There’s more to building a green society than just building.
The signals are there for anyone to see. We have to change our society to protect the planet for future generations. At Skanska, we’re already on the case. Under construction: a green society.

*Skanska’s Green Initiative*
A foreword – complete with three important points.

Most people are not aware that our built environment accounts for a large portion of the strain on the planet. Whether we work in an office, a school or a hospital, live in a house or a condominium, travel by rail or by car, we are part of the problem. Even when we go to the gym, a concert or a sports event, we affect the environment. The good thing is that we are also part of the solution – we can make a positive difference. Buildings and infrastructure can be designed and built to reduce the impact on the environment. We already have the means and methods, some of which are presented in this book.

If we’re seriously going to overcome the challenges facing the planet, it is time to act. At Skanska we carry out green construction, so we can really make a contribution to reduce environmental impact. But also, we do it because it’s good business, for our customers and for us. We want to do our part – we call it Skanska’s Green Initiative. We would like you to join us on the journey. The destination is a Deep Green society.

Important Point #1: We already have the necessary technology for Deep Green construction. We don’t need to wait for a technological revolution.

A house in Seattle, in the US, has an exterior wall system made of recycled paper. In Misteröd, Sweden, buildings are now so energy-efficient that they don’t need a conventional heating system. In Bristol, UK, schools collect rainwater and use it to flush toilets.

Please note that these are not visions, they are here, right now. This is one of the main points of this book. Technology is not a barrier. Already today, we have the knowledge and techniques to go a long way on the road to a Deep Green society. Naturally, technology will become more refined, efficient, cheaper and easier to use. But there is no reason to wait. We’d better start doing what needs to be done.

Important Point #2: We carry out green construction because it is the right thing to do. It is also good business – for our customers and for us.

“But can we afford it?” you may ask if you, like many people, assume that green construction is more expensive. But it doesn’t have to be and, frankly, we can’t afford not to go green. The future well-being of our planet is at risk.

In fact, the solutions we talk about in this book can lead to substantial cost savings. Green construction is simply good business – a slightly larger investment today will yield even larger cost savings over time. In addition, savings will increase as the cost of energy, water and waste treatment rise. This book contains a number of examples of just that: methods that will save both resources and costs. These are solutions that make sense – both financially and environmentally.

Awareness is also rising. Already today we notice that investors are prepared to pay slightly more for our green offices because of their reduced lifecycle costs, and because they are easier to lease and represent a higher value on the property market.

Important Point #3: You are the driving force of change. There is no need to wait for international agreements and national mandates.

If you look behind many of the most advanced green initiatives, you will find visionary and passionate people. In many cities in the markets where we operate, forward thinking mayors and urban planners, companies and organizations have achieved amazing results in the environmental field without waiting for the mandate of federal laws and regulations. All over the world, there are forerunners creating buildings and facilities that surpass national requirements by far.

We are facing great challenges, and we all need to recognize our personal responsibility to act – to do what we can, in ways both large and small. I hope this book provides ideas and inspiration for your efforts.

Skanska has been around since 1887. The reason we are still here – and have grown to international standing – is that we have always had employees and customers ready to take on challenges and think in new ways. Together, over the decades, they’ve worked to solve the new needs of societies in transformation. Today, we need to continue to think innovatively to move forward. We can help our customers and their customers – tenants, commuters, employees, students, patients, travelers – to save energy, reduce emissions of greenhouse gases, prevent waste build-up, avoid hazardous waste, and save water.

We hope that you want to join forces with us. Together, we can make a big difference, and create a society that minimizes its impact on the environment – a society less dependent on non-renewable resources. A Deep Green society.

Johan Karlström
President and CEO, Skanska
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6,890,000,000. That’s how many of us are sharing the planet Earth. And our numbers are increasing fast.
What happens when more and more people move to bigger and bigger cities?

Even faster than the population growth is another process. More people are moving to cities, which are growing ever larger. For the first time in world history, more people live in cities than in the country. And that trend is not going away. By 2050 we expect that 60 percent of the world’s population will live in cities*, and the big cities will only get bigger. This doesn’t mean fewer people will live in rural areas. In more developed countries, the population outside cities may decrease somewhat, but in less developed countries, the population in the countryside will continue to grow – just not as quickly as the population in the cities.

These concentrations of people put enormous demands on Earth and our society. After all, it’s in urban areas that most energy and other resources are consumed. In addition, climate change poses new challenges. An altered climate will mean water shortages in places like Central Europe and the USA, while the situation in already parched areas will become more acute. How can we avoid this? How will we manage transportation and shipping and reduce emissions?

More people wanting more. How can we solve that equation?

We can’t change the fact that people increasingly choose to live in cities – but we can take advantage of the opportunities that choice presents. If it’s all going to come together, we need to find a path forward that lets us do more with less. Or as the United Nations report cited earlier concludes: “Given that the world’s future will be urban, development initiatives must address the challenges and make the best of the opportunities that growing urban centers bring.”

Built environments are responsible for around 40 percent of all energy use and man-made CO₂ emissions.*

Fortunately, we’re a construction company.

Home and work: Without a doubt, they are a big part of people’s lives. So it’s logical that they would account for a large share of the strain on our planet. Since construction companies are so integral to both home and work, it follows that those companies bear a sizeable responsibility in our current situation.

As a construction company, we are uniquely qualified to make things happen. Together with our designers, supply chain and clients, we can contribute to true change. But fully meeting the challenges will require a change in society. Studies show that developers are unaware that buildings produce 30–40 percent of man-made CO₂ — they believe the percentage is much less. They also believe it is more expensive to build green.** However, when the whole lifecycle cost is taken into consideration, green construction can be less expensive.

There really has to be a change in society.

We have everything we need. Why wait?

At Skanska, we do more than just construct buildings, roads and other infrastructure. Our experience and knowledge have led us into a more active role as developer and partner at an early stage.

Let’s not wait for initiatives, goals or directions resulting from international agreements and national mandates. We all need to think in new patterns, to think ahead and always do the things, large and small, that lead to a better future. The tools and technology exist. And, as you will see in this book, plenty of examples show that change is already happening.

There is not one solution to the problems we face. There are thousands — and the solutions are getting smarter all the time. We are in the midst of intense growth in green-society thinking and construction. With 10,000 Skanska projects running simultaneously on three continents, we continue to gather the experience and expertise to move forward.

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** EEB Facts & Trends, September 2008.
Yes, we need to change society. But where are we going? And where are we now in that journey?

To make things a little clearer, we’ve made a colored road-map of our journey. The destination is Deep Green – Deep Green buildings and Deep Green infrastructure. And the definition of Deep Green is simply zero impact or as close to it as is economically possible.


“If the starting point – ‘vanilla’ on our roadmap to Deep Green – means following today’s rules, norms and environmental systems, then we can quickly observe that we are already capable of so much more,” says Noel Morrin, Senior Vice President of Sustainability and Green Construction at Skanska AB, and one of the experts within the Skanska Group on environmental issues. “In some aspects of some projects, we are within sight of our destination. But we are more interested in pushing each and every one of our projects as far into the Deep Green zone as possible, from every point of view, not just what we construct but also how we construct it.”

