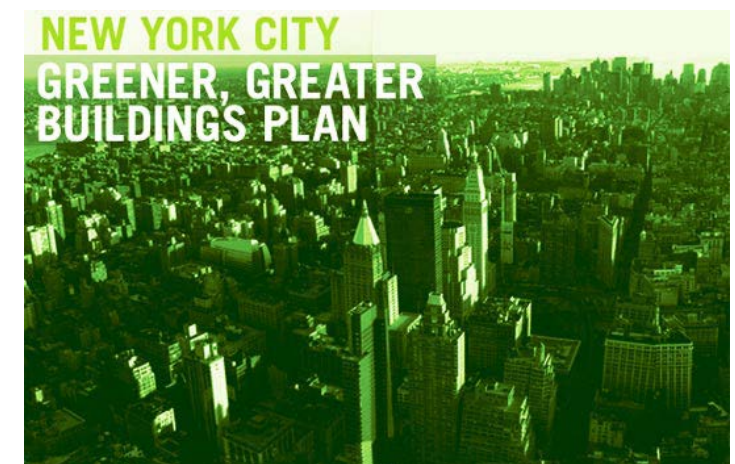
LL88 requires large non-residential buildings to upgrade lighting to meet current New York City Energy Conservation Code standards, and to install electrical sub-meters for each large non-residential tenant space and provide monthly energy statements.

Timeline

Preparations for GGBP took place over a total of approximately 15 months in a process consisting of extensive in-house research, stakeholder meetings and public consultation. Research into characteristics of the New York building stock, benchmarking measures in other cities and potential impacts was conducted with support of the PlaNYC Sustainability Advisory Board. Throughout this preparation phase, staff from the Mayor's Office of Long-Term Planning and Sustainability (OLTPS) led by coordinating both the overall conception and detailed design of the programme design. This role was supported by assistance from the Department of Finance (DOF), the Department of Buildings (DOB), the Department of Environmental Protection (DEP) and the Department of Citywide Administrative Services (DCAS). Technical support for the ENERGY STAR Portfolio Manager was also provided by the US Environmental Protection Agency (EPA). GGBP was officially enacted in December 2009.

The regulatory measures mentioned are joined by two supplementary components that help provide the real estate industry with the tools needed to comply. The first focuses on creating a trained workforce that can reliably deliver improved energy performance. And the second utilizes New York City's federal stimulus funding to create an innovative energy efficiency financing cooperation to provide funds for energy upgrades.

In addition to the resources provided to all building owners for compliance, GGBP also includes extension and exemption provisions in its audit and retro-commissioning piece of legislation. A building considered to be subject to substantial financial hardship under specific provisions will be eligible for extensions in meeting its auditing and retro-commissioning requirements. Certain residential properties including one to three family homes, and condos and co-ops with no more than three dwelling units are exempt. GGBP is a comprehensive, mandatory policy that targets this problem by addressing energy efficiency in large, existing whole buildings throughout New York City.³⁴



ONE CITY: BUILT TO LAST - NYSERDA INCENTIVE PROGRAMS

During NYC Climate Week 2014, Mayor de Blasio announced New York City's bold commitment to reduce citywide emissions by 80 percent by 2050 from a 2005 baseline (80 by 50). As a key first step toward this new goal, New York City released on the same day One City: Built to Last³⁵ (Transforming New York City's Buildings for a Low-Carbon Future), a ten-year action plan to improve the energy efficiency of New York City buildings by 2025. One City: Built to Last aims to reduce citywide emissions from energy used in buildings by 30 percent by 2025, and requires public buildings to lead by example by reducing 35 percent of emissions by 2025.

To achieve these goals, New York City will:

- Complete efficiency improvements in every City-owned building that has significant energy use and install 100 megawatts (MW) of onsite renewable power.
- Implement leading edge performance standards for new construction that cost-effectively achieve highly efficient buildings, looking to Passive House (Passive house³⁶ (German: Passivhaus) is a rigorous, voluntary standard for energy efficiency in a building, which reduces the building's ecological footprint. It results in ultra-low energy buildings that require little energy for space heating or cooling), carbon neutral, or "zero net energy" strategies to inform the standards.
- Develop interim energy performance targets for existing buildings to be met through both voluntary reductions and new regulations, such as performance standards and measure-based mandates, which would be triggered if adequate reductions are not achieved.

By accelerating energy efficiency across the city, the plan will put New York City on a pathway to 80 by 50.

