SmartMarket Report

DODGE DATA & ANALYTICS

Produced in Partnership with United Technologies

World Green Building Trends 2016

Developing Markets Accelerate Global Green Growth

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SmartMarket Report

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World Green Building Trends 2016: Developing Markets Accelerate Global Green Growth SmartMarket Report

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DODGE DATA & ANALYTICS

About Dodge Data & Analytics

Dodge Data & Analytics is the leading provider of data, analytics, news and intelligence serving the North American commercial construction industry. The company's information enables building product manufacturers, general contractors and subcontractors, architects and engineers to size markets, prioritize prospects, target and build relationships, strengthen market positions and optimize sales strategies. The company's brands include Dodge, Dodge MarketShare™, Dodge BuildShare®, Dodge SpecShare®, Dodge DocuPro and Sweets.

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Introduction

For green building to accelerate globally, building industry professionals require the latest data and trends to inform their decisions. We are adding to the body of knowledge with The World Green Building Trends 2016 Study. Focused on global green building growth, the report features the results of more than 1,000 survey participants from 69 countries and includes 13 country-specific profiles, as compared to nine in 2013.

The *World Green Building Trends 2016 SmartMarket Report*, presented by Dodge Data & Analytics and United Technologies Corporation, provides new world green building trends data to support green building development. By expanding the scope of the *World Green Building Trends SmartMarket Report,* published in 2013, this study demonstrates that green building continues to influence construction in both developed and developing economies.

A key takeaway from the study is that global green building continues to double every three years. Emerging economies like Brazil, India, Saudi Arabia and South Africa will be engines of green growth in the next three years, with development varying from twofold to sixfold over current green building levels. The results also reveal that expansion will continue in developed countries like the US, Germany and the UK. Across all regions, many respondents forecasted that more than 60% of their projects will be green by 2018.

Since economic forces are the most important drivers for many of the countries surveyed in this report, it is crucial to demonstrate the positive financial and business impacts of building green. The study found that green buildings offer significant operational cost savings compared with traditional buildings. To this effect, respondents expect a 14% savings in operational costs over five-year savings for new green buildings and 13% savings in operational costs over five years for green retrofit and renovation projects. Building owners also report that green buildings—whether new or renovated—command a 7% increase in asset value over traditional buildings.

Overall, the survey data indicates that the global commitment to green building is transforming the built environment. Special thanks to Saint-Gobain and the U.S. Green Building Council ® (USGBC ®) and to all of the organizations who participated in this recent survey, encouraged survey participation and financially supported it.

Stephen A. Jones
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Stephen A. Jones focuses on how emerging economic practice and technology trends are transforming the global design and construction industry. In addition to hundreds of speaking engagements around the world and numerous articles in industry publications, he authors many of Dodge Data & Analytics' SmartMarket Reports on key industry trends, which are read by millions worldwide and frequently cited as authoritative references.

Steve holds an MBA from the Wharton School of the University of Pennsylvania, and a BA from The Johns Hopkins University. He has a track record of active leadership in many industry initiatives, including the BuildingSMART Alliance, and the TC Chan Center for Building Simulation and Energy Studies. Steve has also been a judge for several BIM Awards.

Before joining Dodge Data & Analytics, Steve was Vice President of Primavera Systems (now part of Oracle), the global leader in project management software. Prior to that, Steve spent 19 years in creative and management roles with top architectural firms, most recently as a Principal and Board of Directors member with Burt Hill, one of the largest A/E firms in the US (now merged with Stantec).

John Mandyck serves as Chief Sustainability Officer for United Technologies Corporation. A global leader in the aerospace, food refrigeration and commercial building industries, United Technologies provides high-technology systems and services that set the standard for performance, reliability and energy efficiency, with well-known global brands such as Pratt & Whitney, UTC Aerospace Systems, Carrier and Otis.

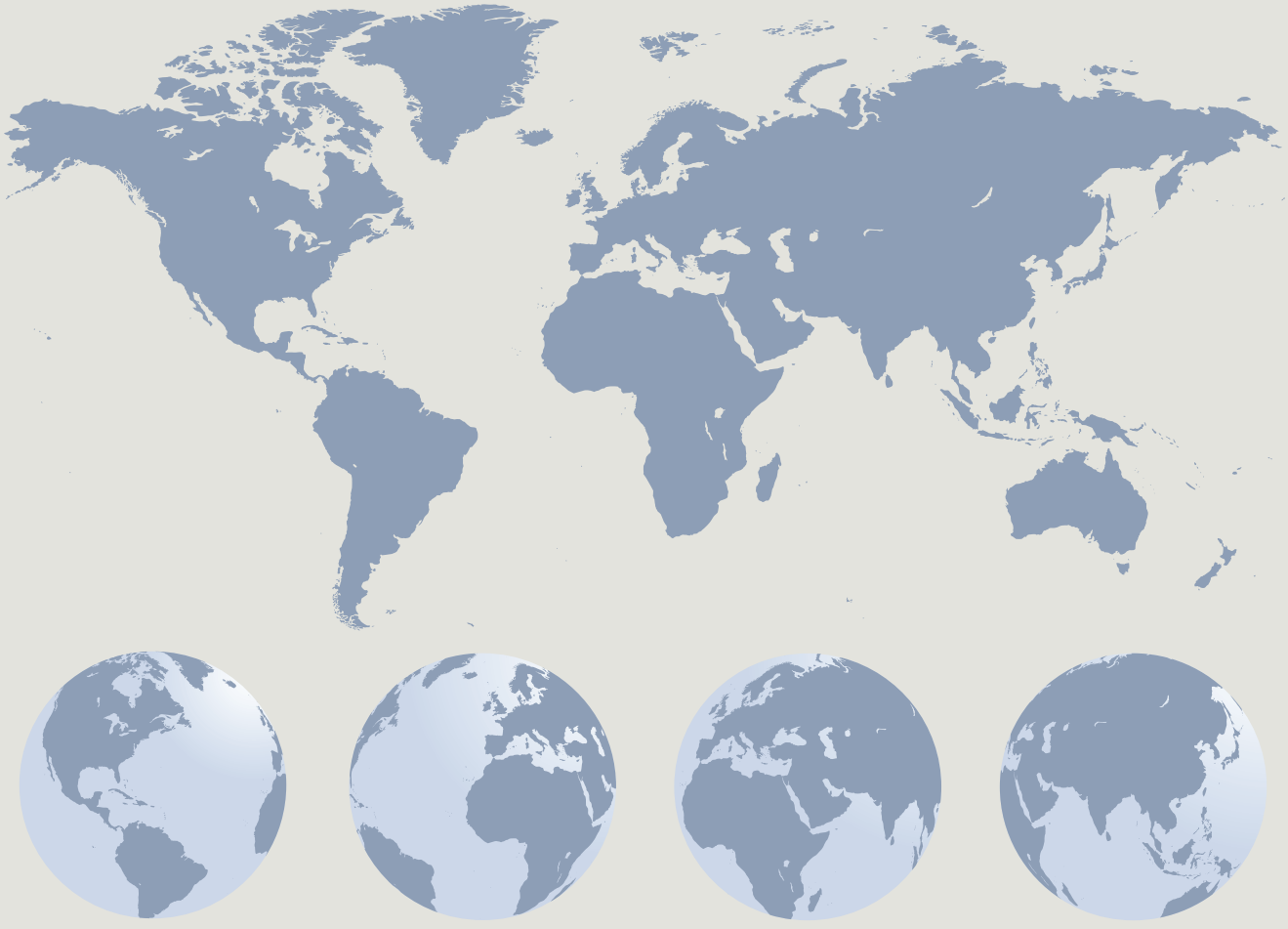
John chairs the Corporate Advisory Board of the World Green Building Council, and serves as chairman of the Board of Directors for the Urban Green Council in New York City. He is a member of the Corporate Council at the Harvard University Center for Health and the Global Environment. He was appointed by the U.S. Secretary of Energy to co-chair the Department of Energy's Appliance Standards and Rulemaking Federal Advisory Committee. John is the co-author of the book *Food Foolish*, which explores the hidden connection between food waste, hunger and climate change.

He blogs on sustainability issues at SustainabilityView.com and can be found on Twitter @JohnMandyck.

Introduction

The results in this report are drawn from survey respondents from the following 69 countries, with statistically significant results on the highlighted 13 countries. See page 64 for the full methodology and country-specific results on pages 24–49.

Afghanistan
Albania
Algeria
Argentina
Australia
Bahrain
Bolivia
Brazil
Bulgaria
Canada
Cayman Islands
China (Hong Kong)
China (Mainland)
Colombia
Costa Rica
Czech Republic
Ecuador
Egypt
Finland
France
Germany
Ghana
Gibraltar
Greece
Guatamala
Guernsey
Hungary
Iceland
India
Indonesia
Iran
Iraq
Ireland
Italy
Jamaica
Japan
Jordan
Lebanon
Malaysia
Mexico
Morocco
Netherlands
New Zealand
Nigeria
Norway
Palestine
Panama
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russia
Saudi Arabia
Serbia
Singapore
South Africa
Spain
Sri Lanka
Sweden
Thailand
Trinidad and Tobago
Turkey
Uganda
United Arab Emirates
United Kingdom
United States
Venezuela



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Cover illustration: Locket Creative. Following Page: Both images courtesy of Perkins & Will

Left: Bird's eye view of the Qatar Reseach and Development Complex

Lower Right: Redevelopment of Sisli, a 24-hectare, mixed-income, mixed-land-use neighborhood in Istanbul

Executive Summary

Green building is already widely adopted globally, with strong growth expected in most countries, but most particularly in the developing world.

The findings reveal that green building is a global trend, with nearly universal importance placed on energy conservation. However, as the previous study from 2012 also demonstrated, the priorities and obstacles need to be understood on a country-by-country basis to truly succeed as a sustainable business in the global marketplace.

Developing Markets Expect Greatest Green Growth

The percentage of firms expecting to have more than 60% of their projects certified green is anticipated to more than double from 18% currently to 37% by 2018. This is a similar pattern to the growth in activity expected in 2012, although the greater share of respondents from developing markets and a shift from a majority to a minority of green building council member participants yields lower levels of activity than was reported in 2012.

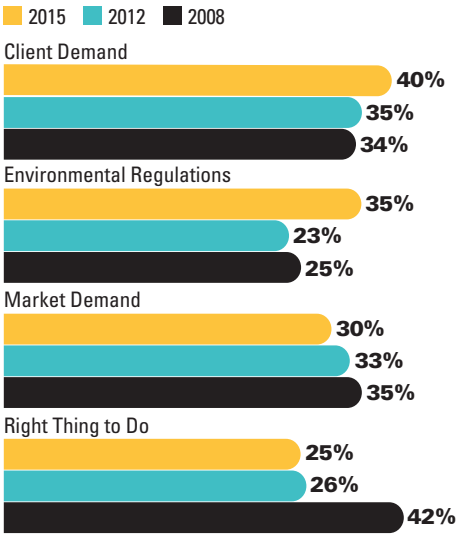
As the chart at bottom demonstrates, the anticipated growth is largely driven by countries that still have developing green markets. Mature markets in the US and Europe (including Germany, Poland and the UK) report moderate levels of growth. In contrast, respondents from Mexico, Brazil, Colombia, Saudi Arabia, South Africa, China and India report much more dramatic growth in the percentage of their projects that they expect to certify as green.

Top Triggers for Green Building

While client demand has consistently been an important trigger in the studies conducted in 2008 and 2012, it takes a significant leap in 2015 as one of the top triggers driving future green activity, from 35% in 2012 to 40% in 2015. Clearly, recognition by owners of the benefits of green is critical to sustaining green market growth globally.

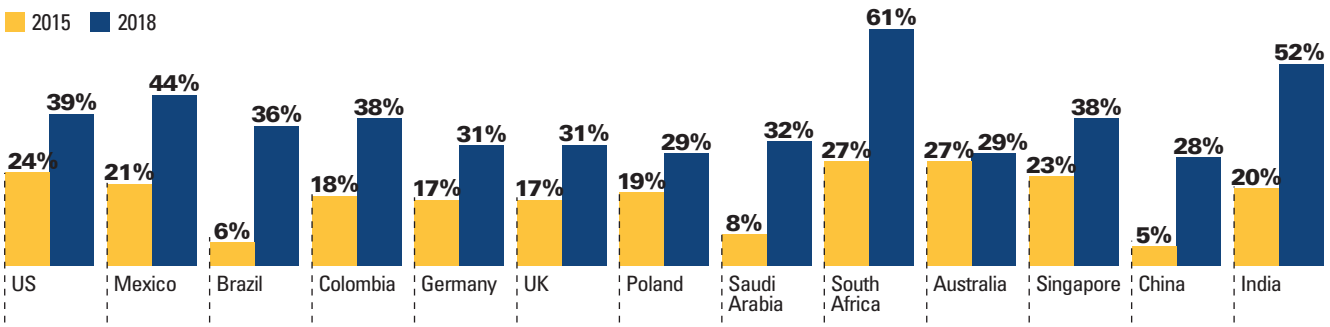
Top Triggers for Green Building
(All Respondents)

Dodge Data & Analytics, 2016



Percentage of Respondents Whose Firms Have Done More Than 60% Green Projects
(2015 and Expected 2018)

Dodge Data & Analytics, 2016



Environmental regulations also experienced an uptick in the percentage who selected it as a top trigger, driven by a high level of response from a few regions, including India, Singapore and the UK.

