Greening a City's Building Codes:
The NYC Green Codes Task Force

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ABSTRACT

In 2010, the NYC Green Codes Task Force released what is likely the most sophisticated and comprehensive analysis of building codes ever conducted by a municipality. Mayor Michael Bloomberg charged the Task Force with recommending changes to the laws and regulations affecting New York City buildings, which account for about 75% of city greenhouse gas emissions, 94% of electrical consumption, and 85% of water usage. Green codes are essential to meet the city's goal to cut energy and water use and reduce greenhouse gas emissions 30% by 2030. The Task Force's 111 recommendations impact new construction and renovations, and remove current impediments to green practices. The proposals affect construction codes as well as zoning, health, consumer affairs and environmental protection policies.

More than 200 expert volunteers worked to develop the report's recommendations. To date, 51 recommendations have been implemented by the city, state, or federal government, with more than a dozen actively under consideration. Already implemented Green Codes measures will reduce city emissions by 5% and lower annual water consumption by 30 billion gallons by 2030. While the recommendations are tailored to New York City, many are applicable to other jurisdictions, particularly those that use the ICC codes or ASHRAE 90.1. Each proposal includes statutory language, detailed explanations, cost analyses, code precedents, and information on implementation. Since the report's release, regular educational events and an online resource keep practitioners and the building industry engaged in greening codes. Using the Task Force approach and tools, NYC's code improvement strategy could be broadly replicated.

Introduction

In 2008, New York City Mayor Michael R. Bloomberg and Council Speaker Christine C. Quinn jointly asked Urban Green Council, the New York chapter of the U.S. Green Building Council, to convene experts from the building industry to review the city's codes and make recommendations on how they could be amended to promote green building.

One year earlier, the city had published *PlaNYC*, a comprehensive planning document designed to accommodate one million extra city residents by 2030 while reducing New York City's carbon footprint 30% over the same period (NYC 2007a). This ambitious goal was codified into law by the NYC Climate Protection Act (NYC 2008a). Since the city's buildings account for almost 75% of emissions, 94% of electrical consumption, and 85% of water usage, it was immediately clear to city officials and the design community that building performance would need substantial improvement in order to meet legally mandated goals (NYC 2007b).

Codes are the DNA of the building industry, affecting every building at certain points during its life cycle and almost all buildings by 2050, a key carbon reduction target date. Strengthening codes is key to improving the aggregate performance of the city's buildings. By

raising the minimum construction standard, stronger codes bring the benefits of green construction to all building sectors. Since many sustainable and energy-saving technologies and practices pioneered by early adopters (for example, high-efficiency toilets and high efficacy construction lighting) have improved in feasibility and affordability at scale, they became suitable for widespread promulgation through incorporation into city codes.

The codes considered by the Task Force included the 2008 construction codes and the 2007 state energy code. The construction codes in effect were the city's first to be based on the model codes of the International Code Council, partly due to the efforts of a previous task force convened after the events of September 11, 2001 (ASCE 2005). While the city would later adopt its own energy code as part of the Greener, Greater Buildings Plan (NYC 2009), the energy code in effect at the start of Task Force was a state code based on the 2003 International Energy Conservation Code (ICC 2014) and ASHRAE 90.1-2004 (ASHRAE 2013).

In identifying opportunities to promote energy efficiency and other sustainable practices, the Task Force considered three techniques in addition to the obvious method of simply increasing code stringency.

- First, it identified and recommended removing barriers to green building found in the code or elsewhere; about 20% of the Task Force proposals were of this type.
- Second, it addressed existing buildings, which constitute the vast majority of the built environment now and for the foreseeable future. These must be dramatically improved to achieve meaningful emissions reductions. By tackling renovations and operations and maintenance issues, the Task Force suggested opportunities for efficiency and savings not normally addressed by building codes.
- Third, the Task Force incorporated climate adaption and resiliency measures into the codes, an approach that appeared prescient more than four years later when Superstorm Sandy hit land in New York City. Soon after that event, the city asked Urban Green to convene a Building Resiliency Task Force to continue the work started by the resiliency portions of the Green Codes Task Force (UGC 2013).

