Mori Building's Environmental Initiatives

Cover photograph:
HILLS MACHI-IKU PROJECT (photo - rooftop of Keyakizaka Complex, Roppongi Hills)

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1 Environmental Philosophy and Environmental Policies

Environmental Philosophy

The Mori Building Group contributes to the creation of a sustainable society for the future by promoting the harmonious coexistence of cities and nature, low-carbon cities, and resource recycling. We do so through urban development and operation that takes as its ideal the Vertical Garden City.

Environmental Policies

Harmonious Coexistence of Cities and Nature

We leverage the vertical plane in cities and, on the ground and on rooftops, create microcosms of nature with consideration of life-form biodiversity that allows people and nature to coexist. Together with numerous urban activities, we create pleasant, verdant spaces where the chirping of birds and the singing of insects can be heard. Through such spaces, we foster environmental communities for people.

Low-carbon Cities

In a compact city that vertically integrates diverse urban functions, we employ a variety of high energy efficiency systems to achieve cities with excellent eco-efficiency. Through total and high-quality management of urban areas, we promote the low-carbon city.

Resource Recycling

While working to adopt environmentally conscious materials and building methods in the processes of urban construction, we promote 3R activities in our daily management of properties, with the aim of forming resource recycling-oriented cities.

Legal compliance and the development of an environmental management system

We carefully watch movements in environmental-related legislation and respond with the relevant changes. Furthermore, to continually improve our environmental promotion activities, we have developed and maintain environmental management systems.

Disclosure of environmental information

The Mori Building Group strives to disclose information on its environmental philosophy, policies, and activities, and to communicate with our communities.

Implementing environmental education and activities to develop environmental awareness

To improve the effectiveness of our environmental promotion activities, we conduct environmental education and act to develop environmental awareness for all employees. We also use our facilities to develop environmental awareness for users of the facilities.

2 Relationship Between the Vertical Garden City and the Environment

‘Vertical Garden City’ refers to Mori Building’s approach to resolving urban environmental problems.

A Vertical Garden City is a compact city that integrates work, residence/living, entertainment, commerce, education, relaxation, culture, social interaction, and other urban functions vertically into a high-rise building with everything necessary available within walking distance.

Combining segmented properties and creating a taller building minimizes above-ground built-up areas, making the resulting empty space available for people and nature.

This not only fosters urban nature and achieves living where people can experience the four seasons, but also mitigates the heat island phenomenon by covering ground surface and rooftops with greenery.

The aggregation of diverse urban functions also brings about a leveling of energy demand, enhancing energy efficiency.
A compact city where work and residence are in close proximity greatly reduces the time and energy required for commuting to work or school. It also has positive effects on resource recycling and efficiency of distribution.

Moreover, making high-level use of urban centers in this form aids in the protection of nature in suburbs. The Vertical Garden City is a new urban model that aims for the harmonious coexistence of cities and nature while constraining impact on the global environment.

Vertical Garden City Image

■ Anticipated environmental effects of the Vertical Garden City

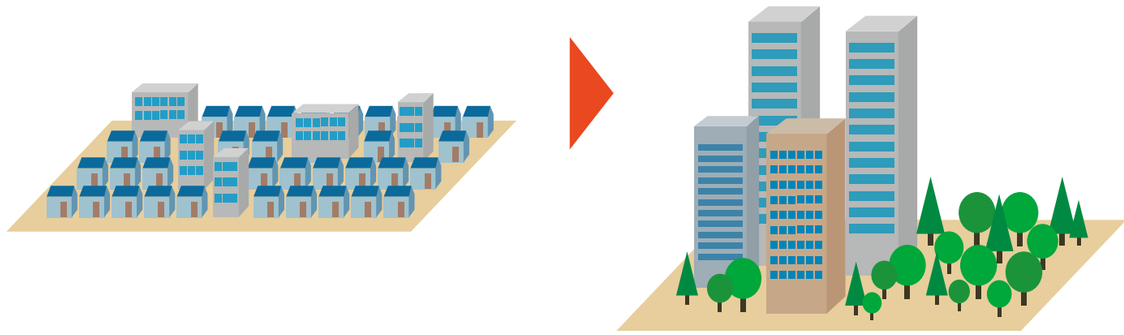
The effect of the Vertical Garden City on improving the urban environment is simulated by comparing two urban area models.

Urban Area A

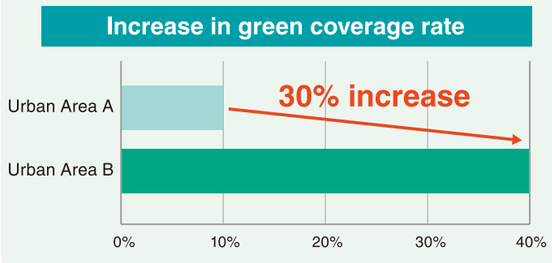
A planar congestion model in which blocks are subdivided and small buildings are densely arranged.

Urban Area B (Vertical Garden City)

A model in which super high-rise buildings are built on large aggregated sites and sufficient open space is available.

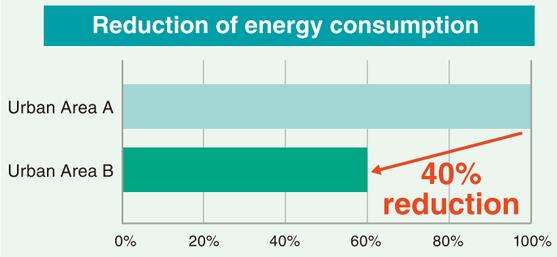


Harmonious Coexistence of Cities and Nature



Compared to Urban Area A, in Urban Area B it is possible to establish large-scale green areas on the open space created. Urban Area B is expected to increase the green coverage rate (indicating the ratio of green area to site area) by 30% more than Urban Area A.

Low-carbon Cities



In terms of energy performance, in Urban Area B it is possible to incorporate various energy-conserving functions such as adoption of high-efficiency equipment and broad use of energy, through greater scale and mixed usage of facilities. As a result, it is possible to reduce primary energy* by approximately 40% in a per-unit comparison with Urban Area A where the adoption of energy conservation measures is more limited.

* Primary energy: Energy obtained from nature, including through fossil fuels, nuclear fuels, hydroelectric power, and solar power.

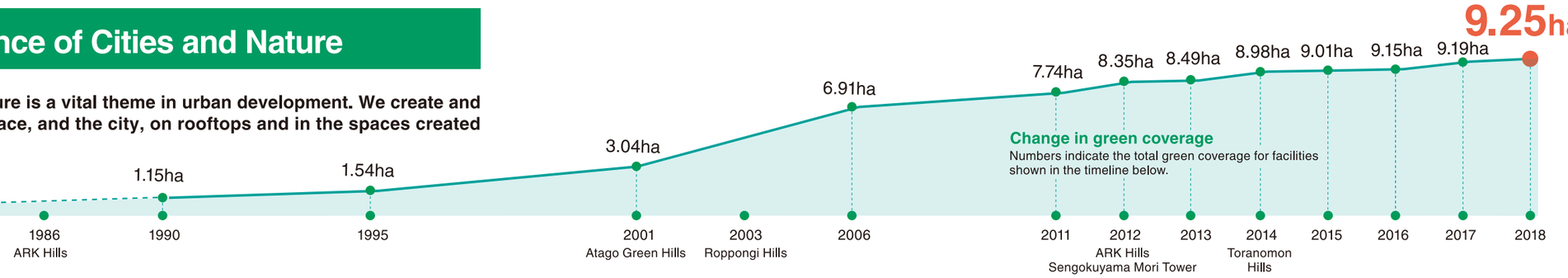
Resource Recycling

The useful life of buildings is longer in Urban Area B, enabling long-term, unified maintenance management. Accordingly, it is possible to achieve reduced resource consumption over the lifecycle of the building. In addition, it becomes possible to utilize a compact urban structure, promote efficient collection and recycling of wastes, and conduct wide-area reuse of rainwater and graywater.

