

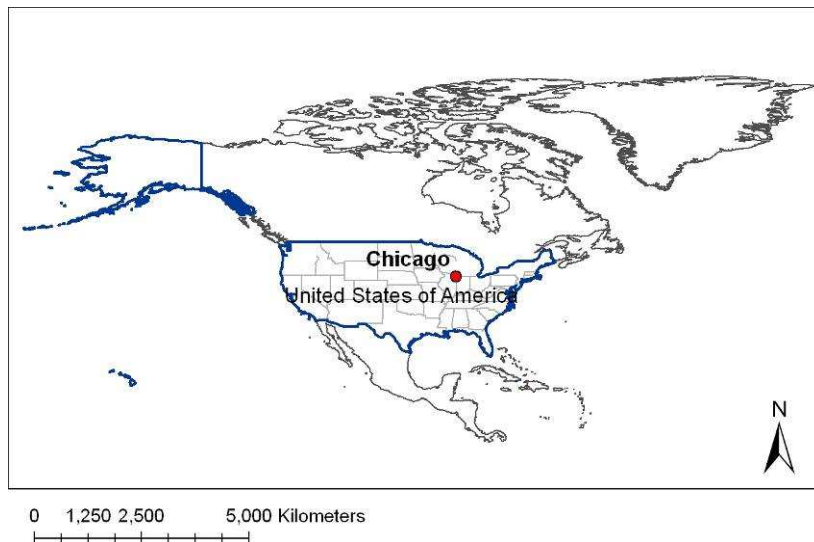
Chicago: Green Permit Program - incentives for developers to install green roofs

Climate change impacts addressed	High temperatures Urban flooding
Spatial scale	Town or city
Response type	Incentive scheme
Themes driving the initiative	Adaptation to future climate Response to current climate Quality of life and attractiveness of place Development need despite climate impacts
Factors of success	Prioritising adaptation Leadership / championship

Summary

Chicago's Department of Buildings (DOB) has developed an incentive program that encourages developers to incorporate environmentally conscious design elements, including green roofs on new buildings. This is known as the Green Permit Program. The incentive is an expedited permit process, through which developers can save both time and money. The initiative is a part of larger portfolio of initiatives aimed at making Chicago's built environment greener and more sustainable. The Green Permit Program was made possible due to the strong leadership of the Chicago Mayor and the efficient processing of the applications by the DOB. Additional benefits of the Green Permit Programme include mitigation of climate change through reduced need for heating and cooling in buildings with green roofs, enhancing the image of the city and the emergence of businesses specialising in green roof installation.

Case study location



Chicago is the third largest city in the United States, with a population exceeding 2.8 million. It sits on the shores of Lake Michigan (Figure 1). A Chicago is a significant transportation and telecommunications hub for North America, and is a major world financial centre with a strong industrial presence. It has the second largest central business district and the second largest workforce in the US (after New York) with approximately 4.25 million workers operating in the metropolitan area.

Figure 1. Chicago's location in the USA

The current problems associated with weather in Chicago include high temperatures in summer, which frequently result in heat waves. The average July day temperature ranges between 26 and 33°C, and overnight temperatures are between 18 and 21°C. In a normal summer, temperatures exceed 32°C on 17 days. During a heat wave in 1995 the highest recorded temperature was 41°C⁽¹⁾. This heat wave, combined with high humidity, led to approximately 600 heat-related deaths

mainly of older, poor residents in inner-city areas ⁽²⁾. Impacts in the Chicago urban centre were exacerbated by an urban heat island that raised nocturnal temperatures by more than 2°C in comparison to surrounding areas ⁽³⁾.

Another problem is urban flooding associated with rainstorms and thunderstorms which commonly occur in the summer. A record-breaking 24-hour rainstorm in July 1996 in south Chicago and its southern and western suburbs killed 6 people, damaged 35,000 homes, and caused evacuation of more than 4,300 people. Losses and recovery costs reached \$645 million ⁽⁴⁾.

Flash flooding and heat waves are likely to be exacerbated by climate change. Temperatures in summer are projected to rise by the end of the 21st century by 5 to 10°C. In 40 years, more than 40 days per year could exceed 38°C. Precipitation in winter is projected to increase by 10-25%, and in summer to decrease by 5-20%. Frequency of 24-hour and multi-day downpours causing flooding may increase by 50-150%. Storms are projected to be more severe and have larger impacts ⁽⁵⁾. By 2095, Chicago is projected to have the same climate as Texas ⁽⁶⁾.