Some factors can really speed up the process. Smart, engaged and demanding clients are one. Other important factors include involvement of stakeholders early on in the process, and partnerships with suppliers. This will help to make the entire chain – from raw material to completed construction – more environmentally sound. It will also assist in developing...
new and better materials and methods that conserve as many resources as possible.

Applying a more holistic approach to our surroundings means that instead of just building a house or a bridge, we make sure it functions in its setting without introducing negative effects, now or at any point in its existence. That doesn’t mean promising to use the latest technology. “We’ll aim to use the best technology, and in some cases it is hundreds of years old,” says Noel Morrin. “Simple, robust solutions are preferable – they cost less, they require less maintenance, and they are less vulnerable to disruption.”

The best results often come from thinking in new ways, and combining old and new methods. A good example is concrete piles with built-in geothermal piping. If you plan to cast the piles into the ground, why not simultaneously use them to decrease energy costs?

Vanilla: The environmental construction process or product performance is in compliance with law, regulations, codes and standards.

Green: The environmental construction process or product performance is beyond compliance, but not yet at a point where what we construct and how we construct it can be considered to have near-zero impact.

Deep Green: The environmental construction process or product performance is future-proofed - for example, it consumes zero net energy and produces zero waste.
Green thinking

Eco-design tool: LEED
Leadership in Energy and Environmental Design. This is a voluntary system for measuring sustainability that was introduced by the US Green Building Council. LEED uses a lifecycle perspective to evaluate how a building handles the most important environmental parameters: energy savings, water efficiency, improved indoor environment, site location and responsible use of materials. The result is a clearly marked scorecard for grading building characteristics. Buildings are certified by independent evaluators. LEED has spread rapidly throughout the US and has contributed to a broader focus on environmentally responsible buildings. The system is being used in more than 100 countries. Skanska is currently using LEED in Europe and the US.

Eco-design tool: BREEAM
Building Research Establishment Environmental Assessment Method. This is a method of assessing a building’s environmental qualities based on selected criteria – it is the UK equivalent of LEED. BREEAM focuses on management, energy, water, land use and ecology, health and well-being, transport, materials, waste and pollution. Buildings outside the UK can be assessed using BREEAM International, which is tailored to suit local circumstances.

EU GreenBuilding
is a voluntary program for energy efficiency in non-residential buildings. To become a GreenBuilding partner, energy consumption must be at least 25 percent lower than the national standard. In a lot of countries where we operate, the first buildings to be recognized by GreenBuilding were built by Skanska.

Eco-design tool: CEEQUAL
Civil Engineering Environmental Quality Assessment and Award Scheme. A method for assessing and encouraging environmental performance in civil engineering, such as roads, railroads, bridges and tunnels. It is used mostly in the UK.

Environmental management system: ISO 14001
is the most important environmental management system. It ensures that we work in an environmentally responsible way and that we continually improve. In 2000, Skanska became the first global construction company to obtain ISO 14001 certification.

Environmental standard: Nordic Swan
is one of the most important of the Scandinavian environmental standards. It is known for its labeling of environmentally friendly products such as cleaners, paper and office supplies, and also hotels and conference centers. Now the standard has been extended to include residential buildings. The Skanska Uniqhus was marked with the Swan in 2005, and since then we have built about 150 of them.

Green certifications.

Along the road to Deep Green, you’ll encounter a lot of strange terms and abbreviations. They include assessment methods, environmental certifications, environmental management systems and product labeling.

The most important terms relate to eco-design tools, which use selected criteria to evaluate and classify how environmentally responsible a building is. Setting a target and offering a reward in the form of third-party certification plays a crucial role in getting things to happen today. But we need to remember that we can already surpass the minimum requirements needed to achieve certification.

Eco-design tools measure the final results of what we build. Environmental management systems are about the way we work. In addition to these standards, product labeling helps ensure the materials we use are produced in an environmentally correct way. One example is the Forest Stewardship Council. The FSC establishes international norms for responsible forestry.
Welcome to Green City
1. Infrastructure promoting walking, cycling and other alternatives to car use

A city with renovated or new buildings, an extensive system of public transportation and basic services easily available. Alternative transportation is made easy.

2. Energy-efficient buildings

Buildings using little energy, thanks to very good insulation levels in walls, ceilings and floors, and with high-efficiency windows. Also saving energy through other methods, such as shading and building occupancy.

3. On-site energy generation from renewable sources like solar, wind and geothermal energy

Buildings capturing solar, wind and geothermal energy to satisfy the electric power demand, space-heating, space-cooling and water heating.

4. Energy Piles™ providing an innovative source of renewable energy achieved by combining the latest piling and geothermal technologies.

5. Renewable off-site energy supply, including low-impact hydropower, wind power and solar power

Energy generated from natural resources, such as sunlight, wind, rain and tides – sources which need not cost anything to either the user or the planet, and distributed through national and local grids to the end user.

6. Waste recycling

Waste products recovered and put to use.

7. Green roofs

A living roof, an eco-roof or even a rooftop garden – a roofing system that uses vegetation to absorb rainwater and reduce heat reflection.

8. Rainwater harvesting

Rainwater collected, stored and used for irrigation and even for livestock.

9. Water recycling

Wastewater treated and reused – for example, in buildings for flushing toilets, or for agricultural and landscape irrigation.

10. Regional materials and resources

Using local materials, preferably with a recycled content and produced with minimal effect on the environment. They should last the entire lifecycle of the building and be easily recyclable afterwards.

11. Factory-engineered products

Using local factory-engineered products in construction. To contribute to zero waste, they are produced to consistent quality standards and tagged for inventory control and just-in-time delivery to the construction site.

12. Healthy indoor air quality

Leaving the pollution outside. No harmful compounds are allowed in, including particulates, combustion gases, outdoor pollution, mold, microbial contaminants, and compounds released by materials.

13. Old buildings made energy efficient

Through renovation and by using updated green technology, old buildings are upgraded to reduce their impact on the environment.
What we are actually doing.

Welcome to reality. Here’s how green thinking is turned into practice, addressing sustainable issues.
There are extraordinary gains to be made, ecologically and economically, says Hans Wallström, Director of Sustainability at Skanska Commercial Development Nordic. “Housing and real estate are responsible for about 30 to 40 percent of global energy use.”

“Most of it, about 85 percent, goes to daily operations while the building is in use. There are massive savings to be made there,” he continues, then explains that only one percent goes to the actual construction, the other 14 percent goes to producing the building materials.

Since so much of the energy consumption in buildings occurs during their operation, we focus much of our work in the design phase to predicting and minimizing it. By making this a standard part of the design and commissioning process, we can help building-users to reduce their impact and operate the building more efficiently.

Getting a whole lot more out of a whole lot less.

“Together with architects and developers, we can help our customers save energy by building less energy-demanding houses,” says Hans Wallström. “And we want to do more, like advise customers how to use less energy.”

He believes in spotlighting energy use. Large central meters displaying usage and cost, for example, can challenge the people in the building to use as little energy as possible.

Hans Wallström also believes in environmental labels clearly stating the amount of energy that buildings consume, such as those used in the EU GreenBuilding program. Labeling helps encourage building for energy conservation – plus it makes it easier to choose suitable premises, especially for companies. Yet we must look beyond the levels prescribed, because we can already do so much more. An EU GreenBuilding label, for example, indicates that the energy used on the premises is at least 25 percent lower than national requirements. Skanska constructs buildings and office space that use 50 to 60 percent less energy than national norms – and in some cases, it’s an even higher percentage.