Source: Estimate of Environmental Impact Reduction Effect of Vertical Garden Cities, Mori Building Co., Ltd., September 2009. Prepared by Nikken Sekkei Research Institute.

3 Harmonious Coexistence of Cities and Nature

The harmonious coexistence of cities and nature is a vital theme in urban development. We create and grow lush greenery suited to the times, the place, and the city, on rooftops and in the spaces created by achieving Vertical Garden Cities.



Evolution and Transitions in Greenery

~1979	1980s	1990s	2000s	2010s
Development of stand-alone buildings	**Toward broad mixed-use development** **Commenced large-scale greening**	**Transition from 'volume' to 'volume + quality' in greening** **Enjoying greenery, interacting with and nurturing greenery**	**Inheritance of the history and nature of the land**	**Toward preservation and restoration of ecosystems**
Commenced in-grounds greening on small scale	1986 Completion of ARK Hills Large-scale rooftop greening through redevelopment	1997 ARK Hills Creation of ARK Garden Transition to volume + quality	2001 Completion of Atago Green Hills Inheritance of the history and nature of the land 2002 Completion of Motoazabu Hills 2003 Completion of Roppongi Hills Preservation of pond and trees at Mohri Garden 2004 Completion of Holland Hills 2006 Completion of Omotesando Hills	2012 Completion of ARK Hills Sengokuyama Mori Tower Preservation and restoration of biodiversity 2013 Completion of ARK Hills South Tower 2014 Completion of Toranomon Hills Creation of green areas through Multi-Level Road System
Community creation and environmental education leveraging green areas	1997-2014 Hills Gardening Club*1			
	2003 Hands-on farming at the Roppongi Hills rooftop garden			
	2008 MACHI-IKU (exploration tour of the secrets of the environment and greenery)			
	2012 Roppongi Hills 'GREEN UP'			

1986 | ARK Hills

In 1986, we created a large-scale rooftop green area at ARK Hills, the private sector's first large-scale redevelopment. We planted over 40,000 trees in a green area exceeding 20% of the grounds, including the rooftop of Suntory Hall. The 150 Yoshino cherry trees planted along peripheral roads are now a famed spot for cherry blossom viewing. In 1997, we planted flowers in year-round green areas, and today continue evolving these into places for feeling the charms of the seasons and interacting with greenery.

2001 | Atago Green Hills

Inheriting the rich nature and history of the Seiso-ji Temple and Mt. Atago, Atago Green Hills was born with the aim of creating a network of greenery connecting Shiba Park and other surrounding green areas. By preserving sloped green areas as much as possible and raising saplings from the seeds of the trees there, we have inherited the region's vegetation. We placed green paths along the slopes so people can enjoy nature while minimizing the impact on plants and animals.

2003 | Roppongi Hills

Diverse technologies and ideas are given life in the creation of distinctive greenery. To communicate the history of the land, trees and an Edo period garden were preserved in the development of Mohri Garden. On the rooftop of Keyakizaka Complex, we built a rice paddy where local residents can enjoy rice planting and harvesting, and make effective use of the paddy as the necessary weight for a 'Green Mass Damper' seismic control system. Using roadside trees, flower beds, and street furniture, we have formed a townscape fusing art with greenery.

2012 | ARK Hills Sengokuyama Mori Tower

We planted primarily local native species, placed dead trees to provide living things with homes and feeding sites, and reused topsoil to create a green area for the preservation and restoration of biodiversity. As a result, this green area has acquired the highest (AAA) JHEP certification*2, a first in Japan. Following the completion of construction, we conduct maintenance and management with consideration of the ecosystem, and, by placing explanatory signboards and holding workshops, provide opportunities for local people to understand nature and interact with living things.

2014 | Toranomon Hills

Toranomon Hills is located at the intersection of the north-south green axis running from the Imperial Palace to Hibiya Park, Mt. Atago, and Shiba Park, and the east-west green axis along Shintora-dori Avenue. By using the Multi-Level Road System, we created a new 6,000 m² of green area on man-made ground, and acquired the highest JHEP certification*2 for our planting plan, which takes biodiversity into account. By connecting to adjacent blocks, the green area functions as a unified base for greenery.

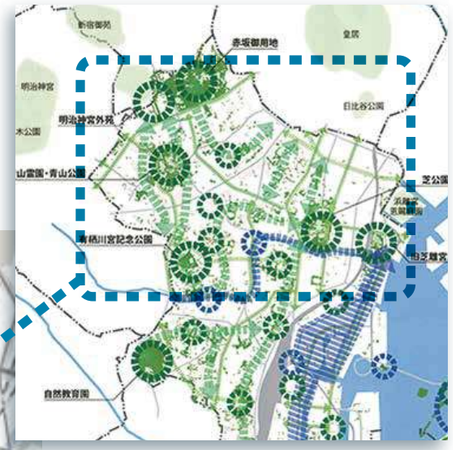
*1 Hills Gardening Club
An initiative to reproduce in green areas the sort of community said to be rare in the urban center. We started the initiative in ARK Hills in 1997, and later expanded its area to Roppongi Hills. Through March 2015, members of the initiative planted and raised flowering plants.

*2 JHEP (Japan Habitat Evaluation and Certification Program) certification
This program quantitatively evaluates and certifies initiatives contributing to the preservation and restoration of biodiversity. It is developed and operated by the Ecosystem Conservation Society-Japan.

Creating Bases for Ecological Networks

In order to foster a rich ecosystem in an urban center, we are creating green areas as 'bases for an ecological network*' to act as relay and rest sites for living beings that travel among green spaces such as the Imperial Palace and Shiba Park, in accordance with plans including the Tokyo Metropolitan Environmental Master Plan and the Minato Ward Comprehensive Plan Regarding Green Space and Water.

* Ecological Networks
There is a need to create conditions under which living things can live easily, allowing movement by linking green areas that form the living bases for creatures with small-scale green areas and roadside trees. Such a network of habitats is referred to as an ecological network (extracted from Biodiversity and Greening Guide, Minato Ward).