Development of the initiative

Key aims

The key aim of the Green Permit Program launched in 2005 is to ensure that new developments in the City of Chicago employ environmentally sustainable, 'green' solutions. The Green Permit Program consists of an expedited development permit process for new building proposals, and also offers a permit fee-waiver for buildings with exceptionally low environmental impact. Items incorporated in the 'green menu' that developers can choose from include green roofs, generation and use of renewable energy, and natural ventilation (see Box 1). In addition commercial, industrial and residential projects must meet the criteria of the Leadership in Energy and Environmental Design (LEED) rating system. The same principles apply to retrofitting buildings as to new builds.

Themes driving the initiative

- **Image of the city.** Chicago has sought to remake itself as "the greenest city in America" through the implementation of a comprehensive environmental agenda that encompasses green buildings, transportation and energy use, and infrastructure and resource management. This strategy is based on linking sustainable or green practices with green economics, improving business prospects, and enhancing quality of life for both residents and visitors.
- **Environmental drivers**
 - **Sustainability of buildings.** Leadership in Energy and Environmental Design (LEED) Green Building Rating System is the most widely used and accepted standard for green building development in the US. It was developed by the US Green Building Council, which is a national non-profit coalition representing the building industry. In addition to serving as a national standard, LEED is also a certification tool. Points are awarded for design and construction practices and technologies in six categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design. By accumulating points, a building can achieve a rating of LEED Certified, Silver, Gold or Platinum ⁽⁷⁾.
 - **Stormwater management.** Around 58% of Chicago's urban core is covered by impervious surfaces, causing problems with rainwater runoff ⁽⁸⁾. In 2007 the City passed a stormwater ordinance that requires large developments to capture the first half-inch of rainfall on-site. This ordinance has encouraged the installation of green roofs.

- **Climate Change Action Plan** adopted in 2008. One of the actions of the Chicago Climate Change Action Plan is to increase the number of rooftop gardens to total of 6,000 citywide by 2020.
- **Leadership.** The city's green strategy is promoted by Mayor Daley, who has played a very strong leadership role in initiatives related to greening of the city since his election in 1989. For example, Mayor Daley has commissioned the planting of 500,000 trees. In 1995 landscaping began on more than 80 miles of median strips (planters separating two lanes of traffic or pedestrian and vehicular traffic) throughout Chicago. In 2001 the City Hall rooftop garden was opened (Figure 2 and 3). Since 2001, the City of Chicago has constructed 36 green roofs on public buildings totalling more than 100,000 square ft. In addition, all new City of Chicago and Cook County buildings must register for LEED certification and achieve silver standard or higher. In 2005 this led to 22 new city buildings, including fire stations, schools and libraries, being registered for LEED certification. As a result, the design and construction community is gaining experience on LEED projects. As this experience grows, it is beginning to influence private sector development activities ⁽⁹⁾.



Figure 2. Roof of the building shared by Chicago City Council (left) and Cook County Council (right). The 20,000 square foot green roof, containing 20000 herbaceous plants, 100 wood shrubs, 40 vines and two trees was commissioned by Mayor Daley and completed in 2001 ^{(10), (11)}

Details of the initiative

To expedite (speed) the permit process relating to gaining planning permission for new buildings, developers must add elements of green building strategy, design and technology to their project as selected from a menu of items created by the DOB (Box 1). Projects admitted into the Green Permit Program can receive permits in less than 30 working days (even just 15 days) rather than within the standard 60-90 days. The more items from the green menu that are included, the shorter the timeline to obtain a permit. In addition, developers who display a particularly high level of green strategy implementation can have review fees waived ⁽¹²⁾.

- Box 1. Green Menu Items**
- **Green roofs**
 - Exceptional energy performance
 - Renewable energy
 - Extra affordability
 - Transit-oriented developments and difficult-to-develop areas
 - Innovation
 - Exceptional water management
 - Exceeds LEED or Chicago Green Homes Certification
 - Natural ventilation
 - Exceptional bike parking

The requirements for expedited permit and fee waivers differ depending on development's type and size. As an example, an office building over 80feet tall needs to meet the requirements listed in Table 1.