The plan adheres to five guiding principles:

- Lead by example.
- Empower New Yorkers to take action.
- Hold New York City's buildings to the highest energy performance standards.
- Ensure benefits are shared by New Yorkers in every neighborhood.
- Use data, analysis, and stakeholder feedback to drive the approach.

The initiatives within the plan fall under the following themes:

1. **Public Buildings as Models for Sustainability**
2. **A Thriving Market for Energy Efficiency and Renewable Energy**
3. **World Class Green Building and Energy Codes**
4. **A Global Hub for Clean Energy Technology and Innovation**

The flagship program for private buildings announced in the plan is the NYC Retrofit Accelerator, a one-stop resource provided by the City to help owners and operators of privately owned buildings reduce operating costs and increase the sustainability of their properties through energy and water upgrades. Additional initiatives include implementing deep retrofits in key City buildings, strengthening requirements for new construction and renovations, bringing solar power to new neighborhoods, and launching the Buildings Technical Working Group and technical study to determine next steps for the building sector to reach 80 by 50.

NYSERDA Incentive Programs³⁷

The New York State Energy and Research and Development Authority is a public benefit corporation that helps New York meet its energy goals and is funded through various means, Federal and State funds, as well as Systems Benefit funds from utility ratepayers. Those goals include reducing energy consumption, promoting energy efficiency, encouraging the use of renewable energy sources, and protecting the environment. The programs for Commercial buildings include:

- Existing Facilities Program
- FlexTech Program
- Commercial Tenant Program
- Energy Audit Program
- Solar PV Program Incentives
- Solar Thermal Program Incentives



NYC CARBON CHALLENGE

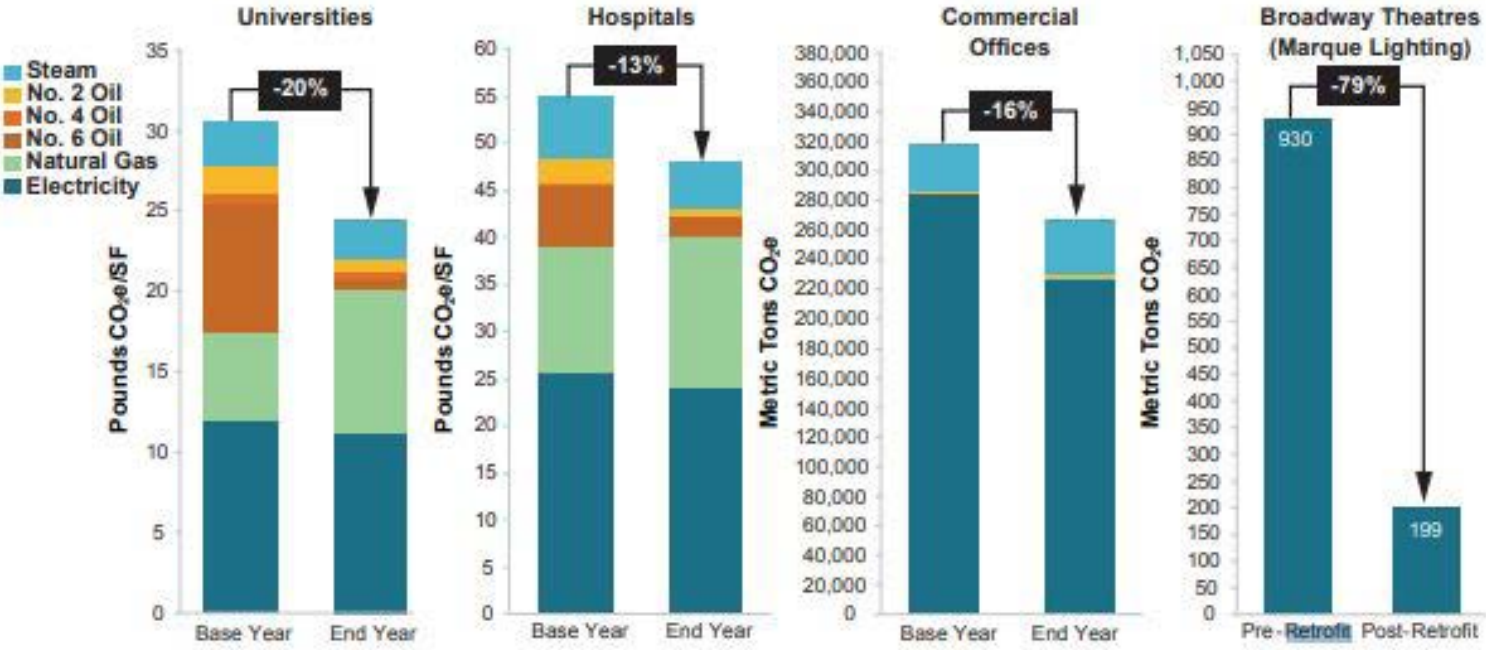
The NYC Carbon Challenge³⁸ is a voluntary leadership initiative and public-private partnership between the NYC Mayor’s Office and leaders in the private, institutional, and non-profit sectors who have committed to reduce their greenhouse gas emissions by 30% or more over ten years. The Mayor’s Office provides programmatic support and resources to assist participants in their efforts to reduce GHG emissions and help the City achieve its goal of reducing citywide emissions 80% by 2050. Participants are recognized, promoted, and celebrated for their progress in the program as they pursue different energy efficiency improvements, efficient on-site generation, and sustainability initiatives.