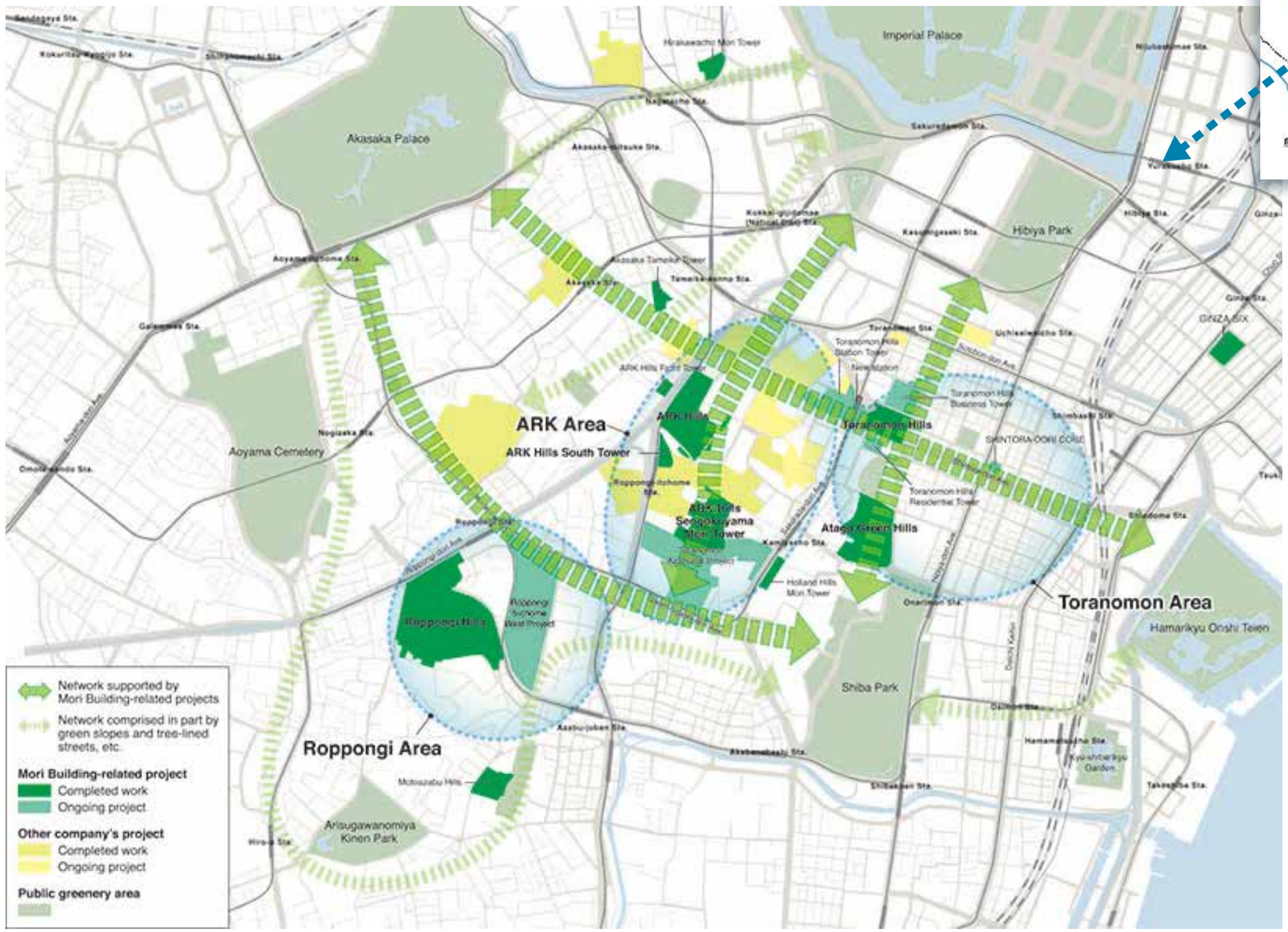
(Biodiversity and Greening Guide, Minato Ward)

Roppongi Hills–Mohri Garden

Roppongi Hills–Japanese tit

Roppongi Hills–Roppongi Sakurazaka

Roppongi Hills–66 Plaza



Toranomon Hills–Oval Plaza

Toranomon Hills–*Rhyothemis fuliginosa* dragonfly

Atago Green Hills–Along Atagoshita Avenue

ARK Hills South Tower–Slope green area

ARK Hills–Suntory Hall rooftop

ARK Hills–Suntory Hall rooftop

ARK Hills Sengokuyama Mori Tower–A Japanese Pygmy Woodpecker in the Kogera Garden

ARK Hills Sengokuyama Mori Tower–Birdwatching

Atago Green Hills–Slope green area and green path

Living with Greenery

People who work, live, and gather in the city love green areas, which let them feel the change of seasons up close and interact with living things. These people make use of the areas for walks, breaks, nature observations, and more.

Interview2016

Chairman Kimura and Director Yamada, ARK Hills Sengokuyama Mori Tower Self-Governing Council

• Winter and early summer make considerably different impressions, don't they.

Kimura: It's early summer now, the peak season for Japanese iris. Just a short time ago, Reeve's spiraea was beautiful too.

Yamada: Frogs are croaking, and in fall, crickets can be heard.

Kimura: In autumn, the colored foliage is also a sight. In winter, the preserved dawn redwood trees lose their leaves, opening up the view; in spring, their seedlings sprouting all at once is wonderful to see.

• How does this compare to 2012 when construction was completed?

Kimura: The types of birds have really increased. Japanese tits, Oriental turtle doves, wagtails...

Yamada: A lot of plants have been raised, making it more natural. I enjoy the change of the seasons on my walks every morning, and am naturally learning the names of the plants. There are preserved *natsumikan* citrus trees. Jam is made from the fruit.

• Growth from here on out is something to look forward to.

Kimura: As the plants have finally just begun putting down roots, they should get even stronger in the coming few years.

Yamada: I want to make this green area a place where people live more in tune with nature, and where they feel themselves to be part of nature.

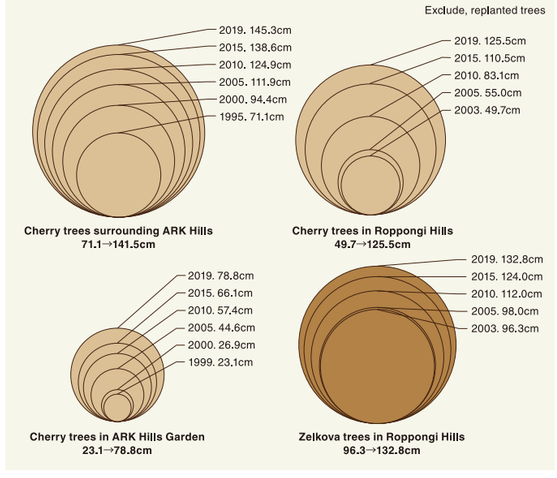
From left: Director Yamada, Chairman Kimura

Growing Greenery

Greenery naturally grows year by year. We carefully support them with daily planting maintenances.

ARK Hills and Roppongi Hills are one of the most famous areas in Tokyo for its cherry blossoms as many people come enjoy them. For the opening in 1986, many cherry trees were planted with the aim of restoring the sight of the old cherry trees that once blossomed in the area. At that time, the trunk thickness of the newly planted trees averaged 28cm. After more than 30 years of careful care (2019), this had increased to 145cm in average and still keep growing moderately.

Yearly tree trunk growth at ARK Hills and Roppongi Hills



ARK Hills

Roppongi Hills

Improving the Green Coverage Rate

To assess the overall amount of greenery, since 2006 we have conducted green coverage rate*1 surveys to measure the percentage of greened land. The green coverage rate and total greened area in ARK Hills, Roppongi Hills, and other facilities managed and operated by our company has been increasing annually, indicating that our urban development contributes to the promotion of urban greening.

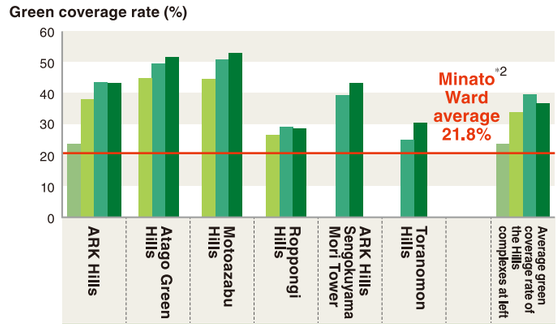
2018 green coverage rate survey, ARK Hills

1990
23.3% (1.15 ha)

2018
43.2%
(2.14 ha)

*1 Green coverage rate = greened area/site area x 100%
In accordance with the Tokyo Municipal Green Coverage Rate Manual, we use aerial photographs as the basis for calculations.

Increase in green coverage rate



	ARK Hills	Atago Green Hills	Motoazabu Hills	Roppongi Hills	ARK Hills Sengokuyama Mori Tower	Toranomon Hills		Average green coverage rate of the Hills complexes at left
1990	23.3							23.3
2006	37.5	44.4	44.3	26.5				33.9
2014	43.5	49.9	50.9	29.0	39.2	24.8		39.6
2018	43.2	51.7	52.9	28.5	43.3	30.3		37.4

*2 Source of Minato Ward average green coverage rate:
9th Minato Ward Survey of Greenery Status, issued March 2017

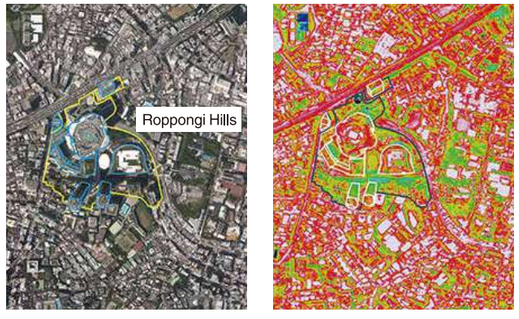
Countermeasure to Urban Heart Island Phenomenon

From thermal images (ThermoMap) around Roppongi Hills, Atago Green Hills, and Toranomon Hills, it was found that during the day, the surface temperature of greened spaces was 5°C to 15°C cooler than the asphalt of surrounding roads. An increase in green areas where cities and nature coexist in harmony not only provides people with places for relaxation, but also leads to mitigation of the heat island phenomenon.