Table 1. The requirements for expedited permit and fee waivers ⁽¹²⁾

Benefit tier	Requirements
Expedited permit (goal <30 days)	LEED Certified + 50% green roof + 2 menu items
Expedited permit (goal <30 days) and consultant review fee paid up to \$25,000	LEED Silver + 75% green roof + 2 menu items
Expedited permit (goal <30 days) and consultant review fee 100% waived	LEED Platinum or LEED Gold + 75% green roof + 2 menu items

The Green Building Permits program is one of a suite of strategies within Chicago's **Green Building Agenda**, launched in 2004, which aims to improve building performance in a changing climate in a comprehensive and flexible manner. The City understood that multiple initiatives must be utilised to address different areas of need, and to accommodate different development perspectives. They include:

- **Green Roofs Initiative:** This is applicable to new public buildings, planned developments and privately funded structures, and is subsidized by the City of Chicago. The initiative promotes green roofs through grants and technical resources. A density bonus, which permits an increased number of units allowed on a piece of property, is offered to developers who cover 50% or 2,000 square feet (whichever is greater) of a roof with vegetation. The City also provides \$5,000 in green roof installation grants for small-scale commercial and residential properties. The program has led to the creation of more than 80 green roofs in the city, totalling over 2.5 million square feet. Inducements include 'sticks' as well as 'carrots'. For example, Chicago requires any developer who receives city assistance (for example, to rehabilitate a brownfield site) to include a green roof ⁽¹³⁾.
- **Green Roof Improvement Program (GRIF):** This relates to commercial projects in the Central Loop Area (the financial district), which can receive reimbursement grants for up to \$100,000 if they meet certain building design conditions. Projects must have a vegetated area that covers more than 50% of the net roof area, include drought tolerant plants (but no monocultures), have a green roof that is highly visible to surrounding buildings, include a minimum two-year maintenance plan for the green roof, and have plans monitor green roof's performance in terms of stormwater management and urban heat island mitigation.
- **Green Homes Program:** The purpose of this program is to encourage residential builders, developers and homeowners to use technologies, products and practices that will increase energy efficiency, provide healthier indoor air, reduce water usage, preserve natural resources, improve building durability and reduce maintenance, and reduce waste and pollution ⁽¹⁴⁾.

The City of Chicago also produces best practice management guides that provide information on specific green building topics to developers, contractors and members of the general public. They

include, for example, the Guide to Rooftop Gardening and The Guide to Stormwater Best Management Practices, which recommends green roofs as a measure to manage stormwater. Greening strategies in the city are not limited to buildings. Other initiatives include Greening Chicago's Alleys and Chicago urban forest.



Figure 3. Photographs of the green roof on the City Hall Building in Chicago (Photographs: Aleksandra Kazmierczak).

Implementation of the initiative

The Green Permits Program required adjustments to the planning application process. To participate in the Green Permit Program, the applicant must submit documentation to the DOB outlining the green building components included in their project, preferably once the production of construction documents has begun. These specific components are discussed at an initial Green Permit Program orientation meeting with the DOB team ⁽¹²⁾. Applicants are then guided through the expedited permit process by a dedicated team of experts in green building design. For details, see the Green Building Process Flow Chart ⁽¹⁵⁾.

In order to benefit from the DOB Green Permit Program, the applicant must adhere to guidelines, which include actively participating in the review process and responding promptly to issues raised ⁽¹²⁾. The expedited permit process results in significant savings for developers (Box 2), financial benefits for building owners, and a variety of benefits for the users of green buildings.

Box 2: Financial benefits of Green Permits Program

Expedited process

Development costs can increase by 1-5% to include green features in a new building, compared to standard designs ⁽⁹⁾. However, private developers are interested in the time-saving dimension, because they can pay less interest on their construction loans by completing the building and selling it on more quickly. Computer chip manufacturer Intel has estimated that a single day's delay in construction could cost a developer \$1 million ⁽⁹⁾. Therefore, shortening the permitting process by 3 months on a 22-month project cycle could influence investors when deciding if to proceed with a project. Permitting delays increase tenant costs in both new and existing buildings – tenants pay higher rents when permitting delays are the norm as the return on investments are also delayed ⁽¹⁶⁾.

Building use

- Many variables affect the financial return of green building interventions. 2-20 year paybacks have been observed with substantial savings afterward ⁽¹⁷⁾.
- Green roofs cost about twice as much as standard ones, but offer at least double the life span because they are less vulnerable to wear and tear caused by temperature extremes ⁽⁹⁾.
- A simulation conducted by the City of Chicago of its City Hall green roof showed that every one degree Fahrenheit decrease in air temperature provided by the green roof resulted in a 1.2% drop in cooling energy use and, thereby, in significant financial savings.
- A student halls of residence building at Saint Xavier University cost \$300,000 more than a standard building, but its energy costs are expected to be \$60,000 per year rather than \$90,000 ⁽⁹⁾.