Energy – making the most of it.

“Unlike other geothermal systems, Skanska Energy Pile™ technology doesn’t require extra land for boreholes or wells. The idea is simple: when casting an on-site concrete pile (or a diaphragm wall), place a closed loop inside. Fill the loop with a glycerol and water solution, connect it to a heat pump, and you have an efficient geothermal energy plant that provides heating or cooling. The cost of boreholes is avoided, since the pile would have been cast there anyway. The system can reduce the amount of fuel required for heating and cooling a building by approximately two thirds with subsequent reductions in CO₂ emissions. The extra investment involved is typically paid back within three to six years.

Energy Smart design

Skanska has developed Energy Smart design services to identify, then apply, the design techniques that will maximize a building’s energy efficiency – while minimizing environmental impact. Using lifecycle assessments and lifecycle cost modeling, the appropriate energy-efficient design features are determined. These can include efficient waste-heat recovery systems, the use of zoned heating and cooling, and energy-efficient installations like sensor-controlled low-energy lighting. All leading to enhanced property values and reduced operating costs.
Energy source: A lake.

Case Study: Efficient ways to conserve energy

Location: Kings Mill Hospital, Nottinghamshire, UK.
Challenge: Make a hospital as energy efficient as possible.
Completion: Sixty percent of the facilities will be operational in 2009, with redevelopment complete in 2011.

When Kings Mill Hospital was rebuilt and expanded, decades of ad hoc extensions were transformed into a state-of-the-art hospital. When the entire reconstruction is completed in 2011, there will be 18 new wards, a new entrance, new clinics and a training center. The new Kings Mill Hospital is also more energy efficient. The reason for that lies submerged in a nearby lake.

Down there, a system of heat exchangers produces both heating and cooling for the hospital. The heat exchangers are connected to four heat pumps inside the hospital. This system will cover the hospital’s cooling needs, while supplementing the heat produced at a natural gas thermal power station. Annual savings are expected to be 9,600 MWh of gas and electricity. That means 1,250 metric tons less carbon released into the atmosphere every year.

Put another way, this is a saving of USD 240,000 per year – meaning the system will pay for itself in less than a decade.

“This project will make life much more comfortable for our staff and patients, reduce our carbon footprint and save the NHS money,” says John William, Project Director at the Sherwood Forest Hospitals NHS Foundation Trust.

Read more about Kings Mill Hospital at skanska.com/kingsmill.
Heating system: A hairdryer.
Passive house technology results in houses that are so energy efficient that no conventional heating system is needed. They are partly heated by all the small heat sources that are there anyway, like people, lights, fridges, freezers, computers - and hairdryers.
It’s never too late to start saving energy.

Case Study: Efficient ways to conserve energy

Location: Brörgården, Alingsås, Sweden.
Challenge: Reduce energy consumption in a 40-year-old housing complex using passive house technology.
Completion: March 2010.

Passive houses are so well insulated and airtight that no conventional heating system is required. The homes are heated by all the small energy sources that are there anyway: lights, appliances, computers, servers, routers, and of course, people. This type of building offers excellent performance, even in a climate as harsh as that found in the Nordic countries. Keeping the house warm on some of the colder days may require a little extra heat, but not much more than the equivalent of a hairdryer to heat an apartment.

To minimize energy consumption, the ventilation system circulates air to every room, and is so efficient that it recycles at least 85 percent of the heat from air vented to the outdoors. A passive house may be more expensive to build, but only in the range of zero to five percent. But just like so many other environmental investments, it pays back over time. Moreover, we are putting a lot of extra work into reducing the cost of constructing passive houses. The homes in Misteröd, Sweden, for example, didn’t cost more to build than if we had used traditional technology. It shouldn’t have to cost more to live in an environmentally responsible way.

The next generation.

The next generation of passive houses will feature systems for generating their own energy. An example is the Öresund Green House prototype developed by Skanska for use in a number of construction projects in southern Sweden. The first homes to be built according to this model will have small-scale wind power generators for electricity, and solar panels that will supply about half the hot water needed. And if the house doesn’t need the energy it generates, it could supply the excess to the power grid, transforming the passive home into an active source of energy.

Read more at skanska.com/swedishpassivehouses.

Making passive houses affordable.

Case Study: Efficient ways to conserve energy

Location: A number of places in Sweden.
Challenge: Create extremely energy-efficient homes that aren’t more expensive than conventional houses.
Completion: Ongoing.

Start with a 40-year-old housing complex of 300 poorly insulated apartments with less-than-optimal ventilation and sky-high heating costs.

Renovate using passive house technology: Insulate well. Make airtight. Install efficient ventilation that ensures optimal airflow in every room. The ventilation system recycles heat from the exhaust air (and can provide additional heat if necessary). Attach new facades with the balconies mounted in a way that avoids thermal bridges.

Result: energy consumption reduced by 60 percent. And a radically improved indoor climate. Before renovation, the buildings were not suitable for older renters because of the poor indoor environment. Read more about Brörgården and other passive buildings at skanska.com/brogarden.

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Read more at skanska.com/swedishpassivehouses.
Carbon calculation for civil engineering projects

If you can measure and compare the carbon emissions of different projects, it’s much easier to find and select the most energy-efficient methods. In the United Kingdom, Skanska has started using a carbon calculation tool that assesses total CO₂ production for construction projects such as roads, bridges and water purification plants. It can be used both to identify areas where emissions can be reduced, and to evaluate completed projects. On one project, the assessment was able to demonstrate that the combination of value engineering and a more sustainable approach reduced the project’s construction carbon footprint from approximately 22,000 to 17,000 metric tons and saved around USD 3 million in costs.

You could stop breathing – but there are more efficient ways to reduce CO₂ emissions.

A project’s design can have a significant effect on its carbon footprint, and therefore on climate change. Energy demand – and energy efficiency – are critical factors in a building’s design. To minimize CO₂ emissions, it’s advantageous to use renewable energy. In several of our projects, the design has included on-site renewable energy generation – which may come from solar or geothermal sources – saving energy as well as money. After all, the sun doesn’t send invoices, and the cost of providing one unit of solar energy by the sun is constant, even if we have not yet found a really efficient way to trap it for use.

A project’s design can help reduce the impact of CO₂ in other ways. Roads can be designed to improve traffic efficiency, thereby reducing emissions.

In all projects, careful material selection can help reduce emissions. The use of low-carbon concrete, low-temperature asphalt and locally produced materials, to name just a few, can all lower the CO₂ emissions. Another approach is to optimize the design to use less material and to use more efficient ways of handling materials, such as reusable packaging that reduces waste, transportation and hence CO₂ emissions.
The carbon-neutral office.

1 Case Study: Smart ways to reduce CO₂

Location: UN House in Arendal, Norway.
Challenge: Provide a completely climate-neutral office building.
Completed: October 2006.

The UN House is located on the waterfront in Arendal, Norway. Originally built in the 1960s, it was poorly insulated and consumed a lot of energy. When the Global Resource Information Database (GRID) acquired the building, it had a whole new list of requirements. Since it is a part of the United Nations’ Environmental Program, GRID wanted a building that met its carbon dioxide neutrality policy, to be consistent with the organization’s position on environmental responsibility.