Convening the Green Codes Task Force

At the heart of the Task Force were nine Technical Committees focusing on topics which generally aligned with LEED subject areas. These subject areas were modified to reflect areas of specific technical expertise and to include emerging areas of interest in New York, such as active design. In addition to oversight provided by a Steering Committee, the Task Force accommodated the real estate industry's desire for participation through an Industry Advisory Committee of stakeholders to provide feedback on the feasibility and soundness of the proposals. Its members included developers, building owners, contractors, unions, environmentalists, universities, affordable housing experts, commercial tenants, and representatives from professional and industry organizations.

More than 200 Task Force volunteers donated several thousand hours of time researching, attending meetings, and writing and reviewing code proposals and supporting information. In order to provide comprehensive technical insight for the recommendations, these participants included architects; engineers; lighting, landscape architects and interior designers; owners and developers; corporate tenants; contractors; cost estimators; affordable-housing

experts; code specialists; attorneys; waste haulers; scientists and public-health experts; and representatives of environmental organizations, building trade unions, city agencies, and industry and professional associations.

Table 1. NYC Green Codes task force committees

Oversight	Steering Committee
	Industry Advisory Committee
Technical Committees	Climate Adaptation
	Construction Practices
	Energy & Ventilation
	Homes
	Lighting & Daylighting
	Materials & VOCs
	Physical Activity
	Site & Site Stormwater
	Water Efficiency & Building Stormwater

Proposal Development

Starting in July 2008, Technical Committees met a total of about 70 times over three months, brainstorming ideas on both code impediments that should be removed and code enhancements that should be added to NYC's laws and regulations. They also considered code proposals from other cities, states, and countries; innovative and groundbreaking ideas that have not been implemented elsewhere; and issues specific to New York. After prioritizing these ideas, first drafts of their proposals, including preliminary code language, were reviewed by the Steering and Industry Advisory committees and relevant city agencies.

The proposals were revised through four formal drafts over a 10-month period. In addition to refining code language and supporting information, each round included addressing and mediating any stakeholder conflicts. The real estate Industry Advisory Committee assisted the initial blue-sky effort in order to build broader acceptance, including making a request for the first cost and length of payback of each proposal. Although approval of all proposals by Committee members was not unanimous, the Committee ultimately endorsed a general statement of support and a commitment to ongoing efforts to refine proposals where needed.

The increase in first cost of construction was estimated relative to standard construction costs. Drawing on the costing approach developed by the NYC Department of Buildings, the final cost analysis included estimates for various building types. For instance, an analysis of the cost of mold-resistant gypsum wallboard was analyzed separately for four building typologies, with total costs ranging from $45 to $19,747. Because cost impacts varied widely if there were different design options for compliance or if the effect was dissimilar between building types, and since some proposals would actually decrease costs, costing experts estimated both positive and negative impacts and the range of anticipated impacts. Future market trends were not considered, and the analysis was on a single measure basis and did not include cost changes that may come from integrated design. Full information about the costing methodology can be found in Appendix A of the report.

The city construction code included a statement that its purpose was to regulate buildings in the interest of "public, safety, health and welfare" (NYC 2008b). The Task Force's first recommendation, later enacted, was that this purpose section be modified to include "the environment" as an interest of the code. This principle frames the discussion for many recommendations and for future efforts to green the codes.