Over 100 participants have taken the NYC Carbon Challenge pledge, including the City’s largest universities, hospitals, commercial owners and tenants, residential property management firms, hotels, and retail organizations. In total, current participants account for over 500 million square feet of real estate, or more than 9 percent of citywide building square footage.

The NYC Carbon Challenge works by inspiring a high-level commitment within organizations. As participants explore new ideas and opportunities to meet the Challenge goal, they will also reveal effective strategies for energy efficiency that can be scaled up across New York City and beyond.



Emissions Reductions by NYC Carbon Challenge Participants



Source: New York City Mayor’s Office of Long-Term Planning and Sustainability

Progress

The Carbon Challenge participants have moved aggressively to cut their energy use and emissions. In fact, 21 participants have already met the 30 percent goal, and 19 universities, hospitals, and commercial offices have expanded their commitment to a 50 percent or greater reduction by 2025. Altogether, participants have cut their annual emissions by 580,000 metric tons of carbon and are collectively saving almost \$190 million annually in lower energy costs. By the end of the program, current participants are projected to reduce citywide emissions by nearly 1,500,000 metric tons of carbon dioxide equivalent—the equivalent of taking more than 300,000 cars off the roads – and result in an estimated \$700 million in energy cost savings.³⁹

CASE STUDY

CHICAGO IL

RETROFIT CHICAGO ENERGY CHALLENGE



The Retrofit Chicago Energy Challenge⁴⁰ (“the Challenge”) encourages, supports and celebrates voluntary energy efficiency leadership among large commercial, institutional, and private buildings throughout the City of Chicago. In partnership with diverse public, nonprofit and private stakeholders, the Challenge motivates and guides voluntary action towards reducing energy consumption by 20% over five years. The Challenge provides direct support and peer networking to help participants achieve their energy goals. Additionally, it facilitates best practise sharing and showcasing of ambitious energy leadership and impact.

As mapped out in the Chicago Climate Action Plan (CCAP) created in 2008, the City of Chicago aims to reduce CO2 emissions by 25% by 2020 and 80% by 2050, compared to 1990 levels.

Program Overview

Since its launch in 2012, the Challenge has sought to motivate large buildings to commit to the pursuit of a common energy reduction target. Participating buildings make a public commitment to improve energy efficiency by 20% within five years of joining the programme. Their participation involves sharing progress and serving as ambassadors to other buildings seeking to save energy and operating costs. The Challenge assists participating buildings in overcoming barriers to improving energy efficiency and delivering successful energy retrofit projects. It provides direct support to managers and owners, facilitates best practice sharing among buildings, and in parallel, seeks to foster voluntary energy efficiency leadership across the building industry.

The Challenge is a collaboration between the City of Chicago and a host of public, nonprofit and private organisations. These include the C40 Cities Climate Leadership Group, Natural Resources Defense Council, City Energy Project, Institute for Market Transformation, Environmental Defense Fund, Alliance to Retrofit Chicago Higher Education, Rocky Mountain Institute and Midwest Energy Efficiency Alliance. Initial recruiting for the Challenge drew upon pre-existing relationships among city officials, public interest groups, building owners, management, design firms, utilities and energy service providers.