However, as the top social and environmental reasons for building green demonstrate, priorities for building green vary widely by region. For example, while encouraging sustainable business practices is an important reason for building green in most countries, it carries little weight in Saudi Arabia, where increasing worker productivity is a critical factor. Similarly, energy conservation is nearly universally an important environmental reason for building green, but in some countries, such as Brazil, Colombia, Saudi Arabia, Australia and China, protecting natural resources is considered a priority by nearly as many respondents.

Obstacles Vary by Country

Higher first costs is one of the top three obstacles in 11 out of the 13 countries featured in the study. It is particularly prominent in the Americas, especially in the US and Colombia.

Lack of public awareness and lack of political support/ incentives are top obstacles in many developing green markets, including Brazil, Colombia, India and Poland. In more established markets like Australia and the UK, the perception that green is for high-end projects is a more prominent obstacle than in less established markets.

Strong Benefits for Building Green Reported Globally, Based on Increased Measurement of Green Building Impacts

Three quarters (75%) of respondents are tracking metrics on the benefits of their green buildings, a 12 percentage point jump over those doing so in 2012. The higher degree of measurement reaffirms the strong benefits noted in 2012, which are largely equaled or surpassed in the current study.

The table at right demonstrates the benefits experienced globally. While there are some differences by country, for the most part, the reporting of these benefits is very consistent across the globe. Perhaps the most notable difference by country is in terms of payback periods for the additional cost of building a new green building, where developing countries in the Americas (Mexico, Brazil and Colombia) report short payback periods of five years. For many commercial investors, this is a critical threshold that can help spur green development.

Top Obstacles for Green Building (by Country)

Dodge Data & Analytics, 2016

Business Benefits Expected From Green Building Investments

(Medians Reported in 2012 and 2015)

Benefit	New Green Building		Green Retrofit Response	
	2012	2015	2012	2015
Decreased Operating Costs Over One Year	8%	9%	9%	9%
Decreased Operating Costs Over Five Years	15%	14%	13%	13%
Increased Building Value for Green versus Non-Green Projects (According to AEC Firms)	7%	8%	5%	7%
Increased Asset Value for Green versus Non-Green Projects (According to Owners)	5%	7%	4%	7%
Payback Time for Green Investments	8 Years	8 Years	7 Years	6 Years

Summary: Country Findings

Global Regional Observations

Green building is a global trend, but its implementation varies widely by country and region, including the pace of growth in green involvement, triggers and obstacles impacting that growth and even the degree of benefits noted by companies. Below is a summary of key market factors by country and region. For a more in-depth analysis, see pages 24-49.

Australia

Nearly all of the growth in green implementation in Australia is expected from increased involvement of respondents already doing green. Like other established markets, concern about green being for high-end projects is an obstacle here. Interest in the positive impact of green buildings on health is also more notable here than in other countries included in the study.

China

Green involvement is expected to increase rapidly in China. Like Australia, and relatively unique among developing countries, China also has a high level of interest in the health impacts of green building. Protecting natural resources and improved indoor air quality are important drivers for green building in China.

Europe

Germany, Poland and the UK, the three countries in Europe that are featured in the study, are very different markets, with different expectations of green growth.

- Germany: Business benefits like improved 10-year costs and higher rents, as well as market demand, are drivers for green building in Germany.
- Poland: Growth in green building is expected to be more moderate in Poland than in Germany or the UK. That growth is dominated by the commercial sector and is also motivated by business benefits.
- UK: High growth in the percentage of those doing more than 60% of their projects green is expected in the UK, with environmental regulations a key trigger for future growth.

India

Environmental regulations are also an important driver for the growth in green building anticipated in India. However, respondents express concerns about the lack of public awareness and the need for public incentives for the green market to continue to flourish, similar to many other developing nations.

Mexico

Among the countries featured in the study, Mexico is the leader in expected commercial green activity. However, respondents in Mexico also are concerned about the lack of public incentives and the need for greater public support.

Middle East/ North Africa (MENA)

Very rapid growth is expected in Saudi Arabia and other MENA countries in those doing more than 60% of their projects green. Business benefits are key drivers of that growth in Saudi Arabia, while environmental regulations are important in the rest of MENA.

Singapore

The mandate to build public projects sustainably is still driving green building in Singapore, with high growth in green building expected in the next three years. However, market demands and lower operating costs are also key drivers of green across that market.

South Africa

South Africa has the highest green share currently of any country in the study, with impressive growth also expected. This high level of activity may contribute to the fact that one of their biggest challenges is finding sufficient skilled/educated green professionals.

United States

A notably high level of green growth is expected in the US, but the data suggest that more measurement of green benefits, similar to that reported by many other countries, would help strengthen the business case for green.

South America/ Caribbean

Green building is still an emerging trend in this region, largely driven currently by commercial construction. Critical challenges to be overcome, reported in Brazil, Colombia and the other countries from this region, are lack of public awareness and public support for green. ■

Data: Introduction

World Green Building Trends Research

In 2008, Dodge Data & Analytics (formerly McGraw Hill Construction) conducted a study of global green engagement that determined that green building was emerging as an important trend in the global construction marketplace. In 2012, the study was updated to include more countries, and it demonstrated a shift to market forces driving green building. That study capitalized on the green expertise of green building council (GBC) members, who made up 75% of the respondents.

The latest study, conducted in 2015 and featured in this report, further expands upon the previous studies in a few key ways. First, it has an even wider response, with 1,026 total respondents from 69 countries, a 27% increase in the number of respondents from the study in 2012. In addition, 13 countries now have statistically significant results, an increase from nine in 2012. The expansion of coverage significantly broadens the overall insights offered by the study, while also revealing how critical it is to examine each market individually, with its own unique sectors of growth, triggers, obstacles and environmental priorities. Throughout the analysis in this report, these factors are examined in detail across all 13 countries with enough responses to be statistically significant.

Another distinctive feature of the new study is that a concerted effort was made to get a statistically significant response from a variety of countries in the developing world. New countries featured for the first time include Mexico, Colombia, Poland, Saudi Arabia, China and India. If the dramatic increase expected in green building involvement by 2017 reported in these countries bears out, then these regions are clearly vital to the future of green.

There is also an advantage to revisiting most of the nine countries included in the original study. For seven of these countries—US, Brazil, UK, Germany, South Africa, Singapore and Australia—we are able for the first time to look for trends of how green building has changed in these regions from 2012 to 2015.

The types of respondents who participated in the 2015 study also differ from those in 2012, with a much higher level of participation from architects and contractors in 2015 than in 2012. And the study no longer relies primarily on the input of GBC members, with only 33% of the 2015 respondents reporting that they fall in that category, compared with 75% from 2012. The well-informed responses and high participation in green from the more industry-representative participants in 2015 demonstrates the expansion of green building, which is now a part of global industry practice.

Note About the Data
The data and analysis in this report are based on the opinions of 1,026 total survey respondents. These respondents break out as follows by type:

- **Architect/Design Firm: 27%**
- **Contractor/Builder: 25%**
- **Specialist/Consultant: 22%**
- **Owner/Developer: 13%**
- **Engineering Firm: 13%**

A statistically significant sample was obtained for 13 countries: US, Mexico, Brazil, Colombia, Germany, Poland, UK, Saudi Arabia, South Africa, Singapore, India, China and Australia. For Europe, South America/Caribbean and the Middle East, enough responses were received from other countries in the region to also support analysis on a regional basis, so the analyses of Brazil, Colombia, Germany, Poland, UK and Saudi Arabia are included in these larger regional sections.

For this study, green building was defined as a construction project that is either certified under any recognized global green rating system or built to qualify for certification. This definition is the same as the one used in the 2012 study.

For the full methodology, please see page 64.

Data: Green Building Market Activity

Level of Green Building Activity

Green building already makes up a significant share of global construction activity, and that share is expected to grow across all the countries and regions included in the study. For the 2015 study, as with the previous World Green Building Trends studies conducted in 2008 and 2012, a green project was identified as one that is either certified or built to qualify for certification under a recognized green standard, such as LEED, BREEAM, Green Star and many other programs.

Share of Green Building Activity

TOTAL GLOBAL RESPONDENTS

Green building is nearly one quarter (24%) of the total share of construction activity among the participants in the 2015 study. This is much lower than the percentage (38%) reported in the 2012 study published in the 2013 *World Green Building Trends SmartMarket Report*.

However, these findings reflect differences in the study population in 2015 versus in 2012, rather than a decline in the overall level of green activity. In fact, the 2015 study indicates a strong and growing commitment to green building globally, especially when considering the rising share of green engagement by respondents expected in just three years (see page 10). The following are the main differences between the study populations in 2015 and 2012:

- **More Industry-Representative Participation:** In 2012, 76% of the respondents were members of national green building councils (GBCs). This helped the study to tap into rising expertise in green at that time. In the 2015 study, only 33% of participants are GBC members. By 2015, green has permeated the construction market, allowing a representative sample of the industry to be knowledgeable about green building, as the current study findings demonstrate.
- **A Higher Proportion of Architects/Contractors Versus Consultants:** A higher percentage of architects (27%) and contractors (25%) and a lower percentage of consultants (22%) participated in the 2015 study than in 2012 (which had 21%, 14% and 28%, respectively for architect, contractor and consultant participation). Consultants specializing in green are more likely to be involved in a higher percentage of certified projects than other industry players, due to the nature of their work.
- **More Developing Nations Included:** The 2015 study was designed to examine green activity in several developing nations, including Saudi Arabia, Colombia and China, that were not included in the 2012 study. Many of these countries currently have a lower green share than that reported in more developed nations like the US, Australia and Germany, which are more typical of countries included in 2012.

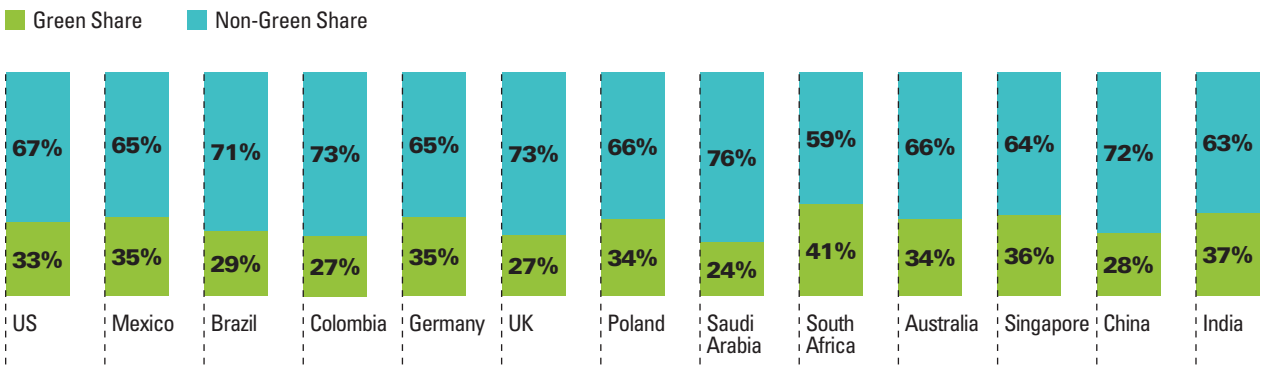
BY COUNTRY

Countries with green activity above the global average of 24% include South Africa, Singapore, India, Germany and Mexico. The Singapore findings are consistent with a high level of green activity report in 2012 and demonstrate the effectiveness of the green building mandate put in place by the Singapore government in 2012.

Countries with lower levels of activity include Saudi Arabia, Colombia, Brazil and China. In many cases, these are also nations in which the commercial sector is the major driver for green. However, one surprising finding is

Average 2015 Green Share of Building Project Activity (by Country)

Dodge Data & Analytics, 2016



Level of Green Building Activity CONTINUED

the relatively low green share of projects (27%) reported in the UK. This is inconsistent with the 2012 findings in which the UK had the second highest green share of the countries reported. It will be interesting to see if this is an anomaly in the current study or the beginning of a trend away from certifying projects in the UK.