While finalizing the work of the Task Force, major themes emerged that crossed committee boundaries. For example, several committees developed proposals that addressed both health issues and passive design. As a result, the final report regrouped the proposals, shown here with a ratio of the number of implemented proposals to the number of total proposals in each category:

- Overarching Code Issues (5/7): Building codes and related laws were developed to protect health and safety, and are now evolving to include environmental issues. These proposals firmly embed this evolution in broad areas of building design and operation.
- Health & Toxicity (9/20): Improving control of pollutants is a well-recognized goal. These proposals open new ground by promoting design that encourages physical activity.
- Energy & Carbon Emissions – Fundamentals (9/17): Codes can be made clearer and easier to use to aid energy efficiency. These proposals also support a whole-building process that lowers energy system sizing through reduced loads.
- Energy & Carbon Emissions – Energy Efficiency (8/28): These proposals include more efficient modeling, load forecasting, controls, and equipment.
- Energy & Carbon Emissions – Operations & Maintenance (2/6): These proposals recognize that efficient building operations require training of building personnel, ongoing maintenance of systems, and measurement and verification of building data.
- Building Resilience (6/9): There is much overlap between sustainability and resiliency, and buildings should be prepared to face multiple natural hazards as well as extended power outages. These proposals, some of which were reconsidered as part of the NYC Building Resiliency Task Force, address these new issues of concern.
- Resource Conservation (2/5): Inputs such as recycled content in concrete and asphalt and outputs such as dedicated tenant recycling areas are addressed by these proposals.
- Water Efficiency (3/7): These proposals promote indoor water efficiency through fixture use and outdoor water use through better irrigation and sidewalk cleaning practices.
- Stormwater (5/7): Combined sewer overflows are an environmental problem, and surface flooding of buildings is a maintenance and construction problem. These proposals recognize that techniques in buildings and public infrastructure can address both issues.
- Urban Ecology (2/5): Natural areas are spread throughout New York and provide both ecological and human benefits. These proposals preserve trees, make sidewalks more sustainable, and support biodiversity in sidewalks and public landscapes.

Report Release

The complete report of the Green Codes Task Force was delivered to the city in February 2010 after 18 months of intense analysis and industry collaboration (UGC 2010a). It included 111 proposals, of which 101 were code-related, the remainder being recommendations for further

study. About half of the proposals focused on reducing energy usage, and one-fifth of them focused on reducing barriers to green building.

Each of the 111 proposals was briefly summarized, including a clear description of the issue, the Task Force recommendation, and a declarative title clearly conveying the benefits of the proposal with minimal recourse to industry jargon. For instance, a proposal to expand the use of airside economizers was titled "Use Outside Air for Cooling", and a proposal to prohibit the use of potable water for use in once-through condensers was called "Stop Wasting Drinking Water For Cooling". Each proposal was rated through a graphical system, as shown in Figure 1, identifying its projected benefits to the environment and health, as well as its expected costs and savings. Presenting this information graphically allowed report readers to visually gravitate towards proposals best representing their concerns or areas of interest without reading the full proposal text. Liberal use of sidebars, callouts, photos, and graphics engaged reader interest and explained technical topics.

Figure 1: Executive Summary proposal description and graphical summary.

Complete details for each proposal, in a separate document, included code language; supporting and background information on the issue, the recommendation, and environmental and health benefits; costs and savings; code or legal precedents, if any; the effect on LEED certification; and comments on challenges to implementation and market availability. Full cost and savings data, detailing assumptions and calculations, was released in a separate appendix. Together, these documents provided extensive supporting information as recommendations were further developed during proposal implementation. Supplementing the code language in the proposals with easily understandable explanations and background information took much time and effort, but was very helpful during the implementation stages.

Post-Report Implementation and Education

About four years after the report's release, 51 recommendations have been either enacted by the city, state, or federal government, or implemented in some other fashion, such as the completion of a study. Including proposals in active development, about 60% of the Task Force proposals have either been implemented or are under consideration, as shown in Table 2.

Table 2. NYC Green Codes task force scorecard

Implementation method	Number of proposals implemented
Laws	36
Rules	10
Programs	2
Studies	3
TOTAL	**51**
City Council law	30
City agency rule	19
Federal or state enactment	2
TOTAL	**51**

Passing legislation requires coordination in phases among many stakeholders. City Council legal staff prepares drafts, which may be based on language provided by the Task Force, from the Mayor's office, and other sources. Each city agency that would be affected by a new law or rule is given an opportunity to comment on proposed legislation. When several agencies comment on the same proposal, their perspectives are not always consistent and must be mediated. Comments are also received by industry stakeholders, addressing the concerns of the real estate, design, construction, and materials supplier communities before the proposals receive a public hearing. Eventually, new local laws are signed by the Mayor after passage by Council.