Rishika Shrivastava

To join the Challenge, a senior representative of building ownership or management sends a letter to the Mayor’s Office stating a commitment to the following goals:

- Reduce energy usage in one or more buildings by at least 20% within five years
- Begin energy efficiency work within six months
- Track progress using the U.S. Environmental Protection Agency (EPA) ENERGY STAR Portfolio Manager (henceforth Portfolio Manager) and share best practices with the public
- Serve as ambassadors to other buildings interested in increasing energy efficiency

The specific goal of reducing energy usage by 20% within five years in each participating building is central to the Challenge’s success and credibility. It provides a clear, quantitative target for guiding voluntary efforts to improve the energy performance of individual buildings. It also motivates participants to continue taking action due to the commitment they have made publicly. At the same time, this individual building commitment fosters a shared sense of ambition, solidarity and responsibility among all participants as the Challenge tracks and shares collective energy savings.

Timeline

The programme launched in June of 2012 with a public announcement by Mayor Emanuel and U.S. Energy Secretary Steven Chu. The 14 founding participants represented 14 million ft² of commercial office and hotel space. The Challenge has since seen three major expansions, attracting 18 additional building participants in both 2013 and 2014 and 12 additional participants in 2016. This has brought total participation to 62 buildings and 43 million ft². However Mayor Emanuel has since announced the city’s intention to continue expanding the number of participants in the programme to around 80 by mid-2017. The Challenge was shaped through conversations between many key stakeholders including the Mayor’s Office, local and regional electric and gas utilities, the Natural Resources Defense Council, C40 Cities Climate Leadership Group, the Joyce Foundation, private sector design and engineering services firms, and other mission-aligned non-profit organisations and foundations.

Existing local and national voluntary energy efficiency initiatives at that time - as well as efforts to improve energy performance of Chicago’s municipal buildings - provided a frame of reference and inspiration for the programme.

CASE STUDY

HOUSTON TX

HOUSTON GREEN OFFICE CHALLENGE

Instead of relying on the power of legislation, the voluntary Houston Green Office Challenge⁴¹ seeks to advance a holistic pursuit of office and building sustainability in energy and water consumption, as well as waste. It also addresses employee behaviour such as modes of transport and engagement to green office practices.

Program Overview

The Houston Green Office Challenge (HGOC) is an annual, voluntary challenge initiated in the Autumn of 2010, officially beginning in January 2011. It consisted of a partnership between the Mayor's Office of Sustainability in Houston, ICLEI-Local Governments for Sustainability and the Clinton Climate Initiative. This initiative seeks to engage commercial property managers, building owners and office tenants in a friendly, voluntary competition that guides participants towards sustainability and greener building management whilst recognising outstanding achievement. The areas targeted by the programme are: energy and water consumption, waste outputs, transportation, building management/tenant engagement and employee outreach. At present, the programme has mobilised 375 buildings and tenants—representative of approximately 75 million sq ft—who disclose data and information to the City of Houston for appraisal. At the end of the first year, high achievements were acknowledged through awards, attracting high-levels of press and media attention and official mayoral recognition. The overall objective of HGOC is to engage the private sector to reduce energy and water usage and increase waste diversion by fostering leadership from commercial building managers and office tenants in regard to environmental performance and sustainability. Specific goals of the programme are to: (1) foster green building practices by providing sustainability knowledge and tools, educational opportunities and funding for building owners, property managers and tenants and (2) contribute to ambitions to attain the highest number of ENERGY STAR and LEED certified buildings in the nation. Through such objectives, the City is seeking to change its image from just an oil- and gas-centric economy to one where energy diversity is celebrated and renewables and efficiency are embraced.⁴²

HGOC targets building owners, property managers and tenants. All building tenants or property managers located within the city limits are eligible to participate. The focus on commercial buildings comes from the awareness that it is this sector making the most significant contribution to community-wide GHG emissions. For the upcoming 2014 Challenge year, considerations are being made to focus explicitly on Class A, with a special emphasis also on Class B and C commercial properties, for which there is no operative definition:

- Class A: Large and centrally-located, premium office buildings. Usually with more than 500,000 m² of total flooring and a super hard finish on ground floor, which typically has a clear height of more than 30 feet.
- Class B: Smaller buildings, typically around 10-15 years old. Usually located closer to the suburbs.
- Class C: Lower market range of buildings, typically located in suburbs. Includes strip malls and light industrial buildings less than 50,000 m².

For the first Challenge year, the programme has mobilised a total of 375 participants, which together account for approximately 75 million sq ft of building flooring space. As for sustainability impacts, City officials have reported the following:

Reductions in energy consumption by 28 million kilowatt hours;

Reductions in water consumption by 280 million litres

90% of participating tenants recycled in the office, achieving a 40% diversion from the landfill.