Expected Growth in Levels of Green Building Activity

TOTAL GLOBAL RESPONDENTS

The global average of those expecting to do more than 60% of their projects green by 2018 more than doubles over current levels, from 18% to 37%. This is roughly consistent with the level of growth anticipated by the 2012 respondents by 2015, which was nearly double as well. Thus, the findings demonstrate that the commitment to green evident in 2012 is still apparent in the current findings.

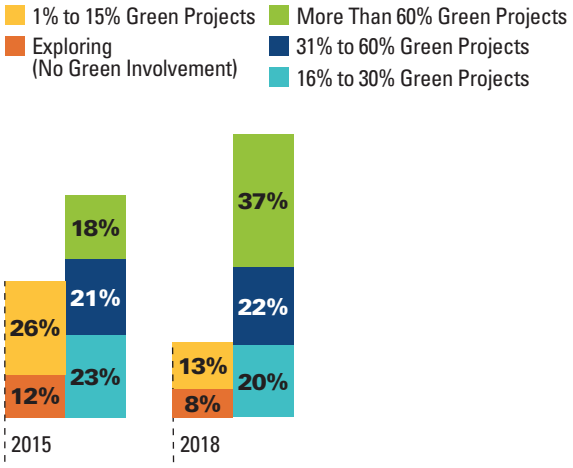
BY COUNTRY

While nearly all countries that participated in the 2015 study expect a rigorous growth in green involvement in the next three years, the highest level of growth is expected in the developing world.

- Brazil: 6-fold growth from 6% to 36%
- China; More than 5-fold growth from 5% to 28%
- Saudi Arabia: 4-fold growth from 8% to 32%
- More than double the level of green involvement expected in Mexico, Colombia, South Africa and India

Level of Green Building Activity
(According to Global Respondents)

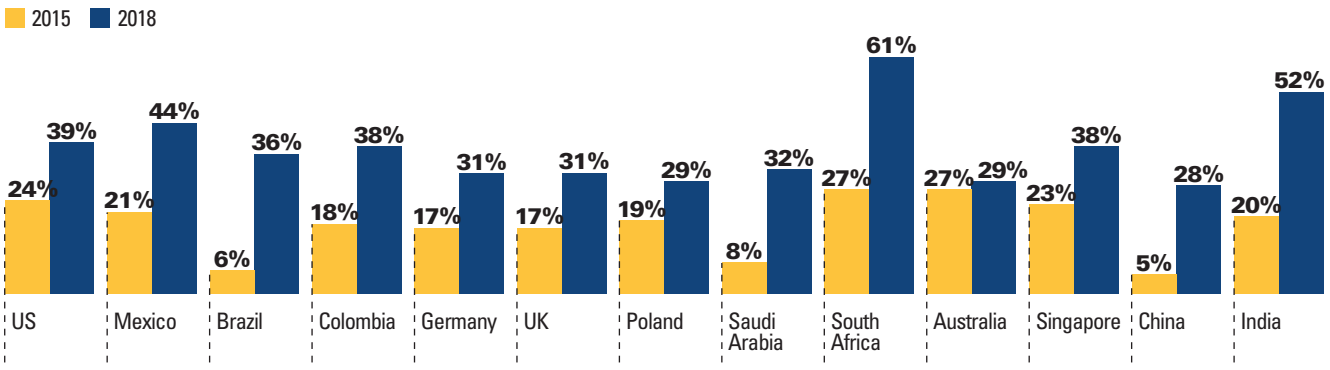
Dodge Data & Analytics, 2016



While developed countries do not report this steep acceleration in the level of green involvement, growth in those doing more than 60% green projects is still expected to be quite rigorous, including in the US, Germany, UK and Poland. The only exception is Australia, which is well below the global average. Given the maturity of the green building market in Australia, this finding is surprising. It is possible, since green in this study only applies to certified projects, that as a mature green market, green building practices are more widely adopted in Australia, reducing the need for certification.

Percentage of Respondents Whose Firms Have Done More Than 60% Green Projects
(2015 and Expected for 2018)

Dodge Data & Analytics, 2016



Sectors for Future Green Activity

Survey respondents were asked to select all the project sectors in which they plan to build green in the next three years. Their responses indicate the most likely sectors for green growth in the immediate future by country.

As the chart on the following page demonstrates, there is great variability by country and region in the sectors pursued. Still, a few interesting patterns emerge about the sectors driving growth in green, both globally and by country.

Top Sectors for Growth

NEW COMMERCIAL CONSTRUCTION

The top sector for green building growth globally is commercial construction, with nearly half (46%) of all respondents expecting to do a green commercial project in the next three years. Commercial construction is also the top sector in eight of the 13 countries included in the study, suggesting its widespread popularity and use.

- **New commercial construction is the top sector for expected green building in Mexico, Brazil, Colombia, Germany, Poland, Saudi Arabia, China and India.**
- **The lowest level of new green commercial construction is expected in Australia and the UK.**

For some countries, commercial construction can play a critical role in driving a commitment to green building, providing needed green experience that may eventually encourage green building in other sectors.

NEW INSTITUTIONAL CONSTRUCTION

Despite only ranking first in one country and second in two, generally strong expectations about new institutional green projects globally lead this sector to rank second in the global average of respondents.

- **The only country in which institutional construction is the sector in which the highest percentage expect to do green projects in the next three years is the US (46%),** likely due to certification requirements for many public buildings on a federal and state level, and schools on a municipal level.
- **On the other hand, Singapore has the highest percentage globally (48%) of respondents who expect to do a new instutitional project in the next three years.** However, institutional construction ranks third in Singapore, below retrofits and new commercial construction and tied with new high-rise residential.
- **Other countries with respondents expecting to do institutional work above the global average include Germany (39%), Saudi Arabia (42%) and China (40%).**
- **The countries with the lowest percentage of respondents who expect to do new green institutional projects include Poland (15%), Mexico (25%) and India (26%).** It is notable that these are also the three countries with the highest percentage of those who expect to do new green commercial construction projects.

RETROFIT OF EXISTING BUILDINGS

While there is a relatively high number of countries where over 40% of respondents believe that they will do green retrofit projects in the next three years, there is also a relatively high number of countries with less than a quarter expecting to do green work in this sector.

- **In the UK (44%), South Africa (46%) and Singapore (55%), green retrofits of existing buildings rank first among sectors for green work in the next three years.**
- **Although not the highest percentage in that country, over 40% of respondents in the US (43%), Mexico (46%) and Brazil (47%) report the same, suggesting a particular focus on this sector in the Americas.**
- **Comparatively few respondents in China (19%), Poland (21%) and Saudi Arabia (22%) expect to do green retrofits, suggesting a focus on greenfield projects in these countries.**

Sectors for Future Green Activity CONTINUED

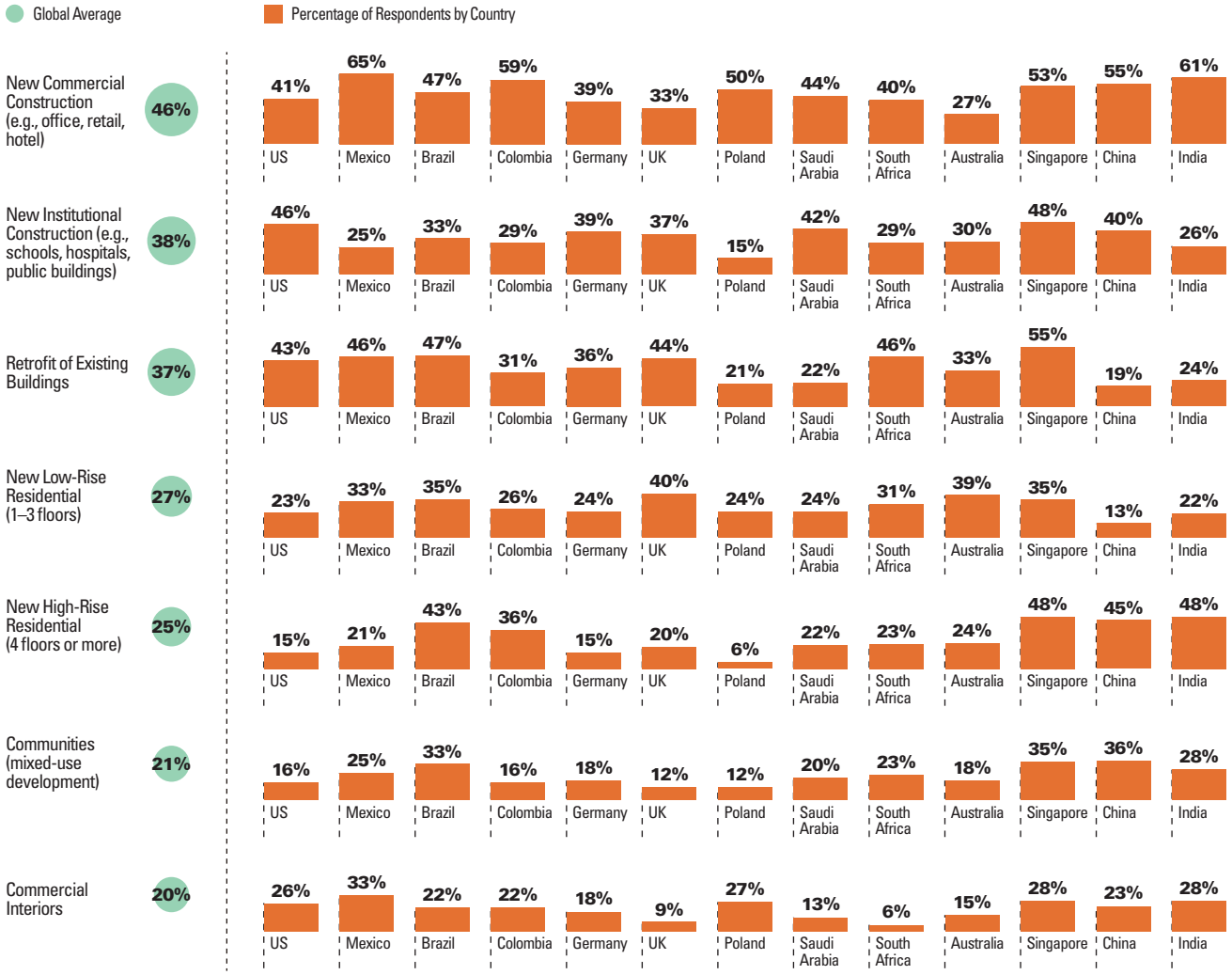
Trends for Other Building Sectors

Understanding patterns and trends that emerge among other sectors can help product manufacturers and service providers create strategies for markets not directly included in the study.

- **Most countries with a lot of green activity expected in the high-rise residential sector report relatively low activity compared with global averages in the low-rise residential sector.** The US is notably weak in both sectors, as is Poland.
- **With a few exceptions, the patterns for high levels of expected involvement with green communities mirror that of high involvement in high-rise residential.** For the most part, countries tend to be above, near or below the global average for both. The one exception is Colombia, which is above the global average for high-rise residential but below it for communities.
- **Nearly every country above the global average for commercial interiors is also above the global average for new commercial construction.** The only exception here is the US, which is above average for commercial interiors but slightly below average for new commercial construction.

Sectors With Planned Green Activity Over the Next Three Years (Global Average and by Country)

Dodge Data & Analytics, 2016



Sustainable and Smart Megacities

With large-scale urbanization underway in the developing world, government leaders, city planners and private consultants are pushing hard to meet demand, including the development of sustainable and smart megacities.

A 2013 IMF World Bank report estimated that by 2030, 96% of urban growth will occur in developing countries. This trend has spurred massive development programs, including the creation of new cities and an overhaul of existing ones. Whether a stated goal or a natural outcome, sustainability ranks as a key component of these plans.

Perhaps no country illustrates this trend better than India. In 2015, Prime Minister Narendra Modi's government advanced plans to develop its "100 Smart Cities." The program calls for a mix of greenfield cities and wide-scale improvements of existing cities. An early example of this strategy is the planned city of Amaravati, which would serve as the capital of the state of Andhra Pradesh in southern India. Stated goals for this city include extensive availability of open green space and large-scale transit-oriented development.

The Appeal of Sustainability

Jason Prior, chief executive of buildings and places at AECOM, says that while urbanization has driven high demand for new and improved cities, many planners are competing against other cities to attract residents and commercial investments.

"There's a big issue of reputation and brand here," he says. "They are realizing that some of the [future residents] they are trying to appeal to, the companies they are trying to appeal to and the tourists they are trying to draw in, [those people] are starting to demand solutions that have long-term credibility."