Roppongi Hills

Actual photograph

Thermal image



Atago Green Hills – Toranomon Hills

Actual photograph

Thermal image

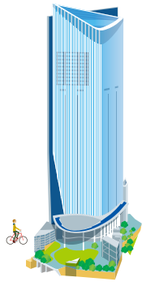
Photos: Skymap K.K.

4 Low-carbon Cities

To achieve the low-carbon city, we implement total and high-quality management in urban development, in all steps from planning to operation. In new construction, we promote the broad use of energy and undertake energy-conserving renovations in existing buildings when upgrading functions, including the introduction of the latest environmentally friendly technologies. Furthermore, in terms of operations, we continue our initiatives aimed at reducing carbon in cooperation with tenants.

Recent Energy Conservation Technologies

Since the era of stand-alone building development, we have actively introduced the latest energy-conserving technology, taking indoor comfort into consideration. We are also taking on such new initiatives at Toranomon Hills, which was completed in 2014.



■ High-efficiency air-conditioning system LOBAS

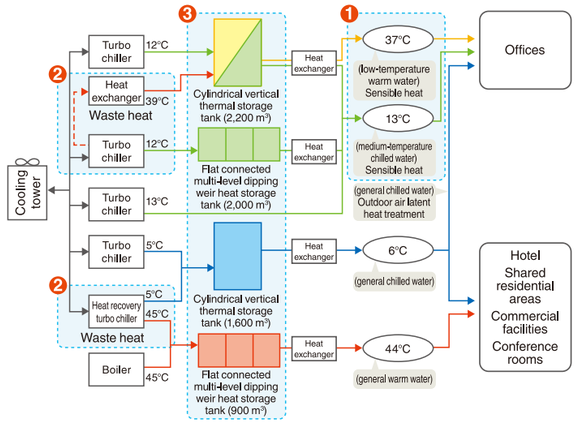
LOBAS (Low-carbon Building and Area Sustainability) is an air-conditioning system that optimally combines multiple energy-conserving technologies, including the use of medium-temperature chilled water and low-temperature warm water, and heat collection using heat pumps (turbo chillers). Based on an electrical system, it is expected to conserve energy by approximately 40% compared to conventional methods.

3 features

❶ Air-conditioning system using medium-temperature chilled and low-temperature warm water
Air-conditioning method separating sensible heat and latent heat treatment using 13°C medium-temperature chilled water and 37°C low-temperature warm water.

❷ Heat recovery heat source system
Use of waste heat from the turbo refrigerator cooling water, and adoption of heat recovery turbo chillers.

❸ Large-scale thermal storage tank system
Combination of a large-depth (approximately 30 m) cylindrical vertical thermal storage tank and a flat connected multi-level dipping weir heat storage tank (6,700 m³ in total).



■ Realizing steady energy conservation with S-BEMS

Since its first implementation in Roppongi Hills Mori Tower in 2003, our Building Energy Management System (BEMS) has been deployed in new properties and large-scale renovations. At Toranomon Hills Mori Tower, we have implemented Smart-BEMS (S-BEMS) which, in addition to existing functions, has functions for clarifying criteria for determining normal and abnormal measured values, further increasing the efficiency of data analysis.

Comparison of BEMS and S-BEMS

Mori Building's past BEMS

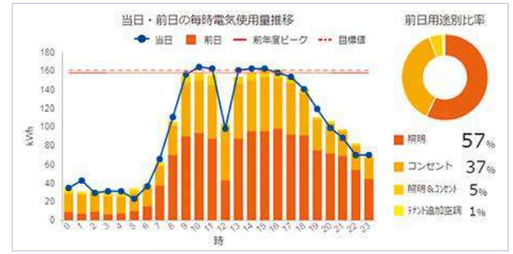
Toranomon Hills S-BEMS

	Basic functions	Extended functions	Further extended functions
Function	**Assessment of energy consumption** By building overall, by energy type, by equipment item, by application etc. **Creation of reporting documents** Daily, monthly, annual, regular, and other reports **Long-term data storage**	**Heat source and air-conditioning system performance evaluation** Energy-conserving control performance evaluation Energy-conserving simulation function Indoor comfort evaluation Equipment COP, pump WTF, air conditioner ATF evaluation* **Collected data diagnosis** Abnormal data detection function Data communication status monitoring	Toward easier-to-use BEMS **Decision functions** Setting of decision criteria for each evaluation item Listing of decision results (OK/NG)
Objective	**Assessment of normal energy consumption**	**Discovery of latent faults Checking and optimization of automatic control**	**Clarification of decision criteria**

* COP: Coefficient of Performance WTF: Water Transportation Factor ATF: Air Transportation Factor

■ Energy WEB system

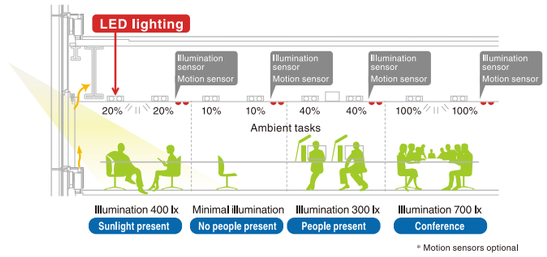
This service displays the energy usage of each tenant in a building. Tenants can easily understand the results of their own energy conservation efforts in graphs and numbers, connecting them to specific measures to save energy and electricity.



Display sample

■ LED lighting system

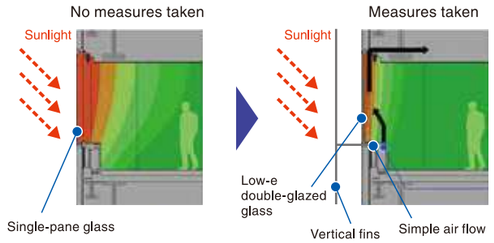
We adopt LED lighting in office areas. In addition to daytime light usage restrictions and energy-conserving control via illumination sensors, area-specific illumination settings in accordance with tenants' wishes are also possible.



* Motion sensors optional

■ Energy conservation measures for windows and external walls

To improve the comfort of window-side indoor environments and reduce the load on air-conditioning, we use low-e double-glazed glass with high solar radiation shielding performance for window glass, and install vertical fins on outer walls. We also use simple air flow that also controls cold drafts in winter, further improving comfort.



■ Communication of environmental information

We communicate electrical usage and other environmental information on facilities through monitors.

■ Solar power generation

We generate approximately 41,000 kWh of electricity per year using solar power installations on eaves.

Acquisition of CASBEE certification

We target with acquisition of the highest "S" certification in CASBEE for Building (new construction), also subsequently to the certification expiration(in 5years),we acquire "S" or "A" certification in CASBEE for Real Estate.