In addition, during the same period, well in excess of half the participants adopted various sustainability measures such as flextime and telecommuting policies, bicycle parking and policies to reduce paper consumption.⁴³





ENERGY EFFICIENCY

CITIES	TARGET	REGULATORY	VOLUNTARY	ECONOMIC
ND	TARGET 7-1			
NY		✓		
CH		✓		
HS	UNIVERSAL ACCESS TO MODERN ENERGY	✓		
ND	TARGET 7-2			✓
NY			✓	✓
CH				
HS	INCREASE GLOBAL PERCENTAGE OF RENEWABLE ENERGY		✓	
ND	TARGET 7-3	✓	✓	
NY		✓	✓	✓
CH		✓	✓	✓
HS	DOUBLE THE IMPROVEMENT IN ENERGY EFFICIENCY	✓	✓	

INSIGHTS from CASE STUDIES

Case studies are like condensed action films—full of characters, plot, and conflict. With every case study mentioned above I was able to find information which either made it reach to another level in a positive manner or put a slight delay in their progression. Also, I was able to interview few experts in the field of energy in NYC like Michael Bobker, Director of Building Performance Lab, CUNY; Jim Henderson and Nora Sherman, Project Associates, NYC Benchmarking Help Center; Laurie Kerr, Mayor’s Office of Sustainability and Russel Unger, Executive Director UGC. After thorough analysis of every possible literature I could find and conversations with the industry experts I was able to conclude few negatives and positives in the policy making scenario.

STAKEHOLDER ENGAGEMENT

Stakeholder engagement is the practice of interacting with, and influencing project stakeholders to the overall benefit of the project and its advocates. The successful completion of a project usually depends on how the stakeholders view it.

A core driver of success was a strong stakeholder engagement process. During the design phase, the team consulted with building stakeholders such as developers, owners, tenants, property management companies, institutions, engineering and architecture firms, environmental organizations, non-profit groups, and other industry experts on design aspects. This enabled them to obtain feedback concerning ordinance requirements before the law drafting process was finalised. Promotion and promulgation efforts are required to foster community understanding and compliance.

REAL ESTATE MARKET’S COMPETITIVE NATURE

In any industry and especially in the real estate sales industry, differentiating your services from competitors’ services is a necessity. It’s not a matter of reading a tutorial on how to become a real estate agent or reading the many stories about successful real estate agents online. It’s about finding the path that you’re the best at. Only when you do what you know best can you join the top real estate agents in your market. The competitive nature of the New York real estate industry seems to have had a positive impact on the success of the programme. Owners of large buildings in particular are acutely aware of competition in the real estate market and committed to maintaining the greenest and most efficient buildings possible. The disclosure of benchmarking data has therefore had the effect of stimulating competition.

PARTNER SUPPORT

Project partners are the organisations responsible for carrying out specific project activities in the manner and scope. Moreover, each project partner was responsible for carrying out the activities they are responsible for according to the partnership agreement. Of the various stakeholders involved, a substantial number of organisations became strategic partners for the programme. The various roles assumed included assistance with outreach or training and the provision of expert knowledge and techniques for data cleaning and enhancing reliability. Energy utilities like Con Edison and National Grid have also played a critical role in forming the programs related to benchmarking.

COOPERATION FROM PROFESSIONAL BODIES

Professional bodies can proactively seek to contribute to economic growth even under difficult conditions through an advisory role for business and governments, thereby also helping market confidence and the achievement of government policy objectives, for example with regard to fiscal sustainability. Relations with various professional bodies and organisations such as BOMA (Building Owners and Managers Association) in NYC were important drivers. BOMA had anticipated the enactment of the legislation, with both the international and local chapter supportive of benchmarking, yet opposed to public disclosure. Despite this, the City succeeded in building a good relationship with the BOMA local office and gained their cooperation in reaching out to key stakeholders, once the legislation was passed.

EXISTING SUSTAINABILITY FRAMEWORK

The Sustainability Framework is a way to organize thinking about sustainability as well as inform planning, management, and evaluation of activities in order to improve and maintain health outcomes at a population level and it's implemented by project staff and local stakeholders. The broader vision and targets set out in the strategy helped justify the need to tackle GHG emissions and water and energy efficiency in the apartment sector.