Rupert Booth, chief economist at Faithful+Gould, says sustainability is a "presumption" when planning these city programs—both in terms of quality of life and lifecycle costs. "No one wants an unsustainable city—all of the investments required would not have a long-term future," he says. "Sustainability is a given to justify long-term investment."

Smart Cities Are Sustainable Cities

Booth notes that while the creation of sustainable cities has been a goal in city planning for some time, the concept has been "subsumed" by the burgeoning smart city movement. He says that while concepts like Masdar City in Abu Dhabi are intended as models of sustainability—particularly through use of renewable energy sources—all smart cities are inherently sustainable. "You can't create an unsustainable smart city," he adds.

In fact, while the data gathering side of smart city programs can help a city run more efficiently, Booth says the public is more likely to recognize the green elements of an urban environment. One example, he notes, is Songdo, South Korea. Advanced monitoring technology runs throughout the 1,500-acre development, but he says residents are more likely to notice that nearly half of the city is green space and all of the buildings are built to LEED standards. "What they found is that what the residents enjoy are the green spaces," he says. "Its attractiveness is tied to the quality of life provided through sustainability."

Planning for the Future

Paul Doherty, president and CEO of The Digit Group, agrees that sustainability has to be a part of all city planning. "This is what we're supposed to do," he says. "This shouldn't just be a branding exercise."

He takes a holistic view of city planning that views a city as an "organism" that is responsive so that it can be sustainable and thrive. One concept he is pursuing is the incorporation of kinetic sources of energy that could be built into roads and walkways, providing energy through friction or compression. "We've found that people walking on a piezo pad can create 14w per sq ft," he says. "That kind of technology can make a building its own generator."

Prior suggests that sustainability efforts at a city level could be much more predictable and achievable than at the building level, where performance is directly tied to user behavior. "At the city level, it's easier to meet your performance targets because you're dealing with some big macro moves," he says. "If you design a decent city, where the public transport is done in the right way, it really doesn't matter if an individual building fails or succeeds—you've already made a huge difference." ■

Data: Influences
on the Green Building Markets

Triggers to Increased Levels of Green Building

Respondents were asked to select up to three of the most important triggers from a list of 16 potential options that would increase their firm's involvement in green over time, as they were in the studies conducted in 2012 and 2008.

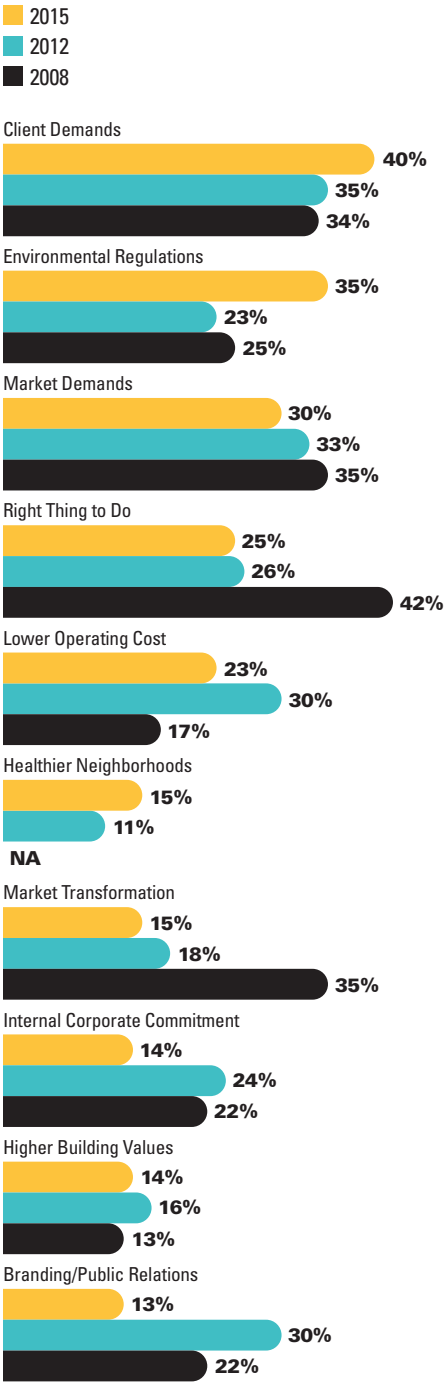
Changes Over Time

A few key trends emerge globally from the findings of the last three studies.

- **Client demands is consistently an important driver for green globally.** This demonstrates how critical it is to create greater public awareness of the benefits of green and the importance of establishing the business benefits of green building, since these are factors that drive clients to make investments in green.
- **Market demands is also important, but has been steadily declining over the last three studies.** Though the shift downward has been slight in between each study, this third one suggests a trend in reduced importance globally for this trigger.
- **The biggest growth since the 2012 study has been among those reporting that environmental regulations are important triggers for green.** However, the sway these carry vary strongly by market, depending on the degree of regulation present.
- **The decline reported in the importance of doing the right thing as a trigger for green building first evident in 2012 is confirmed in the current data.** Generally, this indicates a more mature market driven by the benefits of green.
- **A similar decline in market transformation as a spur for greater green involvement, which first emerged in 2012, is also sustained in the current study.** Similar to the desire to build green as "the right thing to do," the goal of transforming the market tends to be more important to early adopters, so it is not surprising to see its influence fade as green becomes a more common practice globally.
- **Branding/public relations and internal corporate commitment have seen notable drops in response between 2012 and the current 2015 study.** These findings are more surprising. It is likely that they are a result of a combination of very disparate factors, based on the individual market. For example, the decline of the importance in branding/public relations in some markets may reflect the fact that green is becoming standard practice, while in others, the early level of green adoption may be accompanied by lower public awareness of green building, which would diminish branding/public relations impacts.

Triggers Driving Future Green Building Activity (by Year)

Dodge Data & Analytics, 2016



Triggers to Increased Levels of Green Building CONTINUED

Variation by Country

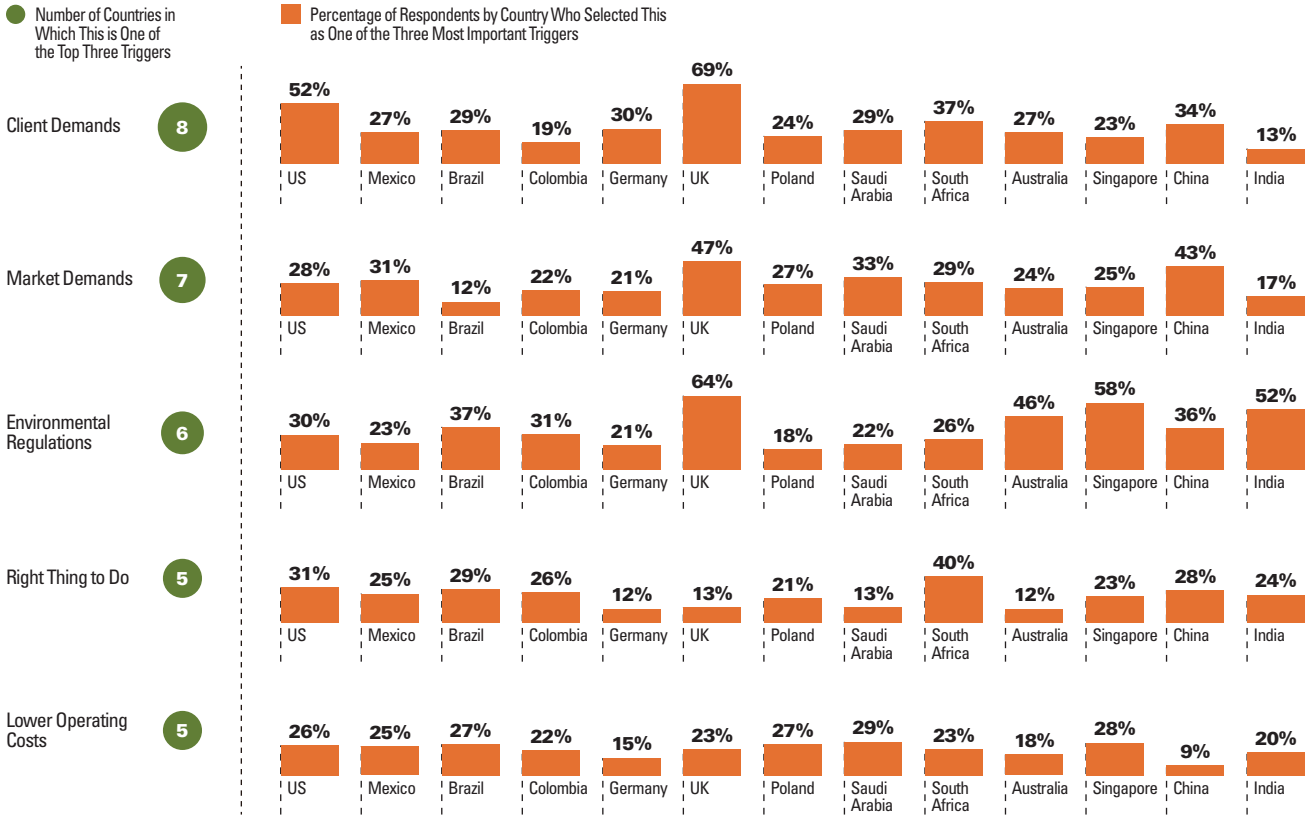
Examining which triggers are most dominant in certain countries can be critical to creating a business strategy for investment in that country.

- **The influence of client demands seen in the global averages is largely driven by US and UK respondents.** Otherwise, it is roughly average with the other triggers, with little influence in India (13%) or Colombia (19%).
- **On the other hand, market demands rank among the top three triggers for most countries,** with the greatest influence in the UK and China.
- **Environmental regulations have the widest range by country of any of the top five factors,** with its influence highly evident in the UK (64%), Australia (46%), Singapore (58%) and India (52%), but with few reporting its influence in Mexico (23%), Germany (21%), Poland (18%) and Saudi Arabia (22%).
- **Doing the right thing is influential across the Americas and in South Africa, Singapore, China and India.** However, it carries very little sway in Europe and Australia.
- **Lower operating costs have the least variation across any of the five top triggers globally,** with between 20% and 29% of respondents selecting this as a top factor in 10 of the 13 countries included in the study. While generally recognized as important, it rarely ranks as the No. 1 driver, suggesting that the argument for business benefits needs to include but not be limited to discussion of lower operating costs.

Top Triggers Driving Future Green Building

(By Number of Countries in Which It is One of the Top Three Triggers and by Country)

Dodge Data & Analytics, 2016



Social Reasons for Building Green

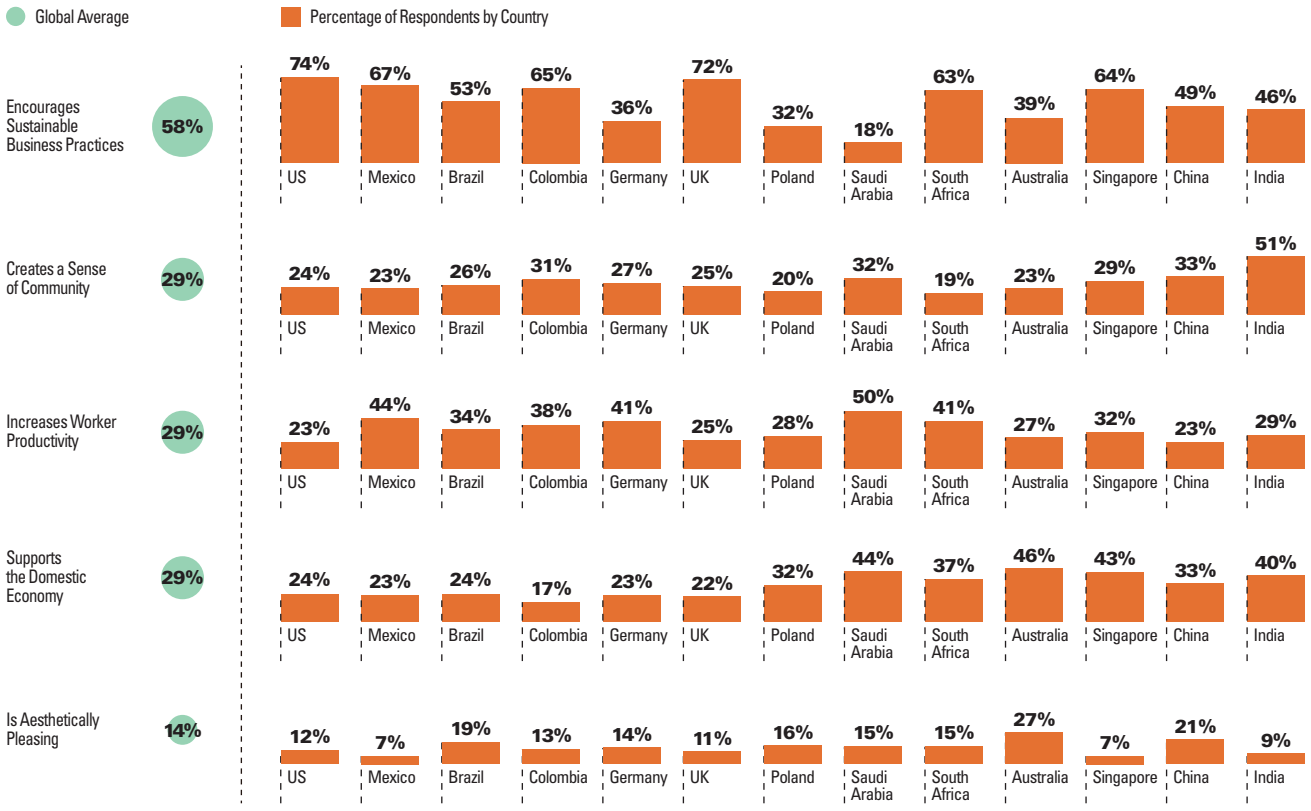
Encouraging sustainable business practices is the most important social reason for building green. The percentage who select it among all the global respondents (58%) as one of their top two reasons is double that of the next most important factors (29%). It is also the top reason in nine of the 13 countries included in the study, including all the countries in the Americas (US, Mexico, Brazil and Colombia), the UK, South Africa, Singapore and China. The only country where it carries little sway is Saudi Arabia, at just 18%.