Impact on users

It was found by a study carried out by the City of Chicago that inclusion of environmentally conscious design in buildings improves staff productivity. For example, sick absenteeism at a police station located in a LEED-certified building was a third lower than in the previous location ⁽⁶⁾.

Other benefits

- More efficient permit processes may make a city more attractive for investment than other locations. Improved permitting processes can be a cost effective tool in addition to or in lieu of other inducements such as preferential tax rates or regulatory relief.
- Increased construction spending provides broader economic benefits – these benefits include not only employing more construction workers but also purchasing construction related materials and services from local suppliers, creating local jobs, and increased spending at local establishments ⁽¹⁶⁾.

Source of funding

The project was funded by the City of Chicago through the DOB.

Stakeholder engagement

The Chicago Center for Green Technology offers tours, workshops and other opportunities for people to learn about green buildings in the city. The Centre's building is LEED-Platinum certified and self-guided tours of the facility are available to anyone who wants to see sustainable design first-hand. Educational workshops on topics of general interest, such as green roofs, are offered to the general public. Seminars designed specifically for industry professionals address issues of interest to them, such as whole-building design strategies. Circa 400 free public programs are

offered each year. The on-site Green Building Resource Center provides reference materials, samples of green building products, and technical assistance seven days a week ⁽⁷⁾.

Can it have an impact?

The studies on the Chicago City Hall green roof indicate that on a typical day in August (32-35°C) the City Hall green roof is cooler than the air temperature, while the roof on Cook County side of the building, which is covered in blacktop (see figure 2), can reach a temperature of 66°C. Therefore, green roofs can significantly reduce the heat island effect. Further, the green roof on the Chicago City Hall Building retains more than 75% of water produced by a one-inch storm, preventing this from reaching the combined sewer system therefore reducing flood risk. Studies show an overall 50% reduction in total stormwater runoff from this green roof ⁽⁸⁾.

Surprisingly, Chicago, which is one of the leading jurisdictions in green roof policy, does not have accessible up-to-date database of green roof installations ⁽¹⁸⁾. The estimated area of green roofs in Chicago is 49,655 m² in 2008 (according to Green Roofs for Healthy Cities; http://www.greenroofs.org/resources/GRHC_Industry_Survey_Report_2008_Media_Release.pdf).

The City issues approximately 50,000 building permits a year. Even if a fraction of these developers applied for green permits, the cumulative impact of the regulations on climatic factors (temperature and precipitation) would be significant. Many businesses in Chicago are pursuing green development; not only residential and office buildings but also museums, restaurants, hotels and real estate management companies. The success of the initiative is highlighted by the fact that Chicago has more green roofs built or under construction than any other North American city ⁽¹⁰⁾. In October 2006 there were 250 private and public green roofs in Chicago. By 2008 this number had risen to 400 (see the interactive map of green roofs; http://www.artic.edu/webspaces/greeninitiatives/greenroofs/main_map.htm). The Chicago Climate Change Action Plan sets a target of 6,000 green roofs by 2020 ⁽¹⁰⁾.

Moreover, the benefits of the initiative reach beyond the City of Chicago, as other metropolitan areas in the USA have followed Chicago's example. These cities include Portland in Oregon, San Francisco and New York ⁽²⁰⁾.

Additional benefits

The green roof effort has also stimulated business development. Indeed, there are now more than 24 green roof companies in Chicago.

The installation of green roofs results in the reduction of carbon dioxide emissions, and also lowers energy costs associated with cooling and heating of buildings. A simulation by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) conducted for the green roof on the City of Chicago Hall showed that every one degree Fahrenheit decrease in ambient air temperature within the building results in a 1.2% drop in cooling energy use. The study suggests that if, over a period of ten years or more, all of the buildings in Chicago were retrofitted with green roofs, (30% of the total land area), this would yield savings of \$100 million annually from reduced cooling load requirements in all of the buildings in Chicago ⁽¹⁹⁾.

Key messages

- The case of Chicago shows that innovative, bold solutions to development planning work. The increase in green roofs has been achieved through an incentive programme for developers, illustrating the effectiveness of solutions where mutual benefits are achieved (see also Faenza,

Italy). Finding a solution that is easy to understand and financially feasible for both public and private sector is crucial (Box 3).

- Strong leadership from the city mayor secured the success of the programme. An influential figure or organisation leading an initiative helps to drive its success (compare with the England Northwest case study, where an NGO and a regional authority led the climate change action plan).
- The vision of a “greenest city on America” stimulated action. Similarly, the City of Nagoya strives toward the status of Environmental Capital of Japan.
- Anything required of the private sector is tested and piloted first within the public sector. By championing green development practices, the public sector is helping to set the standard for others to follow.