PUBLIC RECOGNITION

Another tactic employed was the use of the City Mayor as the official recogniser of excellence at the awards ceremony. The prospect of receiving formal recognition from the Mayor served as a major boost to competition and participation levels.

COORDINATION between MULTIPLE AGENCIES

Different City agencies are in charge of different aspect of the programme, which is complex to implement. It is therefore crucial that multiple agencies communicate frequently and fully understand each other's role to ensure efficient implementation and reduce risks of miscommunication. To briefly summarise the various departments and roles performed, the Department of Finance (DOF) creates the list of buildings required to comply. While benchmarking results are reported to the Mayor's Office of Long- Term Planning & Sustainability (OLTPS),

COMMUNICATION

Communication plays a fundamental role in all facets of business. It is therefore very important that both internal communication within an organisation as well as the communication skills of the employees are effective. Lack of communication causes unmet expectations. Teams miss deadlines, clients miss appointments, and people on a project do not seem to know what their roles are. When employees have trouble figuring out what their priorities should be, they often choose the wrong thing and end up disappointing their superiors. Without clearly communicated expectations and priorities, it is impossible to know where to start and how to complete a project efficiently. Any programme formation can be attributed to relationship building and constant communication with participants via channels such as email, telephone and face-to-face meetings. Although this was challenging for the office when considering the limited staff available and the large participant base.

OVERCOMING FINANCIAL BARRIER

A barrier is an obstacle which prevents a given policy instrument being implemented, or limits the way in which it can be implemented. In the extreme, such barriers may lead to certain policy instruments being overlooked, and the resulting strategies being much less effective. Financial barriers include budget restrictions limiting the overall expenditure on the strategy, financial restrictions on specific instruments, and limitations on the flexibility with which revenues can be used to finance the full range of instruments. It is important not to reject a particular policy instrument simply because there are barriers to its introduction. One of the key elements in a successful strategy is the use of groups of policy instrument which help overcome these barriers. This is most easily done with the financial and political and cultural barriers, where one policy instrument can generate revenue to help finance another or one can make another more publicly acceptable.

LIMITED RESOURCES

Limited city staff capacity to implement programmes was a major problem. It was reported by city officials that limited staff resources have posed significant challenges during the design and implementation of building energy efficiency programs. Firstly, city officials have had to juggle programme duties with other job responsibilities. Secondly, the outreach, marketing, and relationship building with building owners, required by many of the programmes, were particularly time intensive activities.

This was mostly affected by voluntary challenges, it lacked a full-time team of coordinating and engineering staff and a dedicated budget. As such, it had to rely heavily on pro-bono technical, financial and manpower support and donations from its various partners, as well as external grant funding.

MARKETING and ENGAGEMENT

It proved time consuming and challenging to secure the cooperation of building management services companies who are time poor and generally not committed to identifying opportunities for improving environmental performance for which working with tenants through the City's program proved effective to influence owners from the bottom-up.

LACK OF INTEREST IN ENERGY EFFICIENCY

Many building owners comply with the Benchmarking programme simply because they are mandated to do so by law. Many do not realise or appreciate the importance of monitoring or improving energy performance other than to avoid noncompliance and fines. A key challenge for the coming years of benchmarking legislation is therefore to communicate, educate and raise awareness about the importance of building energy efficiency. Towards this end, the benchmarking reports should provide information regarding the significance of energy efficiency improvement measures in buildings and will illustrate their potential benefits to the environment and economy.

RECOMMENDATIONS

The recommendations are based on the principle of one step at a time and hence proceed forward in different levels. All the levels are interconnected and multi purpose and yet can stand alone benefiting from each other.

one

A conference (a meeting, often lasting a few days, which is organized on a particular subject or to bring together people who have a common interest) like the Green Build Conference bringing together developers, sustainability advisory firms, architecture and construction firms and energy efficiency enthusiasts into one place informing them about various measures and techniques of saving energy in the built environment. The aim of this conference would be to engage multiple companies into seeking an energy efficient building type but with a twist of a building challenge.

Hence, introducing a challenge at the conference called the **"Energy Efficient Building Challenge"** or ऊर्जा कुशल भवन चुनौती with a definite goal of a minimum of 20% energy savings. A challenge which will not only make them aware about energy efficiency but will also help them enhance their teamwork, with a clear understanding of occupant behavior and resource consumption.



two

three

With the challenge, as discovered from the case studies a competition between multiple real estate agencies can help ignite the fire of participation. Every agency can participate on a voluntary basis and compete with set guidelines and achieve minimum 20 percent energy savings through innovative measures. The platform of the conference can help the aspiring companies gain a better perspective of efficiency standards and guidelines and then they can move forward with their goal of winning the competition which will definitely be profitable for them as not only will they be recognized in the sector but also rewarded with nation wide media coverage. Emerging as the leader in the challenge can also help diiferent professionals share their knowledge and techniques that they will learn in the whole process.