Three out of the other five social reasons included in the study were all selected by 29% globally.

- **Creating a sense of community is most important to respondents from India (51%), China (33%) and Saudi Arabia (32%).** All of these markets are also notable for their emphasis on new green buildings rather than retrofits (see page 11), and for the development of sustainable megacities.
- **Increasing worker productivity is most commonly selected by respondents in Saudi Arabia (50%), Mexico (44%), South Africa (41%) and Germany (41%).** While overall these are very different markets, all of them are influenced more by market factors than by environmental regulations, and increased productivity could be a compelling part of the overall business case to be made for green building.
- **Supporting the domestic economy is an important reason for building green in Australia (46%), Saudi Arabia (44%), Singapore (43%) and India (40%), many of which have a relatively high percentage of companies from other countries doing work in their country.** It is less important than in countries like the US (24%), UK (22%) and Germany (23%), where many international companies are headquartered.

Most Important Social Reasons for Building Green (Global Average and by Country)

Dodge Data & Analytics, 2016



Environmental Reasons for Building Green

Reducing energy consumption continues to be the top environmental reason for building green, selected as one of the top two reasons by 66% of all respondents and by the highest percentage of respondents from all 13 countries included in the study.

- In the US, Germany, Poland and Singapore, the percentage who select reducing energy consumption is just about double that of the next highest factor, so a focus on energy clearly dominates these markets.
- However, there is a less than five percentage point difference between energy consumption and the next most important factor in Brazil, Saudi Arabia, Australia and China, so other environmental factors carry a high degree of influence in these markets.

Protecting natural resources ranks second globally, at 37%. Many of the countries with the highest percentage of respondents selecting this factor are also countries where extraction and exportation of raw materials is an important economic factor, including Brazil (47%), Colombia (51%), Saudi Arabia (42%), South Africa (46%), Australia (50%), China (49%) and India (48%).

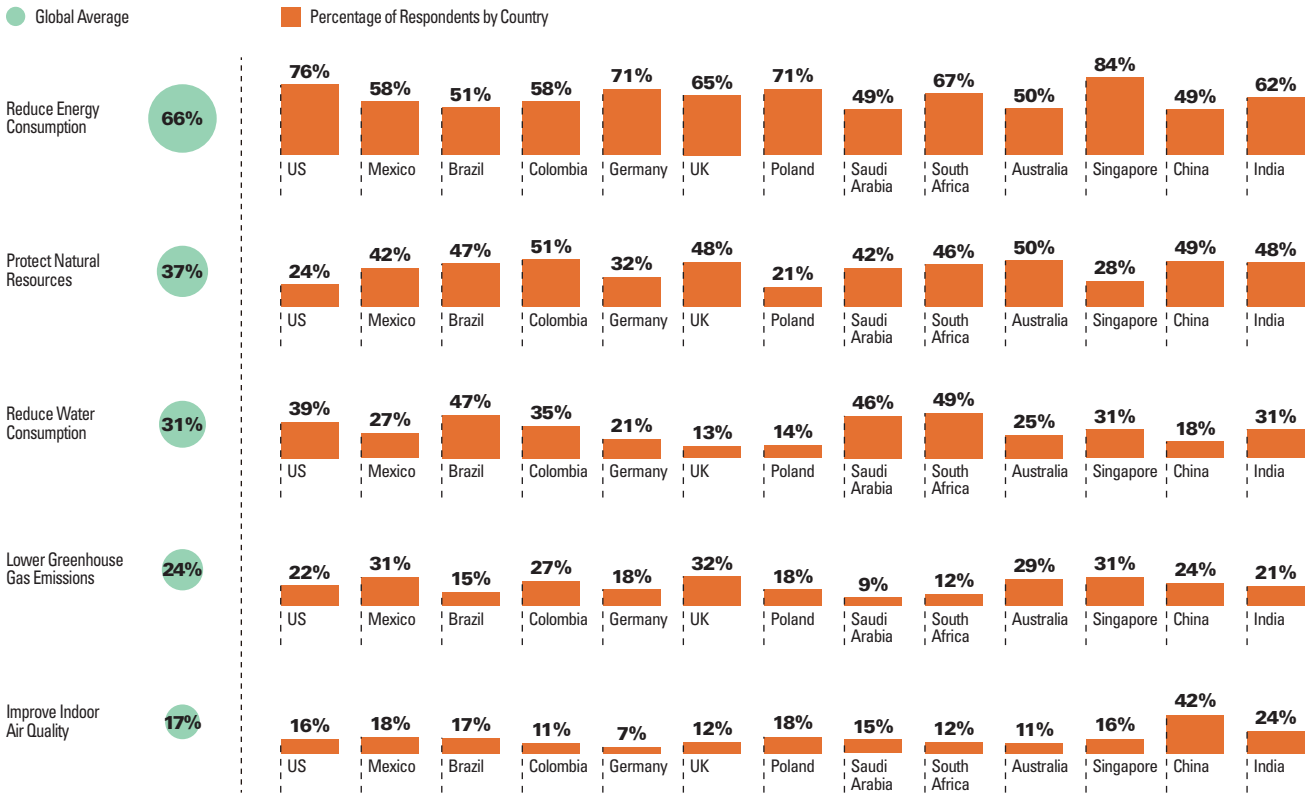
Reducing water consumption ranks third globally, at 31%. Most of the respondents from the Americas, other than Mexico, are above the global average for this factor, and US respondents rank it second only to energy. Also, over 45% selected this as critical from Saudi Arabia and South Africa. The percentage of European respondents are notably low in this category, as are those from China, underscoring the importance of regionality in the emphasis placed on water consumption.

The top countries motivated to lower greenhouse gas emissions—the UK (32%), Australia (29%) and Singapore (31%)—are also the top countries for considering environmental regulations an important trigger for green.

The two countries with the highest percentage for improve indoor air quality, China (42%) and India (24%) are also notable for their struggles with air pollution.

Most Important Environmental Reasons for Building Green (Global Average and by Country)

Dodge Data & Analytics, 2016



Challenges to Increasing Green Building Activity

Survey respondents were asked to select up to three top challenges to increased building activity from an overall list of 11 options. The findings demonstrate both an evolving global market when compared with the findings from 2008 and 2012, and the importance of understanding the challenges on a regional basis.

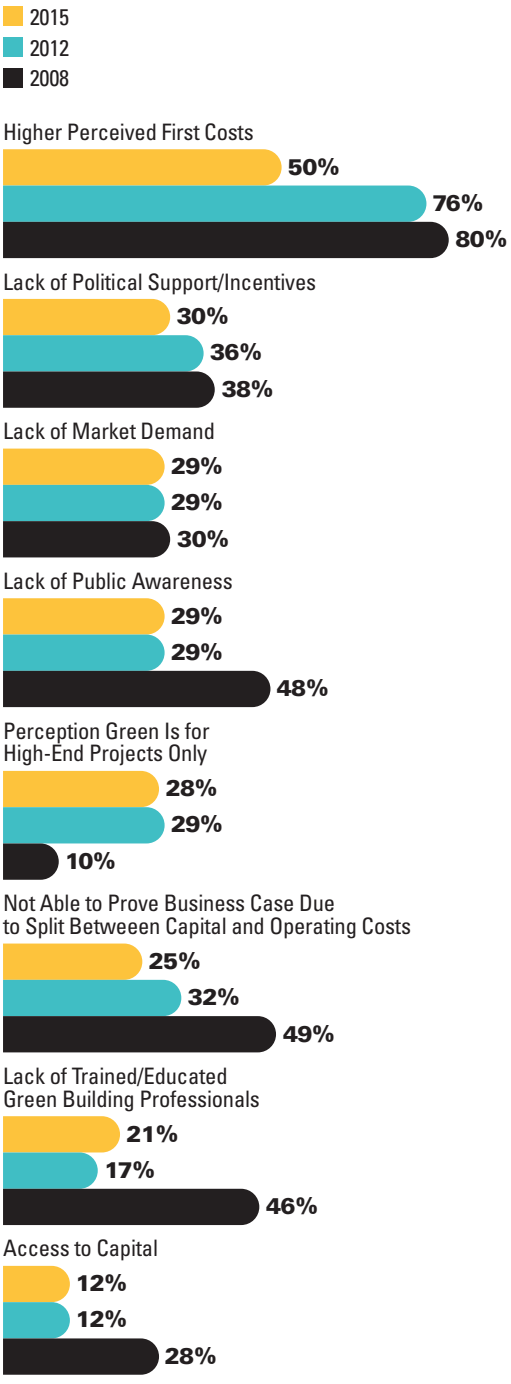
Changes Over Time

The eight challenges selected by the highest percentage globally are represented in the chart at right, and compared with the findings from similar questions in 2008 and 2012.

- **The top challenge is higher perceived first costs, but the percentage who consider this a top challenge has shrunk by 26 percentage points since 2012.** This drop may suggest a global trend toward greater experience with green building techniques and wider availability of green building products and service providers, which may be reducing the premium for building green.
- **The next four challenges are separated by only two percentage points in 2015, a virtual tie among them in terms of the percentage that finds them important.** There is also great consistency between the 2012 findings and the current findings on each of these points, suggesting that the influence of the lack of political support/incentives, lack of market demand, lack of public awareness and the perception that green is for high-end projects only remain issues that need to be addressed by the green building community. However, these factors do vary widely by market (see opposite page).
- **As the benefits of green building are more widely measured (see page 51), the concern about proving the business case has declined, with a seven percentage point drop from 32% in 2012 to 25% in 2015 of those who consider this an important obstacle.** This may also be less of an obstacle as green becomes more common practice in the construction industry, creating less need to justify it on an owner-by-owner basis.

Challenges to Increasing Green Building Activity (by Year)

Dodge Data & Analytics, 2016



Challenges to Increasing Green Building Activity CONTINUED

Variation by Country

The findings reveal that certain challenges carry greater weight in some countries.