To meet the needs of such an energy-efficient building, a new double-wall technique was developed by Green Construction Alliance in Norway (Skanska and GRID are members). The old concrete facade was removed and replaced with a double windowbox facade which has an air-space of 14 inches/35 centimeters between the exterior and interior glass. This lowered heat loss in winter and prevented overheating in summer. Air circulates in the cavity wall space and can be vented out in hot weather through exterior windows. The double wall – together with efficient insulation, sensor-controlled lighting, internal climate regulation and other energy-efficient installations – lowered the building’s energy consumption to a third of what it was before reconstruction.

What’s more, all of the consumed energy comes from renewable sources. Hot water, for example, is heated by a solar energy system. The heated water is stored in the basement to ensure a constant supply. Just about all of the heating and cooling needs (95 percent) are met using heat pumps located in the nearby ocean, together with a 0.9-mile/1.5-kilometer system of pipes. The company delivering electricity to the UN House guarantees 100 percent certified renewable electricity.

The result: an energy-conserving and carbon-dioxide neutral building. One hundred percent of the building’s heating, cooling and electricity comes from renewable sources that don’t directly produce any carbon dioxide. Carbon-dioxide neutrality is just one feature of the UN House in Arendal. There is a lot more of interest, such as advanced conference technology that reduces the need for travel, along with flexible, easily adapted interiors. If you want to learn more, visit skanska.com/unhousenorway.

Office building and an energy plant.

2 Case Study: Smart ways to reduce CO₂

Location: One Kingdom Street, London, UK.
Challenge: A new energy-efficient 12-story office building in the middle of London.

One Kingdom Street is a 12-story building, and part of the renewal around the Paddington Street Station in central London. Besides providing a modern, functional workplace, it represents a whole new way of thinking. One example is that the underground parking only has two spaces – if you work here you are expected to take the train, bike or walk to work.

But the most interesting thing about the building is that it produces a lot of the energy it uses. That energy comes from renewable sources: the ground and the sun. A geothermal heating system was built into the concrete piles that were cast in the ground to support the structure. The Energy PileTM system provides heating and cooling to parts of the building, including the reception area, the atrium and the stairwell.

On the roof, 60 solar panels produce the energy that runs the hot-water heaters. The system provides hot water for the restrooms, showers and coffee corners throughout the building. The result: less external energy is required and therefore fewer CO₂ emissions.

Skanska played a pivotal role in development of a detailed carbon footprint for the construction of One Kingdom Street. Understanding the hidden or embodied impacts of the materials and processes used in building One Kingdom Street has provided an important benchmark against which future buildings can be compared. Read more about One Kingdom Street at skanska.com/onekingdomstreet.
What do you do when you build a hotel by the railroad? Use the railroad.

**Case Study:** Smart ways to reduce CO₂

**Location:** Clarion Hotel Sign, Stockholm, Sweden.

**Challenge:** Construct the largest hotel in Stockholm City on a cramped site in the middle of downtown, while minimizing the environmental impact.

**Completed:** February 2008.

The Clarion Hotel Sign, with 538 rooms and extensive conference facilities, was constructed on a crowded site right next to the railway yard of Stockholm Central Station. It seemed like a great idea to us.

The frame of the hotel was prefabricated, which reduced waste, and was transported from Slovakia by rail instead of using conventional road transport. The parts of the frame were unloaded directly to the site from the railway cars.

Most transports were made by Green Cargo, a company that only uses renewable electricity. By using the railroad instead of conventional trucks, CO₂ emissions were reduced by 335 metric tons. At the same time, shipping costs were cut by 30 percent. Transporting the frame by train instead of by road helped us avoid many of the disturbances created by construction deliveries in downtown Stockholm.

In designing and constructing the hotel, we took great care to make it energy efficient. Efficient lighting has been used wherever possible, and the ventilation system recycles about 80 percent of the outgoing heat back into the building. We also used environmentally responsible building materials, including compressed recycled paper, which we used for the inner west wall.

“The environmental thinking in the construction of the hotel really inspired us to continue in this spirit during its operation – we are now being certified according to ISO 14001,” says Tobias Ekman, CEO of Clarion Hotel Sign.

Read more about Clarion Hotel Sign at skanska.com/clarionsignstockholm.
Saving energy by keeping cool.

**Case Study: Smart ways to reduce CO\textsubscript{2}**

**Location:** State of California’s New Central Plant, Sacramento, US.

**Challenge:** Provide heating and cooling for 20,000 state workers, while reducing energy and water usage.

**Completed:** August 2009.

The old plant that cooled and heated the state capital and 22 offices in Sacramento was no longer up to the job – plus it wasn’t very efficient. In August 2009, the new plant was opened. It radically reduces the energy required for cooling and heating.

The new plant employs an energy-efficient evaporative cooling method. An energy-efficient dehumidifying process also reduces the energy needed to cool the air. The water reclaimed by the cooling tower is then reused for landscape irrigation. Altogether, the new plant reduces water consumption by more than 90 percent, saving in the order of 500,000 cubic feet/14,000,000 liters of water per day. And unlike the old plant, there’s now no water discharge into the Sacramento River.

There’s yet another interesting energy-saving feature at the new plant: a thermal storage system for cooling. The idea is simply to do the cooling at night, when electric utility demand is low. This means less transmission and distribution loss. Purchasing energy at night is also less expensive, and helps reduce energy demands during peak conditions. Moreover, the lower ambient temperatures at night tend to increase refrigeration efficiency.

The result: drastically reduced energy consumption by approximately 25,000 kWh/day, and 4,300 metric tons of CO\textsubscript{2} saved annually.

Read more about the State of California’s New Central Plant at skanska.com/californiacup.
Seeing Earth from space, you might think there’s plenty of water. But if you were to collect all the water on the planet, every little drop of it, including the water in the atmosphere and in the glaciers, into one big drop, it would only be as big as you see to the left. The majority of the water on Earth, 97 percent, is in the oceans, while an additional two percent is frozen in the ice caps and glaciers. Only a fraction is available as a supply for drinking water, which is already in short supply in many parts of the world.

The problem will only get bigger as the planet’s population grows, and the effects of climate change become more apparent. In areas already short on water, the situation will worsen. Other parts of the world, such as Western and Central Europe and the US, will experience insufficient supplies.

We have to start saving water and using it more wisely.

By installing water-saving appliances, consumption can be radically reduced. Another way to reduce water use is recycling – for example, redirecting water from sinks and showers to flush toilets. In large buildings, purification systems make it possible to reuse even very dirty water. Collected rainwater can also be used in buildings, or for garden irrigation.

In addition to conserving water, we need to manage stormwater and preserve, or even enhance, biodiversity in critical areas like wetlands.

Green roofs
Green roofs have plants growing on them that are specifically designed into the construction when the project is being developed. This is yet another example of a robust, technically simple solution with several advantages. Green roofs absorb rainwater and reduce runoff by up to 85 percent, reducing the risk of flooding. Plants and the underlying soil layer filter out impurities from the water, so that what does runoff is cleaner. The technology can be combined with basins to collect the water for reuse in the building or outside. The green plants absorb impurities from the air as well. Green roofs also provide better insulation – and unlike traditional roofing materials such as tin, concrete or tiles, green roofs do not re-radiate heat to urban areas. They also enhance local biodiversity by providing attractive vegetation for wildlife.