A step towards incentives, having an interactive and easy to use data portal where participating companies can upload their designs and measures and also get guidance to get better results where if you win or showcase best strategies in the competition after using the portal there will be an affirmative incentive that will be provided and as there is no involvement of the government in this the funding will come from the client along with the participating stakeholders who aim to keep the industry at top for reducing green house gas emissions along with making the general public interested in environmental awareness and importance.

LEVEL *two.* A COMPETITION!

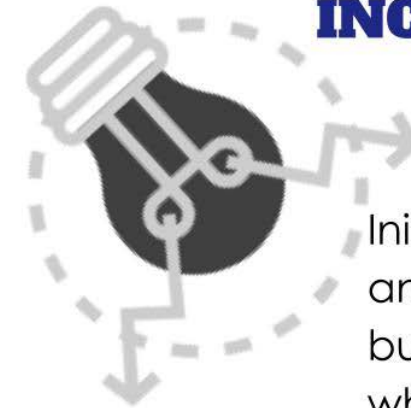
A **voluntary** competitive program for commercial buildings between **top real estate companies** hoping to showcase the **best strategies for energy savings** and emerging as the leader in energy efficient buildings in New Delhi.



Win!



LEVEL *three.* INCENTIVES!



Initiating an interactive and easy to use **portal** for building owners to use which helps the owners **report energy savings** such as lighting, heating & cooling upgrades and get eligible for financing.



four

The last level will be the most interesting and engaging for parties to reach to, it involves having multiple co-benefiting entities at one location which is called co-location in simpler terms. Here the level involves a bonus incentive which is if you win the competition you will get to install solar panels on your roof along with a green roof free of cost. Adding a green roof to a building offers several benefits, including reducing harmful stormwater runoff, lessening the heat island effect, conserving energy and noise, containing air pollution and greenhouse gas emissions, and extending roof life. Green roofs have been shown to increase people's productivity and offer a new habitat for plants and animals. Another important benefit is incorporating photovoltaic systems to generate clean, renewable solar power by taking advantage of green roofs. By installing a solar panel with a green roof, owners can enjoy not only the cost savings and socio-environmental benefits of the living roof but also efficient, renewable solar power – lowering electricity bills by generating clean electricity and reducing demand.

LEVEL

four.

GO - LOCATION!



Bonus Incentive.
Placement of **solar panels**
and **green roof** on the
same property.



Starting the initiative with multiple steps but as one complete system can help the client gain more participation and awareness. This interconnected, multi-purpose and synergistic system can help bring energy efficient on the forefront of decreasing green house gas emissions. As shown in the above diagram, this integrated system will be essential to merge multiple entities together.

Apart from reducing GHG emissions, mitigation efforts can have positive side effects due to the intersection with other societal goals, called co-benefits. In practice, mitigation efforts in one sector can have beneficial effects in other sectors implying that it is more cost-effective if strategies are coordinated cross-sectoral. Many of the co-benefits relate to the improvement of local air quality and the associated health benefits, as well as crop quality. Regarding the problems that arise with the provision of public goods and especially in the case of global public goods, that is mitigation, co-benefits can offset some share of GHG mitigation costs in the short term and hence provide incentives to participate in a cooperation to mitigate climate change. According to the OECD, the benefits of climate change mitigation policies in the coming decades would be essentially the co-benefits since the direct benefits of mitigation policies are expected to occur in the longer run.

complete system

FUTURE PATHWAY

The future plan recommendation is inspired from John Boyd's OODA loop.

The OODA loop is the cycle observe-orient-decide-act, developed by military strategist and United States Air Force Colonel John Boyd. According to Boyd, decision-making occurs in a recurring cycle of observe-orient-decide-act. An entity (whether an individual or an organization) that can process this cycle quickly, observing and reacting to unfolding events more rapidly than an opponent can thereby get inside the opponent's decision cycle and gain the advantage.