CASBEE for Buildings (new construction)

Toranomon Hills Mori Tower

S certification (2011)

ARK Hills Sengokuyama Mori Tower

S certification (2010)

Toranomon Hills Business Tower

S certification (2017)

CASBEE Real Estate (Jul. 2018)

Property	Certification
Toranomon Hills Mori Tower	S
ARK Hills Sengokuyama Mori Tower	S
Hirakawacho Mori Tower	S
Roppongi Hills Mori Tower	S
ARK Hills Ark Mori Building	S
Atago Green Hills MORI Tower	S
Holland Hills Mori Tower	S
Akasaka Tameike Tower	A
Kouraku Mori Building	A

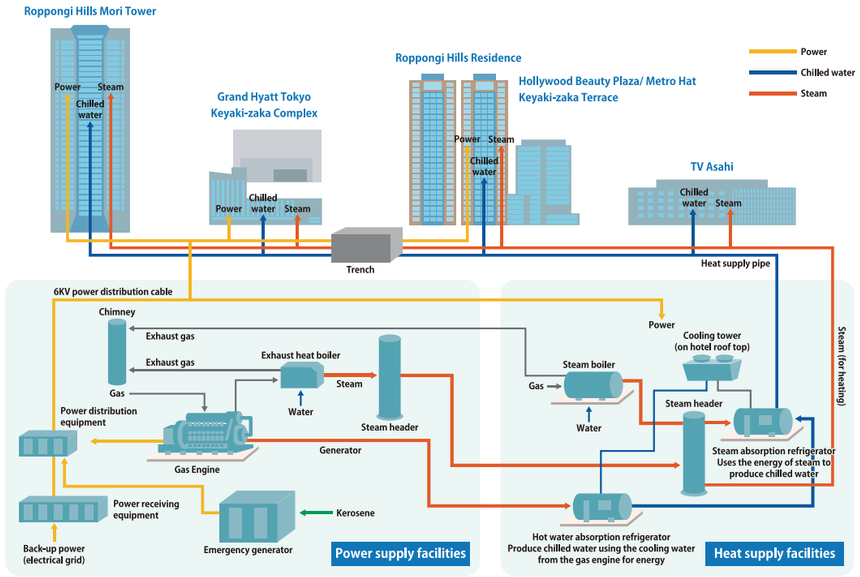
Energy Network

In the development of urban centers where energy density is high and various applications are aggregated, we are achieving improvement in energy efficiency along with improvement in energy security in the event of disasters, by networking energy at the regional level and promoting broad utilization.

■ Roppongi Hills

At Roppongi Hills, we use energy over a broad spectrum. We create electricity through a large-scale cogeneration system, generate steam through the waste heat from power generation, and use these in air-conditioning and heating. At Roppongi Hills, where varied uses are mixed, demand for electricity and heat is present throughout the day, and energy demand is leveled out, achieving a high energy efficiency of approximately 60%. In addition, as the site is fueled by city gas from a medium-pressure conduit with superior earthquake resistance, energy can be supplied in a very stable manner, making the system optimal for tenants' BCP measures. Renovation work including Generator replacement to further improve efficiency was completed in the summer of 2017.

Cogeneration system and district heating and cooling at Roppongi Hills



■ Vicinity of ARK Hills

In the vicinity of ARK Hills, we are moving beyond the area managed by our company, and cooperating in neighboring developments to continuously expand our energy network and further improve efficiency in the area as a whole.

Overview of cooperation

1. 1986: Installed main plant in ARK Hills; introduced district heating and cooling
2. 2000: Began supplying chilled water to Roppongi-itchome
3. 2005: Installed sub-plant in Akasaka Intercity
4. 2009: Began supply to Akasaka Enoki-zaka Mori Building
5. 2013: Re-supply to ARK Hills South Tower (reconstruction of old 21 and 25 Mori buildings)
6. 2017: Installed No. 3 plant inside Akasaka Intercity AIR. Reduce CO_2 emissions per unit of heat (chilled, warm) by approximately 10% from 0.065 t-CO_2/GJ to 0.058 t-CO_2/GJ.

Chilled water
Steam
Area supplied as of 2016
Area supplied from 2017
Buildings supplied with chilled water and steam
Plant, CGS (cogeneration system)

Energy-conserving Renovations

■ Energy-conserving renovations in existing buildings

With the enforcement of the Law on Promotion of Renovation for Earthquake-Resistant Structures in 2005, we conducted a seismic resistance check of all buildings operated by Mori Building under seismic-resistant design methods predating the new seismic resistance standards of 1981. For those buildings not meeting the standards (Toranomon 15 Mori Building and Toranomon 11 Mori Building), we undertook seismic resistance and energy-conserving renovations (individual air-conditioning, adoption of high-efficiency, low-carbon lighting etc.). At the same time, we conducted energy-conserving renovations at buildings found by the diagnosis to sufficiently meet earthquake resistance standards (Toranomon 35 Mori Building, Toranomon 36 Mori Building etc.). As a result, we significantly increased energy-conserving performance and greatly reduced CO_2 emissions performance from that prior to the renovations.

	Toranomon 15 Mori Building	Toranomon 11 Mori Building	Toranomon 35 Mori Building	Toranomon 36 Mori Building
				
Number of floors	10 above ground, 1 underground	10 above ground, 2 underground	9 above ground, 1 underground	10 above ground, 2 underground
Total floor area	11,227 m²	14,333 m²	10,298 m²	12,200 m²
Completion of construction	May 1969	June 1966	August 1981	August 1981
Completion of renovations	December 2009	December 2010	September 2011	June 2012
Seismic resistance renovations	○	○	—	—
Energy-conserving renovations: Air-conditioning	Central→individual PAC	Central→individual PAC	Individual gas PAC→individual electric PAC	Central→individual PAC
Lighting	FL→high-efficiency Hf	FL→high-efficiency Hf	FL→high-efficiency Hf	High-efficiency Hf→LED
Elevators	VVVF inverter control	VVVF inverter control	—	—

* The Building is under redevelopment together with the area next by.
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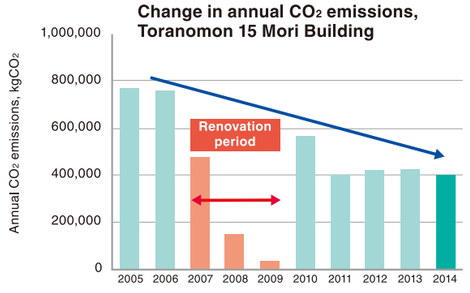
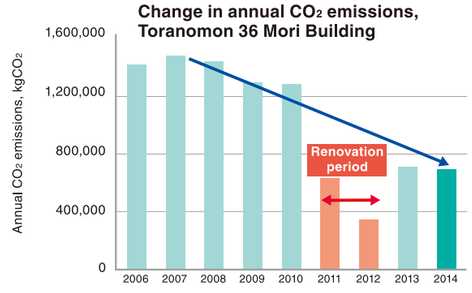
Change in annual CO_2 emissions, Toranomon 15 Mori Building

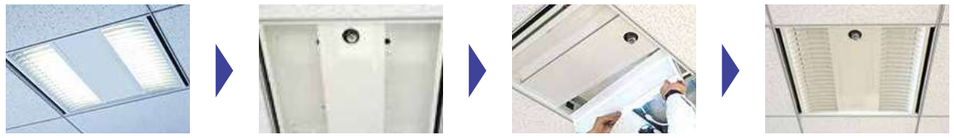


Change in annual CO_2 emissions, Toranomon 36 Mori Building



■ Switching grid lighting to LED

At buildings adopting grid ceiling lighting fixtures on or after 2000, we developed a method for leaving the lighting fixtures and changing only the light sources to LED, for the purpose of improving energy conservation performance, prolonging equipment life, and conserving resources. This removes the need for ancillary work (restoration work and removal of sprinkler heads, air outlets, emergency lighting, sensors etc.) when changing light sources, greatly simplifying construction and conserving resources. We are also undertaking the switch to LEDs at Roppongi Hills Mori Tower, ARK Mori Building, and other buildings.



Existing fixtures (fluorescent lights) → Lamps, ballasts etc. → Installation of LED units → Attach louver, switch to LED

Energy-conserving Initiatives in Facilities Operation

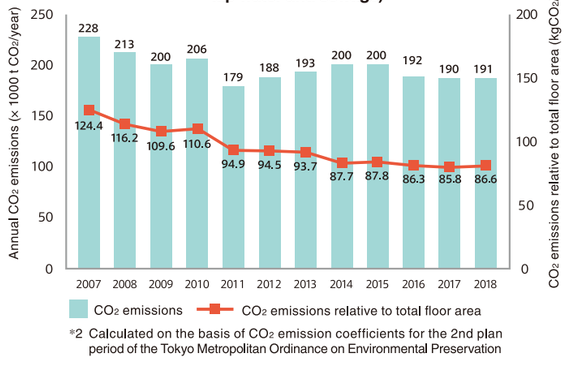
As over 60% of the CO_2 emitted throughout the life cycle of a building (from construction to dismantling) is discharged during operation, energy conservation efforts in facility operations are very important. Even in buildings adopting state-of-the-art technology, we perform appropriate energy management and operation in order to demonstrate the energy-conserving performance that our company expects.