Sustainable drainage systems
Conventional drainage systems divert the runoff water into a network of pipes. This can lead to local and downstream flooding – not to mention the fact that stormwater is often contaminated with pollution from urban surfaces.

By contrast, sustainable drainage systems can reduce the quantity of runoff while reducing pollution. These systems promote natural drainage, filtration and biological treatment processes. By allowing water to penetrate the ground, sustainable drainage replenishes groundwater supplies. Some solutions can also enhance or provide habitats for wildlife.

On a new school campus in the UK, a sustainable drainage system has ensured that site discharge is approximately 35 percent lower following construction, despite an increase in the extent of impermeable surfacing.
Saving water at a bank.

The new headquarters of the Czech bank Československa Obchodní Banka (ČSOB) is the largest office building in the country – around 2,400 people work in the 88,600 square feet/82,000 square meter building. It’s the first building in the Czech Republic to be LEED certified (gold level) – proof of its sustainable construction, including energy efficiency. When it comes to water efficiency, the ČSOB headquarters uses state-of-the-art fixtures, reducing the consumption by over 20 percent compared to conventional Czech buildings. Water-efficient landscaping has reduced outdoor water consumption by over 50 percent.

The ČSOB headquarters also features green roofs, consisting of low-growing vegetation, trees and shrubs planted in a 5.2 feet/1.6 meter thick layer of soil. This reduces rainwater runoff and, together with climbing plants on the facade, improves the heat insulation of the building, while reducing heat reflection. The roof gardens are entirely watered by an automatic rainwater system, which collects and stores water in underground reservoirs for use during dry periods.

Read more about the ČSOB office building at skanska.com/csobprague.

Using water wisely.

Just outside Helsinki there is a new suburb called Eko-Viikki, created for 1,900 residents. In planning and construction, far-reaching criteria were established for the area, regarding energy usage, indoor environmental quality, waste management and water consumption.

To meet these standards, experimental energy-efficient buildings were constructed from environmentally sound materials. The houses save energy through the use of extra-thick insulation, ventilation systems with heat-recovery units, and a design that generates passive solar heating.

Other innovative measures used to lower environmental impact include solar district heating and wind-powered street lighting.

The residents of the Skanska-built houses in Eko-Viikki use 30 to 40 percent less water than the Finnish average. The low water consumption is the result of very simple methods, such as water-saving bathrooms, water-saving appliances, and shared laundry and sauna facilities. The stormwater management systems absorb, filter and direct surface run-off to an adjacent stream. In addition, some of the buildings collect rainwater in a communal pond, which is used for garden irrigation.

Learn more about Eko-Viikki at skanska.com/ekoviikki.
Skanska has designed and constructed several wastewater treatment plants in Finland, Sweden, Poland and the Czech Republic. The plants include those for treatment of municipal wastewater as well as those for treatment of effluent from the pulp and paper industry. They are purposefully designed and constructed to maximize the efficiency of the plant, and optimize the quality of the discharged water. The plants also reduce the margin for human error, minimizing the risk of environmental accidents.

On one Skanska turnkey wastewater project in Finland, it has been shown that the nitrogen content can be reduced by more than 70 percent, thereby reducing the risk of eutrophication in receiving waters, while consuming about 50 percent less energy compared to other solutions on the market.

The kingfisher is just one of the species that is dependent on unpolluted water in lakes and streams. In fact, all biotopes are dependent on water, one way or another.
Keeping a close watch on water.

**Case Study: New ways to conserve water**

**Location:** HMP Dovegate, Staffordshire, UK.

**Challenge:** Expand a prison facility, while simultaneously enhancing local biodiversity and reducing the risk of flooding.

**Completion:** 2010.

Skanska designed and constructed the existing prison between 1999 and 2001, and is now in the process of expanding the facilities. To avoid the risk of flooding, the perimeter was raised by 3.3 feet/1 meter. The material needed was sourced from an area nearby, and then three new lakes were created in the places that were excavated. The lakes are an integral part of the flood management plan—they help reduce runoff and store floodwaters.

The lakes also enhance biodiversity by attracting amphibians, insects, and birds. An island was created in one of the lakes to provide a nesting site for birds that is safe from predators. Consulting with the Environment Agency and the Staffordshire Wildlife Trust, we ensured that the project further improved the area’s biodiversity by creating wetlands and planting trees.

To conserve water, the prison has low-flush toilets and timed showers, as well as a tap system that automatically switches off a few seconds after use. To learn more about HMP Dovegate, go to skanska.com/hmpdovegate.

**Everglades restoration project.**

**Case Study: New ways to conserve water**

**Location:** Ten Mile Creek Water Preserve Area, Everglades, Florida, US.

**Challenge:** Capture stormwater to prevent it from entering the most biologically diverse estuary in North America.

**Completed:** October 2005.

The lifeblood of the Everglades and its ecosystems is fresh water. This project was focused on protecting the St. Lucie River and the Indian River Lagoon, an estuary of immense biodiversity. The objective was to keep the estuary from being harmed by increased stormwater flows caused by development in the area’s watershed. This involved designing and constructing a mechanism to capture and store stormwater from the Ten Mile Creek basin during the rainy season, and then releasing the water and its sediment back into the estuary in a controlled way. This means that stormwater that would otherwise have been lost to the sea is directed back to the ecosystem, revitalizing it.

To achieve this, a 6,000-acre/2,400-hectare reservoir was constructed, as well as a pump station, a stormwater treatment area, and control structures for directing the flow of the water back into the creek. During construction, the flora and fauna were protected—for example, by avoiding construction work in the vicinity of bird nests during the nesting period. Other animals were trapped and relocated to other sites, particularly when it came to threatened or endangered species like the gopher tortoise and the indigo snake.

The project is a vital part of the Comprehensive Everglades Restoration Plan. The goal is to restore, protect and preserve the water resources of central and southern Florida, thereby safeguarding its unique wetlands and ecosystems. Read more at skanska.com/tenmilecreek.
The more holistically we think, the more important material things become.

If you had asked people 50 years ago what houses would be made of in 2010, the average answer might have been titanium, aluminum and high-impact plastic. Reality has long since rendered that view obsolete. We now understand that the world has a finite amount of resources available – and that goes for the construction and operation of our buildings and infrastructure as well.

So, now we may use recycled paper on the building’s exterior, or use straw for insulation. We may use bricks made of residues taken from wastewater treatment plants, and make roofs of living plants. Or we may choose something completely different. Because a green building philosophy means choosing the building material that is best suited to the conditions at the particular site.

Environmentally sound materials.

Among the most interesting requirements is that materials should be produced as close to the construction site as possible. They should not contain hazardous materials, and they should be produced with minimal effect on the environment. They should be easily recycled – and preferably made out of recycled materials such as paper, recycled aluminum, or leftover stone chips. And naturally, materials and products carrying an environmental label should be selected whenever possible.

Another thing about the future: The material should be future-proof. In other words, it should last the entire lifecycle of the building.

Reducing waste and packaging.

Just as important as selecting the correct material is not using too much, or processing it any more than necessary. There are great environmental savings to be made by minimizing excess. First off, of course, resources are saved that would have been spent producing the material. But this approach also reduces the transport of material, and thereby the emissions – first to the building site, and then away from the building site, carrying all the leftover materials and waste.