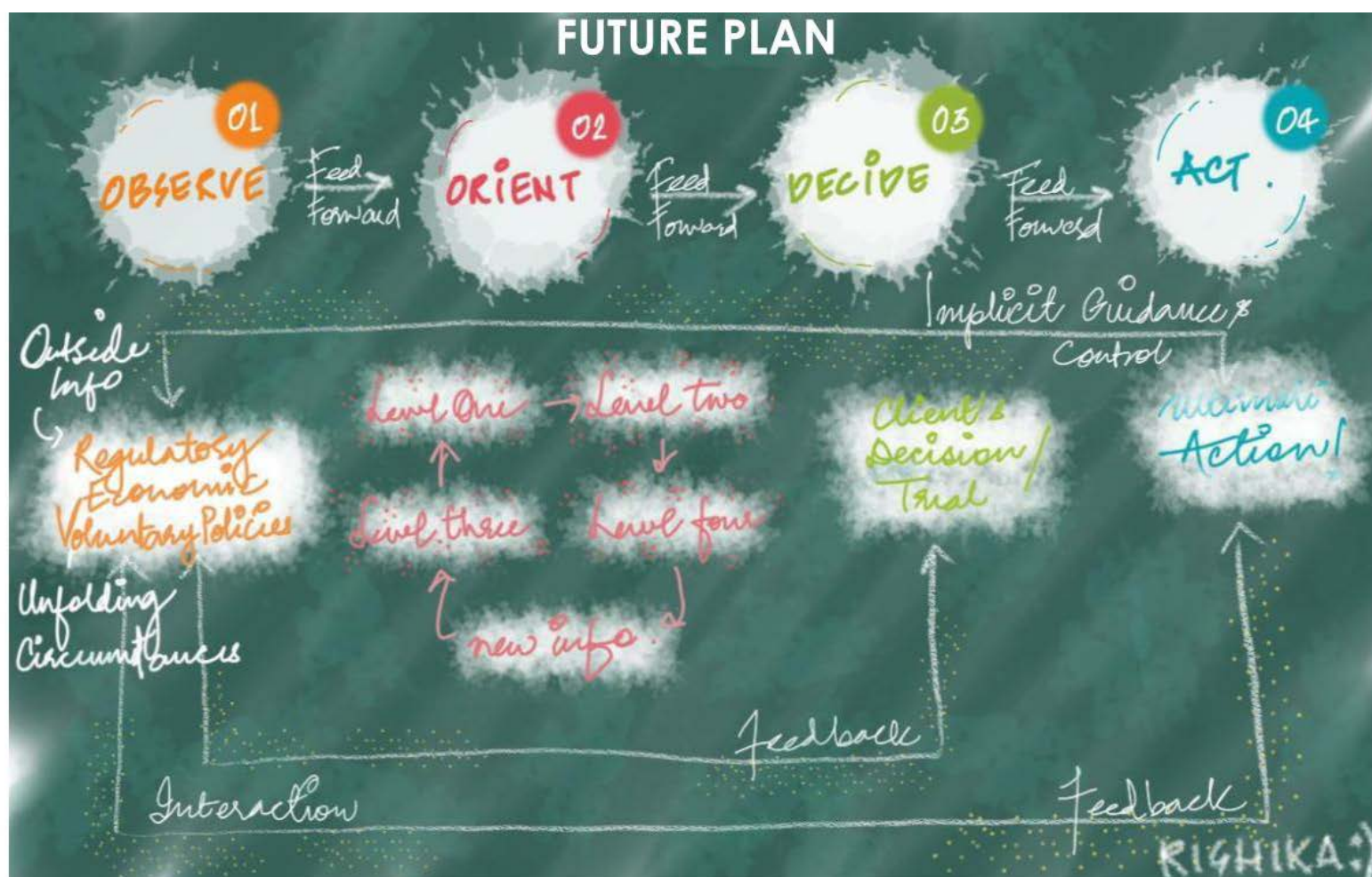
On a positive note the loop helps to make the decision of "Act" after a complete cycle of trial and feedback which is highly important for this challenge as showcasing best strategies and practises will help get the client to a stage where they can make a strong case of their proposal to the government entities involved in the decision making process of formulating energy efficiency policies in the capital of India which can lead them to the implementation of this strategy, also I believe this loop can be beneficial for learning from the positives and negatives that will be discovered along the coarse of action towards enabling an energy efficient India.



"We are living on this planet as if we had another one to go to."

- Terri Swearingen, Goldman Environmental Prize Winner

**ENABLING AN
ENERGY EFFICIENT
INDIA**



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