Energy management in all managed and operated buildings*1

For buildings that our company manages and operates, monthly energy usage is managed in a centralized manner on cloud-based servers for each building and for each type of energy (electricity, gas, chilled water, warm water, steam, tap water, and CO_2 emissions). CO_2 emissions relative to total floor area have been declining annually from a peak in 2005.

*1 Buildings owned or partially owned by our company.

Carbon dioxide emission in all managed and operated buildings*2 (electricity, gas, chilled and warm water, steam, tap water and sewage)



*2 Calculated on the basis of CO_2 emission coefficients for the 2nd plan period of the Tokyo Metropolitan Ordinance on Environmental Preservation

Energy-conserving operations in each building

(1) Energy-conserving operation by energy committees

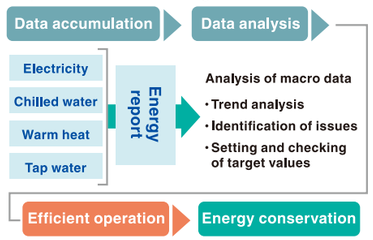
We organize and act through energy committees in each building, focusing on large-scale workplaces that we manage. Facility managers inside and outside the company and design and construction staff cooperate on consideration of energy-conserving operations and on compliance with the Tokyo Metropolitan Ordinance on Environmental Preservation and the Energy Conservation Law, as we continue with initiatives aimed at reducing CO_2 emissions.

Scene from an energy committee

(2) Use of BEMS

Building Energy Management System (BEMS) is a system that enables energy-conserving operations by assessing energy usage conditions and indoor environments in buildings. The system has been introduced into our major buildings, where energy usage conditions are checked in real time through centralized management. Accumulating and analyzing data also enables the elimination of excess and wasteful use of energy. The energy committees work to make maximum use of the BEMS installed in each business site and to fine-tune daily operations to reduce CO_2 emissions.

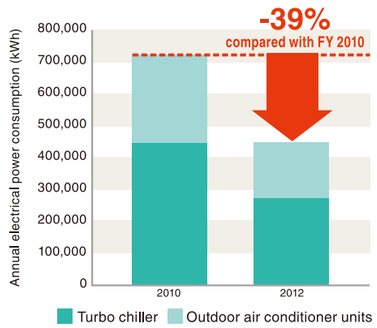
Depiction of BEMS usage



Example of BEMS usage: Omotesando Hills

Since the completion of construction at Omotesando Hills in 2006, we have made use of BEMS and have engaged in initiatives to save energy. In doing so we learned that there was room to improve control over the intake of outside air. Accordingly, in addition to adjusting the frequency of outside air conditioner units and appropriately reducing the intake of outside air, we simultaneously reconsidered operation time. These measures enabled a 39% reduction of electrical power usage in the outside units and heat sources in fiscal 2012, compared with performance in fiscal 2010.

Energy-conserving performance accompanying outdoor air intake control



Energy-conserving Initiatives through Cooperation with Tenants

Management of office buildings' dedicated tenant areas, which account for most energy consumption, is very important. Through collaboration with tenants, we are promoting energy conservation throughout our buildings, in dedicated areas as well as shared areas.

Dialog with tenants

At large-scale workplaces, we organize environmental measure conferences with tenants and engage in dialogs on energy conservation. We also make use of energy conservation pamphlets when tenants move in to request cooperation with energy conservation. We also disclose energy usage for each tenant on our energy WEB system.

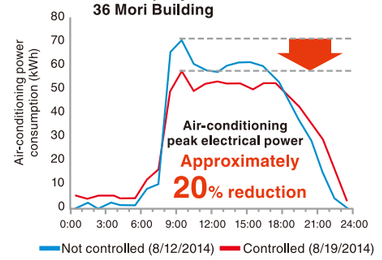
Energy conservation pamphlet

Air-conditioning demand response initiatives employing visualization

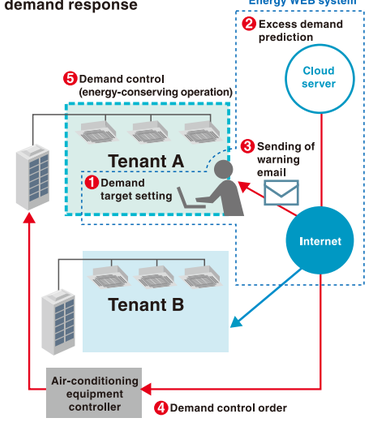
By utilizing an energy WEB system that makes electricity usage visible in two small and medium-sized buildings that have adopted individual air-conditioning systems, we are undertaking electrical power demand response*3 in tenant dedicated areas, a difficulty in the past. We rebuilt the air conditioning system to enable control for each tenant, and set demand targets for each tenant. When excess demand is predicted, energy-conserving operation is executed automatically. At the same time, we provide incentives and encourage proactive behavior among cooperating tenants. As a result, we have cut summer and winter air-conditioning power demand by up to 20%. From here on, we plan to introduce the system into new projects as needed.

*3 A mechanism that promotes the restriction of electrical power usage, suppresses consumption at peak times, and works toward the stable supply of electrical power

Comparison of control effects for Company A in Toranomon 36 Mori Building



Mechanism of air-conditioning demand response



Interview2016 | Customers cooperating with demand response

• How did you come to agree with the initiative?

Seto: We had already been checking demand using the energy WEB system on days that seemed hot. We also looked at the energy conservation ranking to assess energy conservation level, but the results were not up to expectations. We heard about the initiative while feeling the need to do something, and so agreed to it.

Mr. Kawakita
Too Corporation

• How did you gain consensus in the company?

Seto: We took the step of deciding not to actively push it. First, we implemented air-conditioning demand response control without informing employees. We thought that the awareness of doing something would conversely encourage feelings such as 'hot' or 'cold'.

Kawakita: The only parties aware of it were management and a small section of General Affairs. I guess you could call that noninterference (laughs). There were no particular complaints from employees.

• It's running smoothly, isn't it.

Kawakita: Yes, although a problem occurred once in winter.

Seto: On Monday mornings in winter or other especially cold mornings, the heating wasn't effective no matter how long it ran. We wondered why. When we had Mori Building investigate the cause, it was found that in winter, unlike in summer, time and electrical power were required for idling.

Kawakita: In following year, we were able to conduct operation without problems through measures such as loosening the settings and shortening the duration of ventilation. This was something that couldn't be seen until it was experienced.

• Looking ahead, what sort of initiatives are you considering?

Kawakita: Just as now, I hope to conduct reasonable operation matched to the nature of work. The server room, which requires a constant room temperature, is not subject to the control, and we use air-conditioning fully when we have a lot of visitors for new product briefings or other events. I want to maintain awareness of that sharpness.

Seto: We've had good results, so I want to continue working on it.

Mr. Seto
Too Corporation

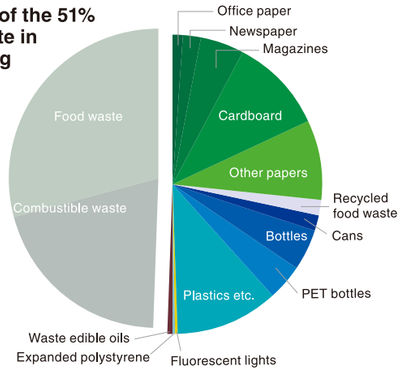
5 Resource Recycling-oriented Cities

In order to achieve resource recycling-oriented cities, we efficiently collect and utilize waste, water, and other resources, under compact urban development through Vertical Garden Cities. In addition, we are making efforts to enhance recycling rates by cooperating with tenants and other stakeholders.