Another way to reduce waste is to deliver materials and installations, such as appliances and other machinery, without packaging.

Suppliers used this methodology on the Barts and The London hospitals in the UK. Large amounts of material were shipped in reusable crates that were shuttled from the supplier to the site. A simple idea that radically reduces the amount of waste.

Using less material and packaging saves a lot of resources. And if you like to watch the bottom line, you’ll soon see that less material also means lower costs.
Different ways to use materials

PaperStone is a surfacing made from recycled paper, cashew nut oils and water-based resins. It was used when retrofitting the 32nd floor of the Empire State Building.

Straw is an excellent insulator. It is a natural, renewable, breathable material which can often be found locally and be less expensive than conventional insulation material. Straw bales can be used for walls or roofs. The walls can be covered with a breathable rendering made from lime and natural clay. We used straw bales as insulation in the construction of the HostFit Center for Sustainable Rural Development in the Czech Republic.

Recycled paper can be used in many ways. Richlite is a material used for exterior wall systems – it’s made from recycled paper and natural fibers from environmentally certified forests.

Eco Bricks which include water treatment residues were used in building the Derby City General Hospital and the prisons Lowdham and Dovegate in the UK.

At our Skanska Bristol Schools project, the external play areas are made from approximately 60 percent recycled truck tires.
The new life of an old hospital.

Case Study: Different ways to use materials

Location: Pilestredet Park, Oslo, Norway
Challenge: Construct new apartment buildings and offices on the site of an old hospital – and put the demolished hospital to good use through recycling.

The old Rikshospitalet in Oslo is no more. But before disappearing, it donated 22,730 metric tons of concrete, 9,320 metric tons of brick, 2,350 metric tons of granite steps and a few thousand paving stones. The result is Pilestredet Park, a mixed-use residential and office area.

There were 343,000 square feet/30,000 square meters of 19th-century hospital to tear down. That alone sounds like an enormous task. And on that site, 893,000 square feet/83,000 square meters of residences and offices needed to be built, with the goal of reusing as much as possible of the old hospital. It was a pioneering project that lasted five years and attracted widespread attention.

Environmental as well as economical gains.

Tearing down the old hospital produced no less than 90,000 metric tons of different kinds of material. Of that, 98 percent could be recycled, mainly because it had already been inventoried and cataloged in the project planning phase. The hospital was torn down piece by piece, so the materials could be saved and sorted. Hazardous materials, such as asbestos and lead, were sorted out and disposed of properly.

After that, 22,730 metric tons of concrete and 9,320 metric tons of bricks were crushed on-site for use in roads, bike paths and green space. Some of it was used to make concrete slabs for flooring that incorporated 25 percent recycled, crushed material. Outdoor stairways and retaining walls were built with 2,350 metric tons of granite stairs, and old pavers were used in pathways.

A large amount of material could be reused at other sites. North of Oslo, 18,000 metric tons of brick and concrete currently reinforce slopes. Coarse-crushed aggregate was used for fill under a parking facility outside Oslo. And 3,000 metric tons of concrete reinforcing bars were sent to recycling.

In addition to these considerable environmental gains, the recycling is calculated to have saved USD 700,000.

It all began in a computer.

Before construction began, a database was created that listed the environmental qualities of each material, to allow choices that met highly specific criteria. It turned out that, in some cases, there were no products on the market that met these requirements. New products had to be developed. One example is the heptane-free lubricant for pipe joints, which was later put on the market as an environmentally friendly alternative.

The database also made it possible to select products with a high percentage of recycled material, such as glass fiber with 50 percent recycled material and plasterboard manufactured in part with refuse from a coal-fired power plant.

 Seriously considering the environment.
Pilestredet Park offers many valuable lessons. From the very start, planners took on the challenge to plan and develop an area that seriously considered the environment as well as resource conservation. As a result, energy consumption is half the Norwegian average. Around half of the roofing is covered in vegetation, which improves insulation, extends the life of the roof and absorbs excess rainwater in downpours.

"Pilestredet Park was a pioneer project with a very ambitious environmental care program. It provided us with valuable experience and knowledge, which have been very useful in subsequent residential projects," says Åge Pettersen, Chief Information Officer at the cooperative building association OBOS.

Find out more at skanska.com/pilestredetpark.

A jigsaw puzzle with 20-ton pieces.

Case Study: Different ways to use materials

Location: New Meadowlands Stadium, New Jersey, US
Challenge: Erect a football stadium for 82,500 spectators on a tight time schedule, at an even tighter construction site.
Completion: Kickoff in 2010.

The New Meadowlands Stadium in New Jersey, future home of the New York Jets and the New York Giants, is a good example of what can be achieved with prefabrication methods and modern technology. Since the construction time is limited and the site is small, 3,200 pieces of concrete are being precast at four plants and shipped to the site using just-in-time delivery. This saves time, resources and transportation.

But keeping track of all these pieces would have been a time-consuming and complicated job using traditional methods – and it’s absolutely crucial for the construction process that the deliveries arrive in the correct sequence. That’s why the construction team uses the innovative approach of Radio Frequency Identification Tracking (RFID). A microchip with an antenna, protected by durable weatherproof casing, is attached to each precast element at the beginning of its production. Using the information this tag provides, a 4D computer model is kept updated, making it quick and easy to determine the location of each piece. This helps keep the project running smoothly and on schedule – and it notifies the team of potential problems, so they can be addressed as quickly as possible.

Read more at skanska.com/newmeadowlands.
Different ways to use materials

This wasn’t achieved with space-age advanced materials – quite the contrary.

Using traditional techniques and local resources maximized the local benefit and minimized the environmental impact of material transport. The larch wood used for siding was harvested from the Hostětín forest. Locally sourced straw bales were interwoven with cardboard for use as insulation in walls and roofs. Bricks were recycled from old buildings on the site. Natural clay plaster was also used.

The dormitory is covered with a green roof, made with low-growing plants. “It contributes to management of the rainwater,” says Yvonna Gašílová, Director of the center. “It retains water and is of great importance to prevent overheating of the upper floor of the hostel.”

The result: a center that promotes sustainability. A key factor in its creation was the use of traditional low-tech techniques and materials that yielded energy savings while reducing environmental impact. To read more about the Hostětín Center go to skanska.com/hostetincenter.

Traditional and local materials do the job.

Case Study: Different ways to use materials

Location: Hostětín Center for Sustainable Rural Development, Czech Republic.

Challenge: Construct a showcase for sustainable rural development.


The Hostětín Center is located in the southeastern corner of the Czech Republic. There, the Ecological Institute Veronica, a non-profit organization that belongs to the Czech Union for Nature Conservation (CSOP), promotes sustainable rural development.

The center opened in 2006, featuring offices, an auditorium, creative workshops, library and a dormitory. The center was created as a showcase for energy efficiency, so it’s built to passive house ultra-low energy standards. Thanks to this, the building uses 80 percent less energy than a conventional building. This wasn’t achieved with space-age advanced materials – quite the contrary.

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Thinking in lifecycles has made a big difference in our business.

It means seeing a building, bridge or road in terms of a cycle. Function, environmental consequences and costs are spread over its lifetime – from construction and operation to final reuse when it has completed its service.