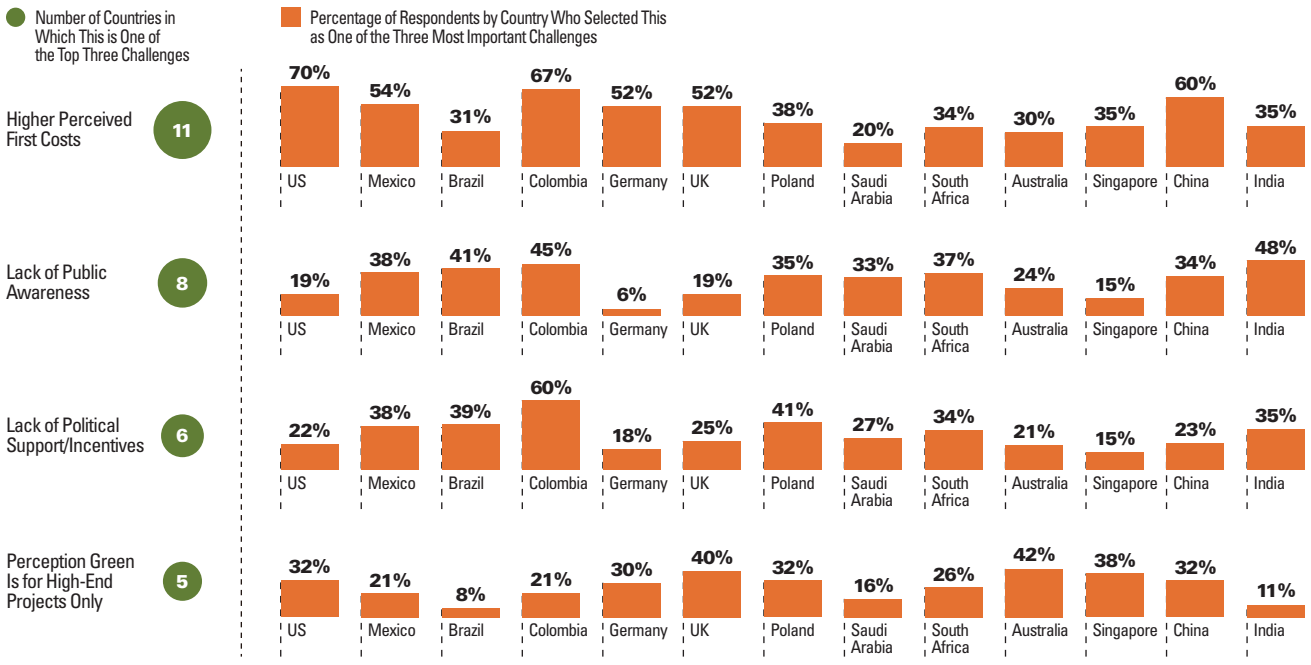
- **While higher perceived first cost is one of the top three challenges in nearly all (11) of the 13 countries included in the study, it is selected by over 50% of the respondents only in the US (70%), Mexico (54%), Colombia (67%), Germany (52%), the UK (52%) and China (60%).** Several of these markets are highly active, suggesting that cost concerns may come from greater competition for skilled labor and reduced availability of needed building products.
- **Lack of public awareness and lack of political support/incentives are most commonly selected by a high percentage of respondents from developing countries.** These challenges are particularly noted by respondents from Mexico, Brazil, Colombia, Poland, South Africa and India.
- **On the other hand, the perception that green is for high-end projects only is more common in developed countries.** The US, UK, Australia, Singapore and China all have a relatively high percentage selecting this option. Each of these are countries with well-established green markets or with strong regulations encouraging rapid green building adoption. Poland also has a notably high percentage of respondents for this category, but it doesn't rank in the top three for obstacles in Poland, which diminishes its overall influence.

Understanding these challenges can help companies build their green businesses more effectively in these countries.

Top Challenges to Increasing Green Building Activity

(By Number of Countries in Which It is One of the Top Three Challenges and by Country)

Dodge Data & Analytics, 2016



Green Building Rating Systems

Survey respondents report using 19 different green building rating systems, including nine that they mentioned in addition to the list of 10 included in the study. In general, rating system use was reported by 78% of the respondents. Given the fact that only one third of the respondents are members of a Green Building Council, this demonstrates the widespread use of certification systems across the building industry globally.

There is some variation by country in the use of rating systems. Rating system use is low in Colombia (50%), Germany (64%), Saudi Arabia (47%) and South Africa (60%), compared with the global average.

Benefits of Using Green Building Rating Systems

Being able to create better-performing buildings is the top benefit reported in the 2015 study, the same ranking it enjoyed in 2012. Despite a slight decline in the percentage who selected it, it is actually now selected by considerably more respondents than any other benefit included in the study.

The second most important benefit, marketing and competitive advantage, retained its ranking from 2012 but declined precipitously in the percentage who selected it, from 67% to 49%. This corresponds with a drop in those who find that branding/public relations is an important trigger for green (see page 14), and it may be influenced by wider adoption of green building, making it less of a differentiating factor for companies.

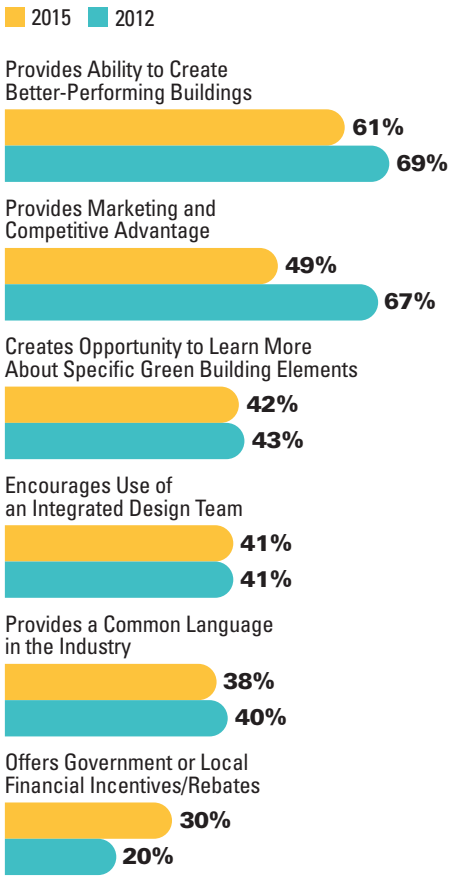
One notable result is that the benefit of improving industry practices and processes is important to a higher percentage than financial incentives. Encouraging use of an integrated design team and the ability to provide a common language to the industry are selected by 41% and 38%, respectively, but government incentives/rebates are only selected by 30%.

Reasons Not to Use a Rating System

The barriers to use of a rating system are roughly consistent with those in the 2012 study. Over half report that use of a rating system is too costly or time intensive, suggesting the need for better tools and simpler approaches. Only a relatively small percentage, though, are still concerned about rating systems being sufficiently tailored to regional concerns or being able to understand the requirements, a change from the findings in 2008, when these were considered bigger challenges.

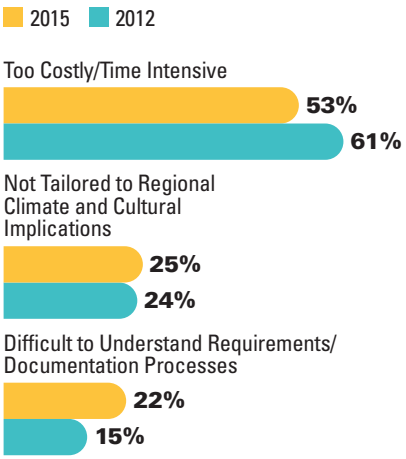
Benefits of Using a Green Building Rating System (According to Global Respondents by Year)

Dodge Data & Analytics, 2016



Reasons for Not Using a Green Building Rating System (According to Global Respondents by Year)

Dodge Data & Analytics, 2016



Designing for Resilience in a Changing World

Resilience is the capacity to adapt to changing conditions, and to maintain or regain functionality and vitality in the face of stress or disturbance, according to the Resilient Design Institute. An increasingly important parameter in development around the world, resilient design requires identification of the hazards a project will face and provision for the capacity to adapt.

Grid Fails? No Sweat

If utilities are disrupted, the sun can overheat a building fast, rendering it all but useless, especially in a hot and humid climate like Jakarta's. The Pertamina Energy Tower, a 523-meter supertall tower scheduled for completion in 2020, which will form the centerpiece of the Indonesian energy company's consolidated new headquarters, is the first supertall tower in the world for which energy is the primary design driver. With a variety of overlapping energy strategies, the Pertamina Tower is intended to keep its cool, without interruption, indefinitely.

To produce more energy than it uses, the tower first reduces energy demand for cooling and lighting with a building form defined by the path of the sun. To shade the solar-efficient form, the design team modelled 675 shade-fin profiles in 30,000 scenarios. "A bit of overkill," says Luke Leung, director of Sustainable Engineering at SOM, architects for the project, "but we had the computing capacity, so we used it to select the most efficient passive strategy."

With insolation minimized and daylighting maximized, the project will meet its energy needs primarily using deep-well geothermal energy, tapping heat nearly two miles beneath the earth's surface to generate combined cooling, heat and power for the entire Pertamina campus. In addition, the project will generate energy from the sun, using shade canopies of photovoltaics along campus paths, and from the wind, using the higher wind speeds of higher altitudes to turn turbines set in the tip of the tower. These combined renewables will make the Pertamina campus the largest net zero energy project in the world: more than 10 times the size of what's been achieved to date.

The Pertamina Energy Tower uses multiple renewable energies to keep its cool indefinitely.

Although the threat of an attack on Pertamina's energy plant is small, the energy system is configured for redundancy, with two incoming services supplying independent substations, so that energy for the campus can be sourced from either of two locations.

Energy disruptions are not the only hazard the Pertamina campus is designed to withstand: typhoons regularly flood the city. To mitigate, the entire campus is raised seven meters above the hundred-year flood line, like a big ship; and, to prevent site run-off from flooding downhill neighbors, the project is also designed to achieve net-zero water. All rainwater falling on the site, as well as all water used in the building, is recycled in cooling towers, irrigation or toilets; absorbed through retention and infiltration; or returned to the aquifer through a recharging well.

A Desert Campus That Knows its Place

In recent generations, Qatar's wealth from oil and natural gas has facilitated the replacement of almost all of the city of Doha's climate-responsive, vernacular architecture

Image: SOM

The Qatar Research and Development Complex exemplifies a shift from reliance on depletable resources to a knowledge-based society.

Image: Perkins+Will

with sprawling, Western-style, car-dependent developments that didn't work where they came from. But the Qatar National Vision 2030 charts a new course, one that aims to shift Qatari society from its dependency on depletable resources. Exemplifying the country's new direction is the Qatar Research and Development Complex.

The master plan for the 40.3-hectare campus, which is seeking certification under LEED for Neighborhood Development at the gold level, draws on passive climate-mitigation strategies from vernacular Arabic architecture and supplements them with some contemporary twists. To achieve an active, connective campus, the plan deploys shading and cooling strategies to make public outdoor spaces comfortable for pedestrians year-round.

"We're encouraging our clients to build from their roots, their climate, and what works for them," says Cassie Branum, a senior urban designer with Perkins+Will.

Shading strategies for achieving the campus' performance standards include building placement for maximum shading effect; free-form concrete shade structures for large open spaces; trees as key design elements, often interplanted with shrubs so that the crenellated planting heights more effectively filter particles from the desert winds; and small concrete canopies to shelter the campus's bike-share terminal.

Beyond shade, cooling strategies use recycled water from air conditioning condensate to create cooling walls, benches and shade structures complete with motion-sensor-activated fans and cooling mists. Effective uses of water include onsite stormwater management, with street paver patterns cleverly designed for varying degrees of perviousness; and water features, a traditional cooling strategy in desert architecture, updated with motion sensors to provide cooling and refreshment only when people are present to appreciate it.

"With all our projects around the world, we're trying to create smart projects where each element supports multiple objectives," says Branum. "We're continually asking ourselves, how can we make a resilient environment that belongs to this place in the world?"

Redeveloping for Resilience

A city of rolling hills, Istanbul's rainwater infrastructure is so inadequate that downhill neighborhoods routinely flood two

or three feet in a cloudburst. The city's population, now approaching 16 million, is expected to double by 2050. And, having been rocked by earthquakes in 1999 and 2012, the city is overdue for a 500-year mega-quake.

In the face of these stresses, Istanbul has embarked on a large-scale program of urban regeneration in which entire at-risk districts are slated for demolition and redevelopment. Perkins+Will's master plan for the redevelopment of Sisli, a 24-hectare mixed-income, mixed-land-use neighborhood that typifies the challenges Istanbul faces, proposes a model for resilience using two complementary paradigms.

One paradigm consists of technical solutions: the use of underground parking levels as base isolators, for example, which decouple buildings above from movement in the ground below; and the use of street planters and green-space networks as green infrastructure to prevent stormwater from flooding districts downhill.

But, says David Green, a principal at Perkins+Will, technical solutions are emphatically not enough. "Resiliency must have an adaptable framework within which cities can accommodate change," he says. "That means a strong, connected, small-block street network."

By contrast with the large-grain, inwardly focused schemes with privately owned infrastructure which are common proposals for Istanbul's redevelopment, the Sisli master plan's small-block street network enables multiple complementary strategies for adaptability. It defines a continuous public domain within which infrastructure can be placed, accessed, maintained and replaced over hundreds of years. It supports walking and transit use. It allows plug-and-play development and redevelopment of individual parcels as needed, which in turn allows greater ranges of affordability and use. It fosters a finer grain of development, within which low- and mid-rise buildings can achieve the same densities as more widely-spaced towers, but without the need for superstructure for lateral resistance. Perhaps most significantly, a small-block street network facilitates a range of increments for change — whether in response to earthquakes, economics, population growth, or factors as yet unforeseen. ■

Image: Perkins+Will

In redeveloping an at-risk neighborhood in Istanbul, technological solutions complement an adaptable framework for change.