Reduce, Reuse and Recycle (the3Rs) in Office Building

In business facilities where firmly establishing recycling is difficult it is very important to properly separate garbage at the time it is generated. To improve the recycling rate at office buildings managed by our company, we promote 3R activities with the understanding and cooperation of tenants.

Breakdown of the 51% recycling rate in Mori Building offices in FY 2018

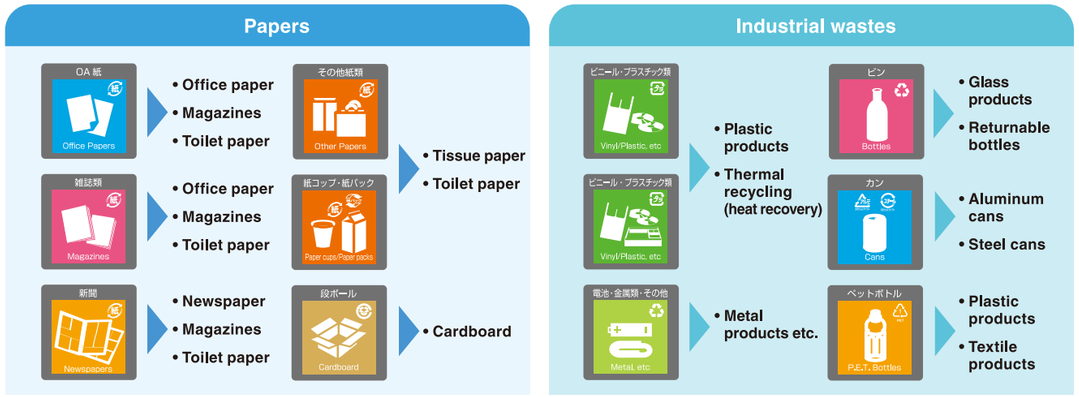


■ Promotion of recycling in offices

We set our own rules for separating garbage into 15 types, provided waste boxes for separating and discarding these, and are promoting recycling. We weigh the separated garbage, summarize the generated volume and recycling rate at each building, and report these to customers. In addition, we recycle 100% of separated and collected paper waste and plastics.

Waste boxes for separation

Separation of recyclable waste, and recycled items



■ Cooperation with building tenants

We produce and distribute a “Recycling Handbook”, providing more customers with opportunities to deepen their understanding of resource recycling and waste separation.

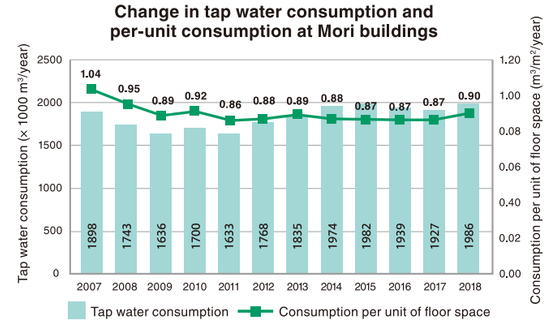
■ Unified management of wastes

In fiscal 2015 we adopted a waste management system. By entering data on the waste weighed in 57 buildings that we manage and operate, we perform timely and unified management of waste volume for each building and each type of waste. As a result, we have become able to comply with legal reforms and make quick and flexible improvements in daily work.

Effective Use of Water Resources

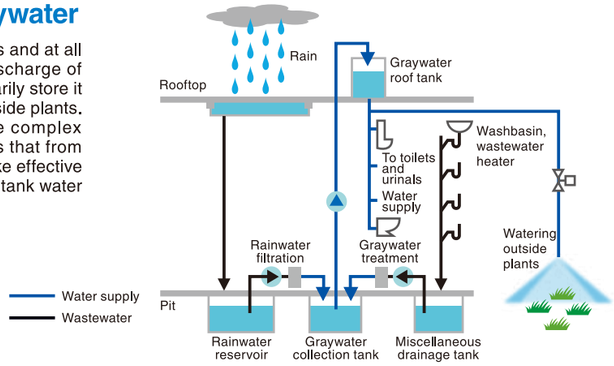
The utilization of rainwater and graywater has effects including reduction of tap water consumption, reduction of discharge into sewage, and control of rainwater runoff during heavy rainfall.
Through urban development, we are promoting conservation and environmentally conscious circulation of water, including the utilization of rainwater and graywater and the adoption of water-conserving equipment.

Change in tap water consumption and per-unit consumption at Mori buildings



■ Utilization of rainwater and graywater

We work to utilize rainwater and graywater at ARK Hills and at all subsequent facilities. In addition to controlling the discharge of rainwater, we collect it throughout the grounds, temporarily store it in a reservoir, and then filter it primarily for watering outside plants. In addition, in Roppongi Hills and other large-scale complex facilities, we treat relatively clean wastewater such as that from hand washing by filtration and disinfection etc., and make effective use of it in the form of graywater for uses such as toilet tank water for offices.



■ Adoption of water-conserving equipment

We promote the introduction of water-conserving equipment in newly constructed buildings, and work to conserve water. At ARK Hills Sengokuyama Mori Tower and Toranomon Hills, we have introduced water-conserving toilets with a flush volume of approximately 6L.

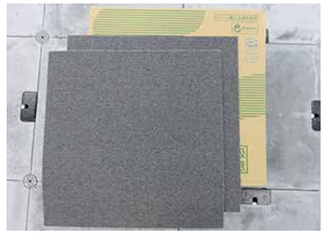
Reduce, Reuse and Recycle (the3Rs) in Construction

■ Reducing construction waste

Together with construction contractors, we aim to achieve zero waste from construction materials and other sources at construction sites. In new construction work, we confirm waste management plans and waste management reports, and undertake the reducing and recycling of wastes.

■ 100% recycling of used carpets

We have established a system for 100% recycling of used tile carpets that remain when tenants leave office buildings. In fiscal 2015 we recycled carpet totaling 57,878 m², resulting in a reduction of approximately 40 tons of CO_2. In addition, we make standard use of Eco Mark certified products for tile carpets in new construction and existing buildings.



6 Community Activities

In order to deepen mass understanding of the harmonious coexistence of cities and nature, and the low-carbon city, and to promote environmental initiatives, we are engaged in a variety of environmental education and awareness-raising activities, while cooperating with the efforts of like-minded administrative agencies.

Together with Children

■ HILLS MACHI-IKU PROJECT

This is an education program for enjoyably learning about cities under the themes of Safety, Environment, and Culture. It began in 2007 as a venue for learning at each Hills complex, and now has over 1,000 participants every year. Tours involving the Environment theme are introduced below.

(1) Exploration tour of the secrets of the environment and greenery

On this tour, participants learn about the importance of the environment and greenery in cities, while interacting with the abundant nature surrounding ARK Hills. At the Roof Garden (normally closed to the public) on the rooftop of Suntory Hall, we hold workshops where participants can experience nature in an urban center.

(2) Bird-watching experience tour

Over 30 species of birds, including the brown-eared bulbul, Japanese white-eye, and Japanese pygmy woodpecker can be observed in the green areas of our facilities. Participants on this tour observe birds and learn about the importance of living things and nature while walking among the greenery of ARK Hills, Roppongi Hills, Toranomon Hills, and other locations.

■ Hands-on farming in rooftop garden

In the rooftop garden 45 m above ground level at Roppongi Hills Keyakizaka Complex, we have reproduced Japanese agricultural landscapes such as a rice paddy, vegetable gardens, and ponds, and use these for various activities throughout the year (usually not open to the public). We offer opportunities for customers in offices and residences to experience Japan's traditional rice culture, including planting in spring, reaping in autumn, and making rice cakes with the harvested rice in winter.