Some proposals are enacted as the rule of an individual agency, rather than a law voted upon by the City Council. Examples are rules of the Department of Environmental Protection that limit stormwater runoff from new developments by 90%, or the rules eliminating the use of dirty #6 fuel oil as a heating fuel. Sample proposal outcomes are shown in Table 3 (UGC 2012):

Table 3. NYC Green Code Task Force code examples

Proposal	Implementation	Estimated effect	Cost
Allow Use of Biofuels	NYC Local Law 43 of 2010	2% biofuel legalized	Voluntary measure
Reduce Artificial Lighting in Sunlit Lobbies & Hallways	NYC Local Law 47 of 2010	Reduces overlighting and allows natural light for illumination	No extra cost; energy savings
Use Manual On - Auto Off Lighting	NYC Local Law 48 of 2010	Vacancy sensors in appropriate spaces	Varies by building type; short paybacks
Proposal	Implementation	Estimated effect	Cost

Increase Lighting Efficiency	NYC Local Law 52 of 2010	Allows use of automatic lighting controls	Nominal; short paybacks
Increase Availability of Drinking Fountains	NYC Local Law 55 of 2010	Increased availability of water fountains using city water supply, instead of bottled water	$1,600 per high rise commercial property
Enhance Water Efficiency Standards	NYC Local Law 57 of 2010	30 billion gallons water saved by 2030	Cost neutral (for fixtures; savings on water usage)
Enhance Code Training for Architects & Engineers	Energy code training	2,100 architects and engineers trained	State funding to develop training
Reduce Summer Heat with Cool Roofs	NYC Local Law 21 of 2011	Strengthening of cool roof requirements	Nominal
Treat Corrosive Concrete Wastewater	NYC Local Law 70 of 2011	15 million gallons of caustic water kept out of sewer annually	$3,000/month during commercial high-rise construction
Use Recycled Asphalt	NYC Local Law 71 of 2011	100,000 tons of asphalt diverted from landfill by 2030	Cost neutral
Provide Recycling Areas in Apartment Buildings	NYC Local Law 60 of 2012	Requires space for recycling storage in multifamily buildings	Cost neutral
Limit Harmful Emissions From Carpets	NYC Local Law 2 of 2012	800 city blocks' worth of low VOC carpet installed annually	Cost neutral
Reduce Stormwater Runoff from New Developments	NYC Department of Environmental Protection Rule	Decrease allowable flow by 90%	Nominal to $30/CF of detention
Increase Lighting Efficiency on Construction Sites	NYC Local Law 51 of 2010 and 17 of 2014	25,000 kWh for a typical commercial construction project	Two week payback for high efficacy bulbs

The green codes process does not end when the Council passes a new law or an agency adopts a new rule. Without the education of practitioners, code officials, and the public, new codes may be on the books but not realize their full potential in buildings. Even after legislation is passed, successful implementation is only likely if a program is undertaken to vigorously promote and communicate the new codes. This may include educational events, blogs, and downloadable presentations. Urban Green maintains an interactive Legislative Tracker detailing the implementation status of each proposal, with links to supporting documents including enacted legislation and a clear, plain English description of the goal and content of any enabling law or rule (UGC 2010b). Google Analytics is helpful in determining use of the website; data

from a subsequent task force and studies have shown that including interactive graphics, even on technical topics, can triple the average time spent on a webpage by site visitors.

Some green codes packaged into groups and enacted simultaneously were significant enough to attract press attention, greatly enlarging their audience. An example is Zone Green, which enacted several Task Force proposals simultaneously and relaxed zoning requirements to allow for super-insulated walls, external insulation beyond zoning limits, larger solar shades, and more green technology on rooftops, while staying within the bounds of zoning requirements (NYC 2012).