Of course, planning for the entire lifecycle requires a lot more work on the front end. Issues become more complex when you have to plan decades or even centuries ahead, and that can sometimes mean a departure from standard financial models. But the gains are that much greater.

Lifecycle analysis means figuring in – from the very start – the environmental benefits that will save energy and reduce emissions throughout a structure’s lifetime. You can plan in flexibility to efficiently utilize a building even when new conditions arise later in its lifetime. It also means selecting materials and designs that can be easily recycled.

Similarly, a lifecycle cost calculation includes not only figuring out what it will cost to build a hospital, for example, but finding out what it will cost for its entire lifetime.

Buildings and infrastructure that are planned, budgeted and designed in this way might well be more expensive up front to build than those traditionally procured – but lower operating costs over the lifetime of the project can soon make it worth the investment.
The Big Apple turns green.

Location: Empire State Building, New York, US.
Challenge: Design a floor of the iconic building for flexible use that meets high environmental standards throughout a 15-year lease.
Completion: November 2008.

When Skanska secured a 15-year lease on the 32nd floor of the Empire State Building, we wanted to show that environmentally responsible renovation, leading to reduced energy use and environmental impact, is possible even 330 feet/100 meters up in a 75-year-old skyscraper.

We initiated the project through a planning session with all project partners – architect, subcontractors and the owner of the Empire State Building, W&H Properties. This way we could draw on the expertise of the entire project team.

The office was designed to allow a variety of office styles without the need for extensive redevelopment work.

“We broke open the floor plan by letting in light through glass internal walls,” explains Steven Pressler, Executive Vice President of Skanska USA Building. “Ninety percent of the space has full daylight access, and all full-time occupants have an exterior view.”

The daylight in combination with smart lighting and ventilation as well as other energy-saving measures has resulted in the Skanska offices having an energy consumption that’s 35 percent lower than baseline.

Our 32nd floor office is the first in the Empire State Building to obtain LEED certification (LEED Platinum). Moreover, the renovation means our 15-year contract will save USD 300,000 in energy costs. Now the landlord wants to adopt the same thinking on other floors. With our new office, we demonstrated that you can radically lower energy use and adopt flexible solutions in older buildings – even those built as far back as the 1930s.

Read more about the 32nd floor of the Empire State Building at skanska.com/empirestatebuilding.

A 30-year project.

Location: M25, the orbital motorway around London, UK.
Challenge: Optimizing methods and materials to be as efficient as possible over a 30-year period.
Completion: The project started in 2009, and including maintenance will continue until 2039.

London’s M25 is one of the world’s largest orbital motorways. Skanska is part of the consortium that has been contracted to add capacity by widening key sections of the M25. The consortium will also be maintaining the entire 740-mile/1200-kilometer motorway during the 30-year contract, including 1,800 structures varying from culverts to motorway tunnels and a major river crossing.

The M25 is used by up to 250,000 vehicles a day. Therefore it is vital that major maintenance works carried out through the contract period are optimized to ensure that disruption of the traffic flow is kept to a minimum. In order to extend periods between major maintenance, and reduce the need and the impact of maintenance works through the project lifecycle, the project team will apply materials and methods with longer lifespans, including paving that lasts several years longer than traditional paving. Other measures include using recycled materials when repaving, and selecting more sustainable materials.

One of the most critical factors is the energy supply for lighting, since there are several tunnels and most of the motorway is lit at night. The consortium is looking at satisfying the entire energy demand through power generated by waste-to-energy.

Read more at skanska.com/m25uk.
At Skanska, our aim is to make a positive contribution to the built environment as well as its inhabitants. By involving stakeholders early in the process, it is possible to include their views, wishes and knowledge – right from the start. In our projects we strive to provide a wider benefit to society while improving the quality of life for those who use them, without relying on purely economic factors.

Let’s say a community needs a new school. If we are seriously going to plan for a better and greener future, it’s not enough just to count the number of students and start building.

Take the Bristol school project in the UK, for example. It is being developed in a long-term partnership between Skanska and Building Schools for the Future (BSF), a national program. The objective is not only to construct schools, but to ensure that we create an environment where students learn more, get better grades and get a better start in life. The project provides new approaches to teaching and learning for students who previously only had access to schools that were perceived as failing and producing poor exam results. The project also aims to optimize the facilities for use by the entire community. Achieving this involved making sure all the stakeholders – students, teachers and other citizens in the community – were briefed on the plans and invited to give their input on the design of the buildings.

Read more about the project at skanska.com/bristolschools.
Checklist for maximizing the benefits of a bridge.

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<th>Case Study: Involving the community</th>
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<td><strong>Location:</strong> Cooper River Bridge, South Carolina, US.</td>
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<td><strong>Challenge:</strong> Construct the longest cable-stayed bridge in North America in a way that maximizes the benefit to surrounding communities and the local economy, while protecting and enhancing wetland environments.</td>
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<td><strong>Completed:</strong> July 2005.</td>
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You need to remove two obsolete bridges and erect a 2.5-mile/4-kilometer, 8-lane bridge, and avoid disturbing the environmentally sensitive area. How do you make the most of that situation?

1. Select a design that will last at least a century.
2. Use models and simulations to evaluate the effects of design options on the ecosystem of the Charleston estuary.
3. Apply the lessons learned from similar projects, such as the Öresund Bridge – the 10-mile/16-kilometer road and rail tunnel/bridge connecting Denmark and Sweden. Since the Öresund Bridge project is very similar, utilize members of its project team to draw on their experience.
4. Starting early in the process, establish close cooperation with local authorities and organizations to maximize the utility of the bridge, and quickly address social and environmental issues before they turn into difficulties. Encourage dialog with local participants, including government officials, organizations and residents. Maintain this dialog throughout the construction process.
5. Based on the dialog, select diamond-shaped towers from among several options, eliminate the proposed light beacons on the towers, and add a pedestrian walkway and bicycle lanes to the bridge.
6. Use local construction workers and suppliers where possible.
7. Create task forces across agency borders to advise on particular issues – for example, have the US Army Corps of Engineers monitor the demolition of the old bridges, and ensure that the wetlands are protected and enhanced by involving the US Fish and Wildlife Service and the South Carolina Office of Ocean and Coastal Resource Management.
8. Choose lighting that minimizes impact on sea turtles and migratory birds.
9. Restore wetlands. Reuse material from the demolished bridges to create new, artificial reefs along the coast.
10. To avoid erosion, reforest the construction site as soon as possible.

The result (of these and many other steps): a bridge that maximizes the financial investment, while benefiting society and the environment – not to mention the fact that it was completed one year ahead of schedule, and approximately USD 150 million under budget. Read more about the bridge at skanska.com/cooperriverbridge.
In Kent, UK, a clan of badgers has moved into a newly built sett. The sett is a burrow of the highest badger quality, designed in cooperation with a licensed badger expert (yes, they do exist). The new sett was built in their own familiar territory to replace the sett that ended up being too close to a recently widened highway.

In this book we’ve mostly discussed large, global environmental issues. But we can’t forget the local effects on the environment – the building process and outcome both have undeniable effects on the local environment.

One aspect of green construction involves broadening the concept of stakeholders. They are not only the commissioner of the project, local authorities and the people intended to use the building, bridge or road. “User” includes the animals and plants that live where we build.