Box 3: Key factors influencing the success of financial incentives ⁽²¹⁾

- Key stakeholders need to agree on clear, specific, measurable environmental objectives.
- Given agreement on performance objectives, developers responsible for implementation should have the freedom to design plans that lead to meeting the programme’s objectives. Successful programmes mandate performance goals rather than technology.
- Clear procedures should be established for open stakeholder participation in the design and implementation of programs. At the same time, these processes need to be linked to the achievement of program objectives.
- Incentives for participation in programs of this kind need to be tangible and significant

Contact organisation

City of Chicago
Department of Buildings
www.cityofchicago.org/buildings
buildinggreen@cityofchicago.org

References

- (1) NWSFO (2009) Online weather data. National Weather Service Forecast Office. Available at: <http://www.weather.gov>
- (2) Changnon, S.A., Kunkel, K.E., Reinke, B.C. (1996) Impacts and Responses to the 1995 Heat Wave: A Call to Action. *Bulletin of the American Meteorological Society* 77 (7): 1497–1506.
- (3) Kunkel, K.E., Changnon, S.A., Reinke, B.C., Arritt, R.W. (1996). The July 1995 Heat Wave in the Midwest: A Climatic Perspective and Critical Weather Factors. *Bulletin of the American Meteorological Society* 77 (7): 1507–1518.
- (4) Changnon, S.A. (1999) Record flood-producing rainstorms of 17-18 July 1996 in the Chicago Metropolitan Area. Part III: Impacts and responses to the flash flooding. *Journal of Applied Meteorology* 38(3): 273-280.
- (5) USGCRP (2009) Global Climate Change Impacts in the United States. US Global Change Research Program. Available at: <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/download-the-report>

- (6) Hobbs, K.A. (2007) Loeb Action on Climate Change. Available at: http://www.gsd.harvard.edu/professional/loeb_fellowship/action/climate/ChicagoAGreenCity.pdf
- (7) City of Chicago (2005) Building healthy, smart and green. Chicago's Green Building Agenda, City of Chicago. Available at: http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/BHSGAgenda_1.pdf
- (8) WERF (2008) Chicago, Illinois: Becoming the "Greenest City in America". Water Environment Research Foundation. Available at: http://www.werf.org/livablecommunities/studies_chic_il.htm
- (9) Widholm, P. (2006) Sustainable buildings. Permit program speeds greening of Chicago. Midwest Construction, November 2006. Available at: http://midwest.construction.com/features/archive/0611_feature2.asp
- (10) City of Chicago (2008) Climate Change Action Plan. Available at: <http://www.chicagoclimateaction.org/>
- (11) Google Earth
- (12) DOB (no date) Green Permit Program Brochure. Department of Buildings, City of Chicago. Available at: http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/GreenPermitBrochure_1.pdf
- (13) Taylor, D.A. (2007) Growing green roofs, city by city. Environmental Health Perspectives 115 (6): 306-311.
- (14) City of Chicago (2009) Chicago green homes program guide. Available at: http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/ChicagoGreenHomesGuide_v2.pdf
- (15) DOB (2010) Green Permit Process Flow Chart. Department of Buildings, City of Chicago. Available at: http://www.cityofchicago.org/content/dam/city/depts/bldgs/general/GreenPermit/Green_Permit_Flow_Chart_%202_1_10.pdf
- (16) Price Waterhouse Coopers (2005) The Economic Impact of Accelerating Permit Processes on Local Development and Government Revenues. American Institute of Architects.
- (17) Malec-Mckenna, S. (2006) Interview on Chicago's green development and building initiatives. Available at: <http://www.asse.org/practicespecialties/interviews/SMalec-McKenna.php>
- (18) Carter, T. and Fowler, L. (2008) Establishing green roof infrastructure through environmental policy instruments. Environmental Management 42: 151-164.
- (19) Peck, S. and Kuhn, M. (no date) Design guidelines for green roofs. Available at: <http://www.cmhc.ca/en/inpr/bude/himu/coedar/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=70146>
- (20) Yudelson Associates (2007) Green Building Incentives That Work: A look at how local governments are incentivising green development. The National Association of Industrial and Office Properties Research Foundation. Available at: www.naiop.org/foundation/greenincentives.pdf
- (21) Beardsley, D.P. (1996) Incentives for environmental improvement: an assessment of selected innovative programs in the States and Europe. A report to the Global Environmental Management Initiative. Available at: <http://www.gemi.org.mx/documentos/documentos/1996incentivesusaandeurope.pdf>