Data: South America/Caribbean

Green Building Activity and Trends

in Brazil, Colombia and 11 Other Nations in South America/Caribbean

The findings reveal that green building is still an emerging trend in South America and the Caribbean, but expectations about more green building across the region are high. Individual markets within the region have unique triggers and obstacles, but commercial construction is a critical sector for green here.

Dramatic Increase in Green Expected in South America/Caribbean

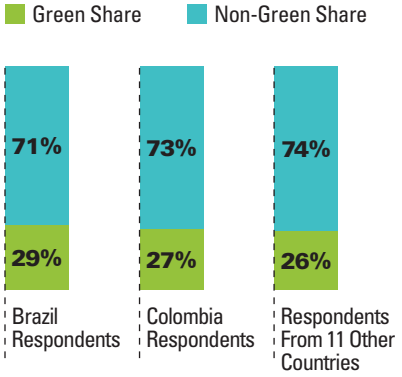
The findings from South America and the Caribbean suggest that this region is still an emerging market when it comes to green building. The share of green building reported by respondents in Brazil, Colombia and the other 11 countries that participated in the study averages 29% or less, but the share of many developed markets, including the US, Australia, Germany and Poland, averages above 30%.

However, the expectations of the level of green building in three years demonstrate a strong commitment to green in this region. The percentage of respondents who expect more than 60% of their projects to be green grows dramatically throughout the region.

- **Brazil:** In addition to having the highest share of current green building in the region, Brazil is also expecting the most dramatic growth in green in the next three years. The percentage of respondents who expect to do more than 60% of their projects green is six times higher than those currently at that level of green involvement, from 6% to 36%.
- **Colombia:** The growth in green in Colombia occurs in those with both moderate and high levels of green activity. The percentage of respondents from Colombia who do more than 60% of their projects green is expected to double between 2015 (18%) and 2018 (38%), and the percentage doing between 31% and 60% of their projects green is expected to double as well (from 11% to 24%). This is in contrast to the respondents from Brazil, where most of the green growth is expected at the highest level of involvement. This suggests that the Colombian market may be at an earlier stage of green involvement than the market in Brazil.
- **Other 11 Countries:** Growth is also evident in the other countries from this region, with those who expect to do more than 30% of their projects green nearly doubling from 28% in 2015 to 52% in 2018. However, the findings are not as universally strong in the other 11 countries as they are in Brazil and Colombia. The percentage who report that they do not expect to do any green projects also increases from 7% in 2015 to 17% in 2018. This suggests a divided market, with strong commitment to green among some respondents countered by a loss of interest in doing green projects for others.

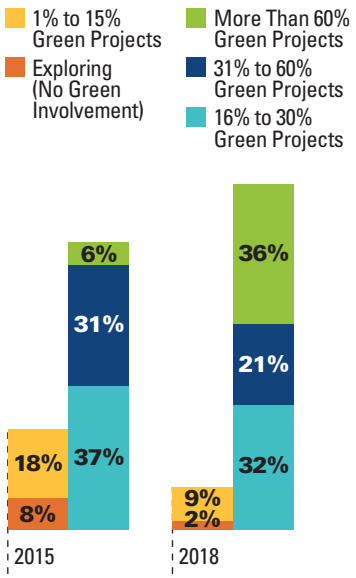
Average Green Share of Building Project Activity (For Firms in Brazil, Colombia and 11 Other Countries in South America/Caribbean)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in Brazil (2015–2018 Expected)

Dodge Data & Analytics, 2016



SECTORS WITH EXPECTED GROWTH

Across the region, a high percentage of respondents expect to do green projects in two sectors in particular.

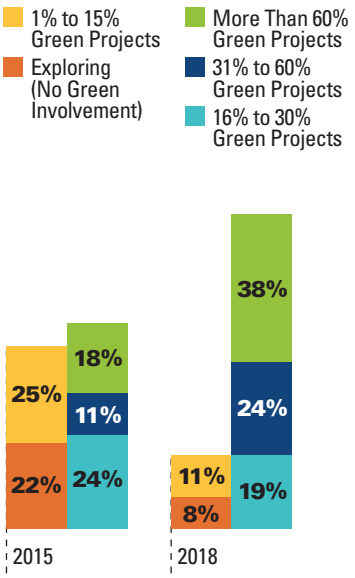
- **New Commercial Construction (e.g., office, retail, hotel):** New commercial construction is driving green in this region, with the highest percentage of respondents

in Brazil (47%), Colombia (59%) and the other 11 countries (48%) reporting that they plan to do green projects in this sector in the next three years. The percentage in Colombia also exceeds the global average of 46%. It is comparable to the percentage expecting to do commercial construction in China (55%), India (61%), Mexico (65%) and Singapore (53%). For Colombia, like many other emerging markets, commercial construction is an important driver of green building.

- **Retrofits of Existing Buildings:** In Brazil, the percentage who expect to do green retrofits of existing buildings (47%) is equal to those who expect to do new green commercial buildings. Retrofits are also selected by the third highest percentage in Colombia (31%) and the other 11 countries (37%). This emphasis on retrofits distinguishes this region from other developing markets like China, India and Saudi Arabia, where the focus appears to be on new green construction.

Levels of Green Building Activity for Respondents in Colombia (2015–2018 Expected)

Dodge Data & Analytics, 2016



Other notable trends for green building by sector vary by country.

- **New green low-rise residential** projects are quite popular among those from the other 11 countries, with the second highest percentage (44%) expecting to do a green low-rise residential project in the next three years (second only to new commercial construction). The percentage who anticipate doing this work in Brazil (35%) also exceeds the global average (27%), but this sector will see less activity in Colombia (26%).
- **New green high-rise residential** projects are also anticipated by respondents in Brazil (43%) and Colombia (36%) more than globally (25%), but this is a particularly weak sector in the other 11 countries in this region (19%).
- Brazil is a strong market for **green communities** (mixed-use developments), with 33% expecting to do a green project in this sector. This puts Brazil considerably above the global average (21%) and on par with Singapore (35%) and China (36%).

When compared with other global markets, green building has yet to take hold in new institutional construction in South America and the Caribbean. While new institutional construction is ranked second globally, it does not rank in the top three sectors in Brazil, Colombia or the other 11 South American/Caribbean countries. This may provide opportunity for further growth in green building in this region, but government support rather than market forces may be needed to help drive green activity in this sector.

Influence Factors for Future Green Building Activity

TRIGGERS

The key triggers for future green building vary among the countries in the region.

- **Brazil: Environmental regulations** are the top driver for green building activity in Brazil. This is in marked contrast to the findings from 2012, when market demand was selected as a top trigger by over half of the respondents, double the amount for any other trigger. In the current study it has dropped to just 12% who consider it important, with other triggers driving the market. Other important triggers driving the market in Brazil include:
  - **Client demands**, at 29%, ties for second in Brazil in the current findings, a marked increase in terms of its overall ranking compared to 2012. However, the percentage who find it important has only increased slightly, from 26% in 2012. In addition, the 29% in the current study is considerably below the global average of 40%.
  - **Higher ROI** is a particularly important trigger in Brazil, also selected by 29%. This percentage not only exceeds the Colombian (3%) or other regional (15%) percentages, but it also tops the global average of 11%. Only Mexico has a comparable

response to this trigger, with 25% regarding it as important.

- **Doing the right thing** is the third trigger that tied for second in Brazil. The percentage who select it in Brazil, however, is roughly on par with that in Colombia and the global average, and notably below the average for the other 11 countries from South America/ Caribbean that participated in the study.
- Brazil falls behind Colombia and the other 11 countries in that region in terms of the importance of market factors like **market demands** and **internal corporate commitments**, suggesting that a consistent call for green based on business benefits is not as evident in Brazil as it is in the rest of the region.

- **Colombia:** In Colombia, the top three triggers for future green building are **internal corporate commitments** (selected by 33%), **market transformation** (31%) and **environmental regulation** (31%). The emphasis placed on internal corporate commitments corresponds with the high level of commercial green building activity expected in Colombia, and it indicates the importance of corporate commitments for driving green in that country. Taken together, these three top triggers suggest that the market is simultaneously driven by the push of regulations and the pull of the ability to transform the construction market and corporate demands.
- **Other 11 Countries:** The triggers considered most important regionally include doing the right thing (41%), market demands (33%) and client demands (30%). These findings suggest that green is still an emerging trend across the region because they are triggers that push firms into compliance rather than compel them to adopt green to improve their bottom line. As green building becomes more common and the benefits emerge more clearly, it is likely other market and financial forces will gain influence.

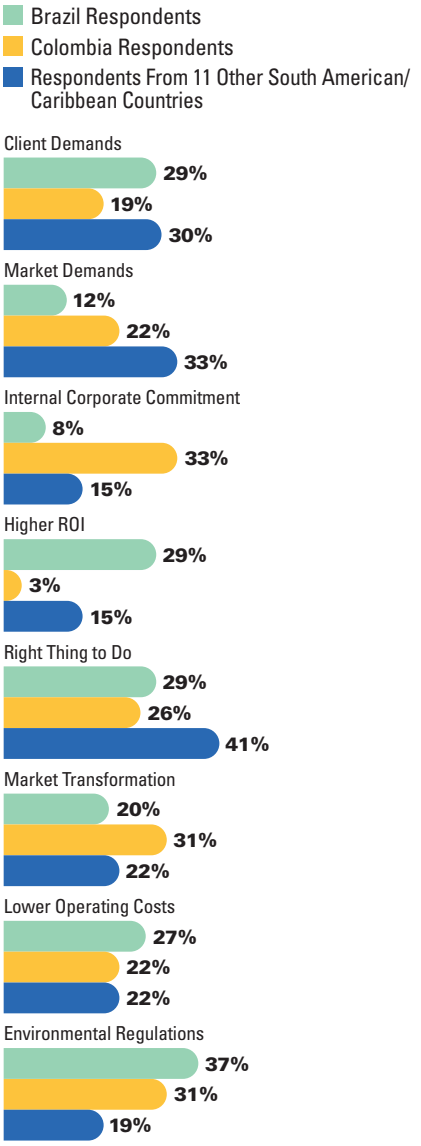
Challenges There are two challenges that are considered important by a high percentage of respondents across the region.

- **Lack of Public Awareness:** 45% of respondents in Colombia, and 41% in Brazil and the other 11 countries find this to be one of the top three barriers to green building in their country. This is on par with responses from Saudi Arabia, India, China, Poland and Mexico, which suggests that this is a common issue for markets where green is still emerging.
- **Lack of Political Support or Incentives:** This obstacle is most notable in Colombia, selected by 60%. Brazil, while significantly lower at 39%, still exceeds the global average of 30% for this obstacle. The responses from the remaining 11 countries from this region are equivalent to Colombia, with 59% finding this to be among the top three obstacles. Globally, no other countries exceed 50% of respondents who regard this as a top obstacle, suggesting its particular importance in this region.

Two obstacles are more important in Brazil or Colombia than they are regionally.

Top Triggers Driving Future Green Building Activity in Brazil, Colombia and 11 Other Nations in South America/Caribbean

Dodge Data & Analytics, 2016



- **Higher first costs is selected as a top obstacle by 67% of the respondents in Colombia.** While this is the top obstacle globally and one that is selected by the highest percentage in many countries included in the survey, only in the US (70%) and China (60%) is the percentage who select it so dominant compared with other obstacles.
- **Lack of trained/educated green building professionals is a top obstacle in Brazil, selected by 35%.** This is much higher than the 22% in Colombia who regard this as a top obstacle, and Colombia is essentially on par with the global average of 21%. Across the region, only 15% of the respondents from the other 11 countries consider this a problem. Brazil has seen high levels of construction activity in the last few years, including a relatively high percentage of green projects, and this may be creating a shortage of skilled workers for green projects.

Social and Environmental Reasons for Building Green

SOCIAL REASONS

There is general agreement for the most part across the countries from South America and the Caribbean that participated in the survey on the social reasons for building green. The top factor for all is to **encourage sustainable business practices**, selected by 53% of the respondents in Brazil, 65% in Colombia and 61% in the other countries. These percentages place Brazil slightly below the global average of 58% and Colombia and other regions slightly above it.

An increase in worker productivity due to green building is the other major factor of importance in Brazil (34%) and Colombia (38%), no doubt due in part to the market focus on commercial buildings and existing building retrofits.