That is why we consult experts who can map and inventory the ecosystems that are affected, and find solutions that reduce the adverse effects, or even completely avoid them. It may be a matter of selecting an alternative design, rerouting an access road, or digging up the road after use and planting a forest there to create a green corridor for animals and plants. Or moving badgers to a new sett.

To read more about the badgers in Kent and other aspects of the motorway widening project, go to skanska.com/a2kentuk.

An animal deterrent system for high-speed railway lines

Wild animals don’t perceive trains as a natural threat, and often don’t have time to react when a high-speed train approaches. Conventional methods, like fencing or tunneling, are expensive and restrict the animals’ natural behavior. With this system, devices are placed every 230 feet/70 meters along the line – the devices emit a noise sequence when a high-speed train approaches. The sound is designed to scare animals off the tracks, but not cause stress or other harm. When the train has passed, animals are free to cross the tracks again. On a Skanska rail project in Poland, use of the animal deterrent system instead of tunnels and migration corridors reduced project costs by approximately USD 1.2 million.
What other company would gladly talk about construction projects in the Amazon?

Case Study: Local impact

Location: Urucu-Manaus, Brazil.
Challenge: Construct a gas pipeline through an ecologically sensitive area in the Amazon.
Completed: August 2009.

To substitute imported oil with cleaner and locally produced natural gas, a 416-mile/670-kilometer pipeline was laid in northwestern Brazil. It passed through a sensitive rainforest area in the Amazon. A biodiversity inventory revealed, for example, 192 fish species, 96 species of large mammals, 13 species of primate, around 600 bird species, and 29 types of bats.

"An inventory of all areas involved was made before starting construction. It described the native species, as a basis for the recuperation program to be executed after the construction and installation of the pipeline," says Mauro de Oliveira Louveiro, Project Implementation Manager for the North Region at Petrobras.

To avoid disturbing this environment, pipes and heavy equipment were transported by barge to get as close as possible to the construction site. The site was then secured to prevent non-native species from entering, and pipeline sections were inspected to prevent "free riders." Noise and lighting were restricted to avoid disturbing nocturnal animal life.

To bury the gas line 3 feet/1 meter deep, a vegetation corridor of 4 to 6 meters/14 to 20 meters was cleared in the rainforest. This opening favored some species, but not others, so a program of detection, transferring and health care was implemented for all species that were found in the track of the pipeline.

When the pipeline was completed, access roads and all the facilities installed during the construction period were removed, and the area reforested to prevent future exploitation. These measures – and others – satisfied the environmental organizations that had been deeply concerned about the project. Read more about it at skanska.com/manauspipeline.
What can you do?

So far, this book has shown some of the things that can be done. But we can do even more. Join us on the journey to Deep Green.

Local impact

Landscaping a highway.

Case Study: Local impact

Location: A1 highway, northern Poland.
Challenge: Construct a safe highway through culturally and ecologically sensitive areas.

The old two-lane highway was one of the most dangerous roads in all of Poland. It wasn’t built for the current, heavy traffic. It passed right through towns and villages, creating traffic jams, making local communities unsafe and exposing the inhabitants to extensive pollution.

In 2005, the first 56-mile/90-kilometer section of the new A1 highway was begun. Ultimately, the completed highway will cover 350 miles/560 kilometers from Gdansk in the north to Poland’s southern border. The goal is a fast and safe connection, and the finished road is expected to reduce travel time by 10 percent.

The challenge was to minimize effects on the countryside, which is rich in cultural heritage and is also environmentally sensitive. About 60 percent of the road passes through or near protected cultural landscapes. For that reason, plantings and earth embankments were added to hide long stretches of the new road from view. During construction, historical buildings and other cultural heritage sites were protected. For example, the junction near the town of Pelplin was built from the opposite direction to keep dust and pollution away from the town’s cathedral.

The new road cuts through four ecologically sensitive woodland and wetland areas. It grazes 1.8 miles/3 kilometers of a bird sanctuary that also includes animal migration corridors. At the start of the project, nature conservation experts and representatives of environmental organizations were invited to discuss issues and make environmental impact analyses. They suggested special measures for some species, such as erecting elevated platforms for storks to nest on at a safe distance from the highway. These analyses also indicated the need for ecological corridors, which resulted in the building of nine passages under the highway for large animals and 20 passages for small animals such as lizards and frogs.

Sand filters and separators were created to keep rainwater runoff from the highway from polluting the sensitive surroundings.

More than 100,000 trees and other vegetation were planted in a greenbelt along this section to obscure the road and dampen noise. An additional 61 feet/20 meters of land was acquired on either side of the road – this will make it possible to provide an extra noise buffer, if it is determined that it’s needed in the future.

Read more about the A1 project at skanska.com/a1poland.
What can you do?

The power to drive social change comes from within. The same applies to making our society as Deep Green as possible. To quote Gavin Newsom, the Mayor of San Francisco, known for his environmental initiatives: “If there is one thing I’ve learned as Mayor, it’s that real change comes from the people and not from politicians.”

Building a house that consumes zero net energy, for example, is not a technological challenge. What we need is for more politicians and public officials to care, and for companies to see the potential for business. International treaties are important. The problem is that they aren’t far-reaching enough, and they take a long time. The one who has the real power to make change is you.

As a politician or official on a local, regional or national level, you can play an enormous role in accelerating the journey to a Deep Green society by facilitating, by encouraging, and by providing inspiration for green building – including having environmental performance as a criteria for building permits.

As a planner, developer, financier, investor, tenant or client, you can start immediately to build a better world by steadily introducing greener thinking in project after project.

If you are not a politician, urban planner or developer, you can drive change by making your wishes known. You can show that it is already possible to do much more than legislation requires, or that environmental design methodology prescribes.

The beauty is that if we all contribute to green development, change will happen on all fronts – whether it’s building a new row of garages or planning a new urban area. To really change society, we all need to push development forward. Or as the Mayor of San Francisco says: “Let’s get serious about this.”

Maybe the most hopeful message of the entire book:

You are the one who drives development forward.
Top ten green tips.

1. Ask yourself if there’s any reason not to build green.

2. Involve affected parties early in the process, so you can incorporate their opinions and concerns into the solution, rather than try to find remedies afterwards. Make “suppliers” into “partners” so you can take advantage of their knowledge, experience and enthusiasm.

3. Take the entire lifecycle of the building or structure into account when planning it. What’s interesting isn’t the cost of construction, but the total cost over the structure’s lifetime. Also, you avoid future environmental issues.

4. Think long-term flexibility to avoid the high costs and environmental impact generated by complicated rebuilding when having to respond to evolving needs.

5. Look at new financial planning models that support long-term gains rather than short-term low costs.

6. Be open to innovative solutions. Consider the local conditions and utilize the best technology. Use local materials to avoid unnecessary transport, and use local renewable energy sources as much as possible.

7. In the planning and design process, keep the four R’s in mind – reduce, reuse, recycle and recover.

8. Define your own plan for the Deep Green journey and make it visible. Start now. Communicate the strategy and operations so everyone involved understands their necessity, and what they need to do. Inspire others to think greener.

9. Consider the positive effects of green building on the brand equity of your company.

10. Again, ask yourself if there’s any reason not to build green.
With more than 10,000 Skanska projects on three
continents going on at any given moment,
there’s often green news to report. Read more at
skanska.com/projects.