Ongoing Impacts of the Task Force

The codes that have been enacted to date are estimated to have a large effect on the health and environment in New York City. Based upon assumptions found in *PlaNYC* and elsewhere, Urban Green and city government staff have estimated the effects of some of the implemented proposals, as shown in Table 3. In all, of the 19% reduction in citywide emissions from the 2005 baseline reported by the 2013 city greenhouse gas inventory, about 7% are estimated to be from green codes (NYC 2013). Energy cost reductions through 2030 is estimated at $400 million.

The Task Force's work also contributed to the passage of New York City's *Greener Greater Buildings Plan*, which requires large buildings in the city to annually benchmark energy and water usage, install lighting upgrades and tenant sub-meters, and undertake an energy audit and retro-commissioning once every decade. The elements of this plan are now being promulgated in 10 other cities by the City Energy Project, a joint effort of the National Resources Defense Council and the Institute for Market Transformation (CEP 2014).

Starting a Green Codes Effort

Without implementation, green code proposals cannot bring about improvements. Therefore, political success is as important as the technical development of proposals. The surest path to eventual enactment of code recommendations is to have those recommendations requested by the government entities who pass and enforce laws. In the case of the Green Codes Task Force, Urban Green received a joint request by Mayor Bloomberg and Speaker Quinn, notable in its own right as well as helping to secure future interest in Task Force conclusions.

Identifying the goals of a green codes effort will determine its scope. This may include model code adoption, removing barriers, focusing on retrofits, maintenance and operations, localization, and stretch codes.

When followed, modern codes are likely to produce buildings that meet at least basic standards for energy efficiency, water and resource conservation, indoor air quality, resiliency, and other factors. Energy codes have become especially stringent in recent years, with ASHRAE 90.1-2013 being 30% more stringent than ASHRAE 90.1-2004 (ASHRAE 2014). Jurisdictions with no or out-of-date codes, particularly the energy code, should probably focus on adopting a model code before beginning a separate code effort. Guidance is available from the U.S. Department of Energy and code advocacy organizations (DOE 2014, OCEAN 2014).

Removing code barriers to good construction practice is just as important as adding new restrictions. Eliminating unneeded or obstructive laws helps to lighten the regulatory burden on industry, building connection and trust with stakeholders. In New York, zoning laws did not

include renewable energy equipment as a permitted obstruction. The Task Force recommended adding combined heat and power and renewable energy systems to the list of rooftop structures exempted from building height and other zoning restrictions, removing a barrier to their use.

To achieve deep carbon reductions, improving new construction will not suffice; extensive retrofits on existing buildings are needed. Even with a strong energy code, there may still be a need for an existing building code to clarify how renovations to existing buildings fall under code jurisdiction. In New York, the city energy code explicitly removed a loophole that exempted many building renovations from meeting energy code requirements. Greening existing buildings should include maintenance and operations, such as benchmarking, energy audits, retrocommissioning, and training for building operators (NYC 2009).

Outside of energy efficiency, other parts of the building code may benefit from a fresh look. For instance, there may be no existing code guidance for indoor air quality, active design, health and toxicity, or water conservation. There may also be issues of local concern not addressed by the model codes. In addition, some jurisdictions may use a stretch code (Faesy and Finlayson 2012) as a tool to aid building improvements above code minimums.

Green building regulation doesn't stop at the building code. An administrative code may affect maintenance and operations, and zoning is a key element in everything from transit-oriented development to building height limits. Stormwater and transportation authorities may have rulemaking that affects green building as well. Existing green codes in other jurisdictions may be a helpful guide. Many of the Task Force proposals are applicable to other areas, particularly to jurisdictions that use ICC model codes or ASHRAE 90.1.

Running a Successful Task Force

Several stakeholder groups should be involved to make a task force successful. Writing code language will require the assistance of technical experts, but technical expertise alone will probably not give results that are easily communicated to legislators and the public. Other help may be necessary to develop persuasive explanations in lay language.