ARK Hills "GREEN WORK SHOP"

GREEN WORKSHOP is a once-in-a-month membership program that activates the rich nature of the ARK Garden in the field. For grow children's five senses, physicality, and free sensitivities through contact with nature through the four seasons, horticultural activities to grow flowers, and art work will be nurtured.

Together with People in the city

■ Roppongi Clean-up

As part of community contribution by the Roppongi Hills Self-Governing Council, we have conducted this activity since 2003 in order to clean up streets in Roppongi and enjoy interactions with local residents. In addition to customers who are tenants of offices and residences in Roppongi Hills, nearby neighborhood associations, schools, and other organizations also participate and continue the volunteer cleanup activities. The cleanup takes place once a month, with over 100 people taking part.

■ Roppongi Hills GREENUP

We have undertaken Roppongi Hills GREENUP from 2012, focusing on customers in Roppongi Hills offices and residents. The activity seeks to deepen attachment to Roppongi Hills and communication among participants through planting and maintenance of flowerbeds. Held once a month in the morning, it has received a warm response as a meaningful way to spend time before heading out to work or elsewhere.

Together with Companies, local and national Government officials

■ Companies and the Environment Exhibit

(organized by MECC)

The Minato Eco-Conscious Consortium (MECC) was established by Minato Ward in 2005 as a place where companies, ward residents, and the ward can cooperate on receiving and transmitting information and knowledge concerning the environment. Agreeing with the aims of MECC, our company has participated since 2007. In particular, since 2010 we have cooperated in planning, operations, and provision of space for the Companies and the Environment Exhibit, which features displays and presentations on the environment.

■ Minato Ward Bicycle Sharing

(implemented by Minato Ward)

In 2014, Minato Ward launched Minato Ward Bicycle Sharing as a new means of transportation to improve the convenience of an everyday means of mobility and enhances the appeal of the city in terms of tourism promotion. The program aids measures to combat neglected bicycles in cities and reduce CO_2 emissions. Supporting this concept, our company is cooperating in establishing a large number of cycle ports in ... in Toranomon Hills, Atago Green Hills, ARK Hills, and Roppongi Hills, among other locations.

■ CO_2 Reduction and Light-Down Campaign

(organized by the Ministry of the Environment)

Since 2003, the Ministry of the Environment had conducted this campaign, which calls for turning out lights in facilities to prevent global warming. Participating since 2008, our company has set the summer solstice and the Star Festival and Cool Earth Day as special days for the campaign, and has requested cooperation in the conservation of electricity not only from the areas of our business but also from offices and shops. We work to turn off lights in all of our facilities, and make the campaign an opportunity to think about global warming.

■ Umi-no-mori (Sea Forest) Project

(organized by Bureau of Ports and Harbors, Tokyo Metropolitan Government)

The Bureau of Ports and Harbors of the Tokyo Metropolitan Government began this project in 2007. The project plants saplings on reclaimed land built on waste and construction soil inside the central breakwater to make Tokyo a more beautiful city. A total of 480,000 seedlings purchased through donations by residents and other parties, and raised from seedlings by Tokyo elementary school students – have been planted on the site. Agreeing with the aims of the project, our company has donated funds from the start and has also participated in the tree planting and growing activities from 2010, together with customers in offices.

7 History of Awards

Greening Division

2002: 22nd Green City Awards, Minister of Land, Infrastructure, Transport and Tourism Award (awarded to ARK Hills)

2004: 2004 Minato-ku Green Urban Development Award (awarded to Roppongi Hills)

2005: Highest grade (Stage 3), 1st SEGES (Social and Environmental Green Evaluation System) (awarded to ARK Hills)

2006: ENERGY GLOBE AWARD – National ENERGY GLOBE AWARD Japan – (awarded to ARK Hills Rooftop Garden, Mori Building Co., Ltd.)

2008: 17th Global Environment Awards, Minister of Land, Infrastructure, Transport and Tourism Award
(awarded to green areas at major properties)

2008-2010: 2nd-4th Green Tokyo Fund, Governor's Award (awarded to Mori Building Co., Ltd.)

2009: 2009 Minato-ku Green Urban Development Award (awarded to Akasaka Tower Residence Top of the Hill)

2010: Top 100 Biodiversity Focused Properties (awarded to Roppongi Hills, ARK Hills, Atago Green Hills)

2010: 9th Fumi no Miyako Urban Landscape Award of Bunkyo City
(awarded to Koraku Ryokudo (awarded to Council for Management of Koraku Pedestrian Path))

2011: 2011 Urban Scenery Awards, Urban Space Division, Special Award (awarded to ARK Hills green area)

2011: 10th Competition for Specialized Greening Technology for Rooftops, Walls and Green Spaces - Walls and Special Greening Division: Organization for Landscape and Urban Green Infrastructure, Chairman's Award
(awarded to Greening of Roppongi Hills' artificial ground base, seismic control system etc.)

2011: 13th Green City Awards, Green Area Creation Incentive Award Division (awarded to Atago Green Hills)

2013: Green Social Contribution Awards, Organization for Landscape and Urban Green Infrastructure, Chairman's Award
(awarded to ARK Hills Sengokuyama Mori Tower)

2014: 2014 Minato-ku Green Urban Development Award (awarded to ARK Hills Sengokuyama Mori Tower)

2015: 2015 Minato-ku Green Urban Development Award (awarded to ARK Hills South Tower)

2016: 2016 Minato-ku Green Urban Development Award and Minato-ku Scenic City Creation Awards, Incentive Award
(awarded to Toranomon Hills)

2016: 15th Competition for Specialized Greening Technology for Rooftops, Walls and Green Spaces - Rooftop Greening Division: Minister of Land, Infrastructure, Transport and Tourism Award (awarded to Toranomon Hills)

2016: 36th Green City Awards, Prime Minister's Award (awarded to green areas at major properties)

2018: 17th Competition for Greening technology for Rooftops, Walls and Green Spaces "Greening for Rooftops Division"
Minister of Land, Infrastructure, Transport and Tourism Award.(Awarded to GINZA SIX)

Energy Conservation Division

2001: 20th Lighting Design Prize
(awarded to Development, implementation, and evaluation of new lighting system: Forest Ceiling System (Atago Green Hills MORI Tower))

2004: 18th The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan Promotion Awards, Technology Promotion Award 2001
(awarded to Presidential Tower)

2005: 43rd Society of Heating, Air-Conditioning and Sanitary Engineers of Japan Awards, Technology Award, Architecture and Equipment Division
(awarded to Roppongi Hills Mori Tower)

2007: Heat Pump and Heat Storage Symposium, Heat Storage System Operation, Management etc. Improvement Case Studies, Effort Award
(awarded to Mori Building Co., Ltd. (equipment owner))

2010: Fiscal 2009 Kanto District Energy Conservation Case Studies Presentation Meet, Award for Excellence
(awarded to ARK Mori Building, case study of energy conservation improvement through energy committees)

2011: Fiscal 2011 Energy Conservation, Lighting Design Awards Energy Conservation, Lighting Design Award (Exceptional Case Study Award)
(awarded to Sky lighting in Venusfort interior environment performance)

2012: Fiscal 2012 Energy Conservation, Lighting Design Awards, Energy Conservation, Lighting Design Award (Exceptional Case Study Award)
(awarded to ARK Hills Sengokuyama Mori Tower external wall lighting and office unit LED lighting)

2015: Energy Conservation Awards, Energy Conservation Center Chairman's Award
(awarded to initiative for energy conservation through air conditioning demand response control in tenant buildings)

2015: 24th Global Environment Awards, Minister of Land, Infrastructure, Transport and Tourism Award
(awarded to Initiative for Demand Response Control in Tenant Buildings Through Visibility)

Resource Recycling Division

2010: Minato-ku Commendation for Excellent Waste Operators etc. (awarded to Toranomon 37 Mori Building)

2013: Minato-ku Commendation for Excellent Waste Operators etc. (awarded to Akasaka Enoki-zaka Mori Building)













Photos on page 22: HILLS MACHI-IKU PROJECT, hands-on farming experience in rooftop garden