Useful input on the code development process may come from code experts, who can help ensure new regulation is consistent with existing laws and that the removal of barriers does not create code gaps. Cost experts can help estimate the expenses and savings entailed by proposals, and ranges of payback, life cycle cost, or cost/benefit. Proving realistic costs, accepted by industry, will help gain the support of the business community. Using a few common building models throughout the process helps with like-to-like comparisons. To be broadly applicable, the models should be representative of building typologies in the jurisdiction, and if possible recycled from another governmental effort like building codes or zoning.

When selecting committees, a balance of contribution and influence should be sought. Committees should include equal representation from architects and engineers who research and develop proposals, owners and developers whose opposition can stop adoption, and government officials who will enact and enforce new laws. Domination by any one group reduces the chances for success. Each group must be involved in the process in order to support the outcome.

Coordinating volunteer experts takes time, ranging perhaps from a part-time job for a small effort to practically full-time work for several people for a large effort. This management need should be carefully considered before beginning work.

Reporting and Implementation

Once code proposals are complete, they must be clearly communicated to be implemented and enforced. Since building codes aren't exciting to the press or public, and do not tend to garner votes for public officials seeking reelection, proposals won't succeed on their intrinsic merit alone; they require clear, plain English descriptions of the issue and solution in order to be persuasive. The press may be more likely to find codes newsworthy if the emphasis is on safety, health, job training, or removing barriers and streamlining regulations. Credit and attention should belong mainly to the elected officials who requested the recommendations; if they can't count on receiving good press from the endeavor, their support is much less likely.

Dedicated resources from the executive and legislative branches of government are critical to enact new legislation. These resources may be augmented by outside assistance such as nonprofit staff acting as a technical resource or as a conduit to other technical help. Staff from an outside nonprofit can also help provide continuity across administrations to continue to push for code adoption over time. Since this process can take years, it can be difficult to maintain this needed continuity if the nonprofit partner relies exclusively on volunteers. However, since the benefits of better building codes can be clearly described and sometimes even quantified, foundations and other funding sources may be available to support resources towards enactment.

Once passed, new laws and rules require education to become common practice. This includes outreach to the media, designers, owners and developers, code officials, and the public. It can include websites, presentations, seminars and panels, and targeted education campaigns. Following up on enforcement by the local building department or relevant agency is easily overlooked but essential to realize the gains promised when codes are improved. States that accepted money from the American Recovery and Reinvestment Act (GPO 2009) may have already committed to 90% code compliance by 2017. When enacted, laws often include future dates by which agencies must enact rules, develop standards, or complete studies. A third party can keep tabs on these deadlines, increasing the chances of eventual compliance.

Conclusion

Over the past decade and a half, much of the real estate industry has come to embrace the enormous potential for improvement in the design, construction and operation of buildings. Many owners, developers, and designers have become national leaders in developing green buildings, and several organizations have developed model green leases. Over the same period of time, both the International Code Council and ASHRAE have released model green codes. Finally, recognizing the importance of training to ongoing green operations and maintenance, several labor unions have developed green training programs.

Even with this progress, green building remains the exception rather than the rule for the building industry. While many green building techniques and materials have been widely accepted, most buildings   do not come close to achieving their potential for efficiencies. Because codes are enforceable, they bring about wider adoption of green building practice, and aid in transparency and accountability. They can be tuned to the priorities and conditions of a particular area. Codes can be used to correct market failures such as split incentives, including landlords who do not want to pay for improvements because the benefits would go to their tenants. Green building is often adopted by the high end of the market, but there is opportunity

for growth among the less well-off buildings that can least afford the high operating costs caused by inefficiency. Green codes may lower costs by economy of scale in both expertise and materials.

New York City had an uncommon ability to undertake a green codes effort, given its world-class architecture and engineering community and its proud history of sustainable building (NYC 2014). However, the benefits of greener codes can be achieved by many other jurisdictions as well. By doing so, they will improve the health, safety, and well-being of their citizens, while lowering costs and reducing environmental damage and climate change.

Acknowledgements

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