ENVIRONMENTAL REASONS

Reducing energy consumption is the top environmental reason for building green in Brazil (51%), Colombia (58%) and the other countries from that region (72%). This finding corresponds to the global priorities around energy reflected in the overall study findings.

More notable is the importance of **protecting natural resources** to respondents in both Brazil (47%) and Colombia (51%), roughly similar in percentage to those who select energy. Also notable is the concern about **water consumption** in Brazil, selected by 47%.

Business Benefits of Green Building

Brazil is more conservative about the expected decreases in operating costs over one year but far more optimistic about expected 5-year decreases than the other countries in South America and the Caribbean. However, payback periods for green investments in both Brazil and Colombia are quite short, which could be an important driver for green building in the future. ■

Expected Business Benefits of Green Buildings in South America/Caribbean (Including Brazil, Colombia and the Average of 11 Other Countries)

	New Green Building			Green Retrofit		
	Brazil	Colombia	Respondents from 11 Other Countries	Brazil	Colombia	Respondents from 11 Other Countries
Decreased Operating Costs Over One Year	8%	12%	12%	6%	12%	12%
Decreased Operating Costs Over Five Years	20%	9%	12%	13%	13%	12%
Payback Time for Green Investments (Years)	4	5	8	4	4	8

Green Building Activity and Trends

in Germany, Poland, the United Kingdom and 18 Other European Nations

Green building in Europe is widely considered a mature green market. However, countries that participated in the survey predict a higher level of green involvement in the next three years, demonstrating ongoing potential for growth. The triggers for that growth, though, vary by country.

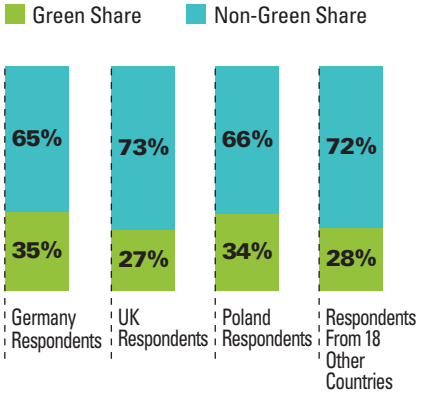
Shift to High Green Involvement Varies Across Europe

Across Europe, there is a general trend toward companies expecting to be very highly engaged in green for the next three years. That trend is also evident in the three countries with sufficient levels of response to support an independent analysis—Germany, Poland and the UK—although to varying amounts.

- **In Germany, strong growth is expected by 2018 both in the percentage of firms doing between 31% and 60% of their projects green, and in the percentage doing more than 60% green.** This suggests that the green market in Germany is still developing at a steady pace.
- **In Poland, the growth of green involvement is more measured, with only a 10 percentage point gain expected in the percentage of those doing more than 60% of their projects green, and limited growth among those doing less green work.** The decline in those doing little to no green, however, is still quite substantial, from 31% to 18%.
- **In the UK, the shift to green by 2018 is most dramatic, with a 22 percentage point decline in those expecting to do few (less than 16%) green projects and a 14 percentage point gain in those expecting to do more than 60% of their projects green.** However, there is also a small but persistent group of respondents (9%) who currently do not do any green projects and do not expect to do any in the next three years. This may suggest that, without different triggers being put into play, the UK may have defined the extent of its green market.
- **The combined findings of the other 18 European countries that participated in the study show a major increase of 27 percentage points in those expecting to do more than 60% green projects by 2018, compared with those currently highly involved with green.** This jump in those highly involved with green is mirrored by a strong 10 percentage point drop in those who do not expect to do any green work, from 15% in 2015 to 5% in 2018. This demonstrates that Europe, despite its advanced green reputation, is still a growing green building market.

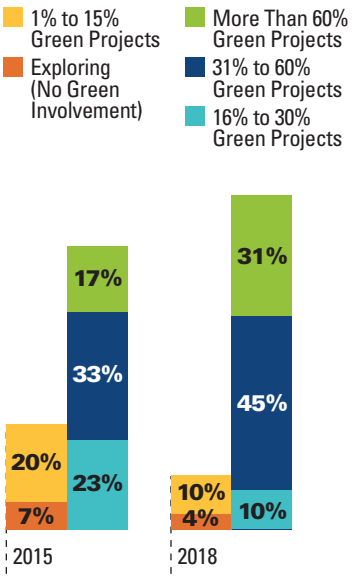
Average Green Share of Building Project Activity (For Firms in Germany, Poland, the UK and 18 Other European Countries)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in Germany (2015–2018 Expected)

Dodge Data & Analytics, 2016



SECTORS WITH EXPECTED GROWTH

An examination of the three countries featured in the study demonstrates that **there is no single sector that dominates the European green building market**.

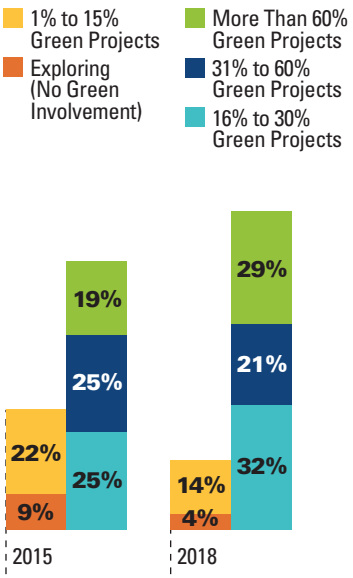
- **Germany:** In general, Germany corresponds to global trends in green building sectors. The highest percentage (39%) of German respondents expect to do green projects in the **commercial** and **institutional** sectors in the next three years, with the **existing building retrofit** sector coming in as a close second (36%). The

remaining sectors also generally correspond to global averages in Germany.

- **Poland:** One sector dominates the responses from Poland: 50% select **new commercial construction** as a sector in which they intend to build green in the next three years. **Commercial interiors**, at 27%, is a distant second, but it is still a bit higher than the 20% globally that expect to do work in this sector, demonstrating the importance of the commercial market for driving future green work in Poland. On the other hand, Poland has the lowest percentage of respondents from any of the countries included in the study who expect to be doing **new green institutional** construction. This reveals the need for greater green engagement by the major institutions and government in Poland.
- **UK:** The top two sectors in which respondents from the UK plan to do green projects in the next three years are **retrofits of existing buildings** (44%) and **new low-rise residential** (40%). These percentages both exceed global averages, with the UK seeing the highest commitment to greening new low-rise residential projects of any country included in the study. The other major sector for future green growth in the UK is **new institutional buildings**, selected by 37%, on par with the global average. On the other hand, the UK is notably lower in respondents who expect to do **green commercial** projects, both new buildings and interiors.

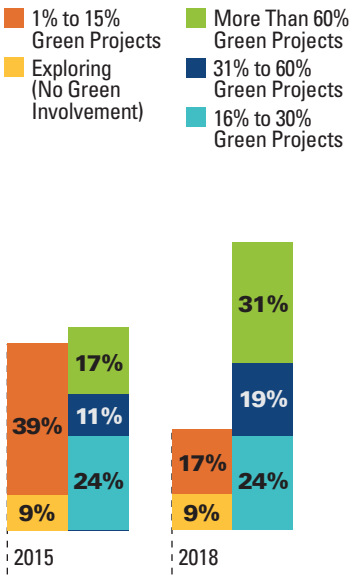
Levels of Green Building Activity for Respondents in Poland (2015–2018 Expected)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in the UK (2015–2018 Expected)

Dodge Data & Analytics, 2016



Influence Factors for Future Green Building Activity

TRIGGERS

The findings make it clear that the construction markets in **each of the three European countries are influenced by different factors**.

- **Germany:** No single factor is considered influential by a high percentage of German respondents. Instead, the German construction market is pushed toward green by a variety of different triggers. These findings are consistent with the 2012 study findings as well.
  - **Client demand** is the most popular trigger, although the percentage who select it (30%) are 10 percentage points below the global average (40%) and over 20 percentage points below the average (52%) of the other European countries besides Germany, Poland and the UK that participated in the study.
  - Market forces are clearly drivers for green in Germany, even if no one factor is in itself encouraging green building. **Market demands** and **improved 10-year costs** are selected as important by 21%, and **higher building values** and **higher rents are** selected by 18%. Germany is generally consistent with (or in the case of market demands, notably under) the percentage of other European respondents who are influenced by most of these factors. The exception is the high percentage in Germany (21%) who select improved 10-year costs, which is much higher than respondents from Poland (9%), the UK (5%),

other European countries (5%) and across the globe (9%).

- **Environmental regulations** is an important trigger equal to market demands and 10-year cost improvements in Germany. However, Germany pales in comparison to the UK for this factor.

- **Poland:** The percentage of Polish respondents who find the top triggers influential are even less varied than those from Germany. The top five fall within a six-point range, between 27% and 21%. Again, market forces are the most important drivers, with **market demands, client demands, lower operating costs** and **higher building values** being critical drivers. This corresponds with the emphasis on commercial green building in Poland, where these drivers would be particularly influential.
- **UK:** Unlike those from Germany and Poland, UK respondents are clearly driven to green by three factors: **client demands**, **environmental regulations** and **market demands**. Taken together, these suggest that currently the market is being pushed into action by factors like government regulations and corporate influence. However, the financial drivers that are influential in the rest of Europe carry less sway here.
  - **Client demands** is popular across Europe (selected by 52% of those from the other 18 European countries in the study), but at 69%, this factor dominates the UK market.
  - The UK is also one of the top countries globally for considering **environmental regulations** an important trigger for future green building, with 64% far exceeding the European and global averages of 35%.
  - The high percentage expecting **market demands** to be an important trigger in the UK (47%) corresponds to the overall European market (42%), notably exceeding the global average.
  - While the top three triggers for the UK in the current study were also important in 2012, each has gained in importance by several percentage points, suggesting the growing influence of these factors.

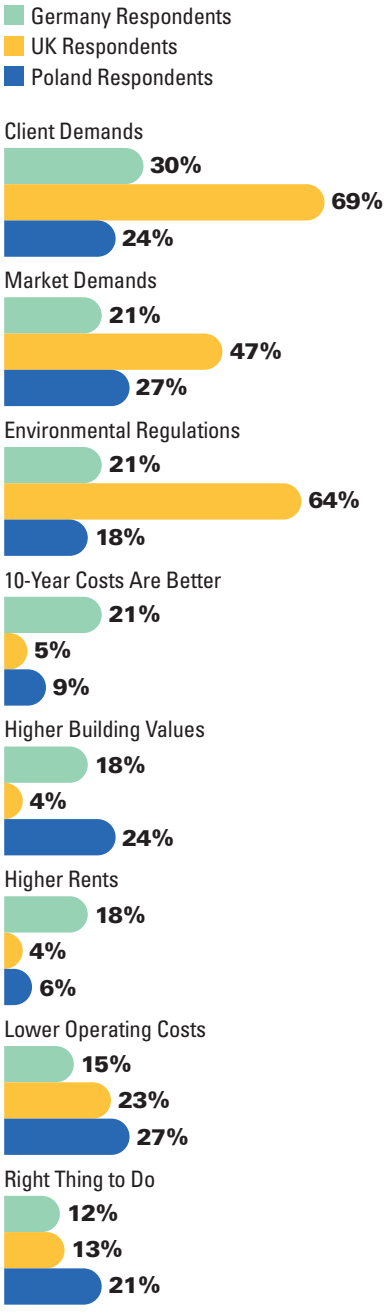
CHALLENGES

The importance of the top challenges also varies by country.

- **Higher First Costs:** This is consistently perceived as a problem across Europe. It is selected as a top barrier to green by the highest percentage in Germany (52%) and the UK (52%) and by the second highest percentage in Poland (38%) and the other European respondents (40%). These findings are consistent with the percentage globally concerned about this issue.
- **Affordability/Green Building Is for High-End Projects:** This factor is selected by the second highest percentage of German respondents (30%) and the third highest in the UK (40%), both of which exceed the global average of 27%.
- **Lack of Public Awareness:** This ranks third in Poland (35%), in sharp contrast to Germany, where it is only selected by 6%.
- **Inability to Prove the Business Case:** The split incentive between capital and operating costs is noted as a particular problem in the UK (43%), compared with the rest of Europe (21% in Germany,

Top Triggers Driving Future Green Building Activity in Germany, Poland and the UK

Dodge Data & Analytics, 2016



3% in Poland and 26% in the other European countries, which is roughly on par with the global average).

Social and Environmental Reasons for Building Green

SOCIAL REASONS

Encouraging sustainable business activity is a top social reason for building green across Europe. It is particularly popular in the UK, where it is selected as one of the top reasons by 72% of respondents. It also ties for first in Poland, but it is considered a top social reason there by a much lower percentage (32%), than those who consider it important in the UK. This factor ranks second in Germany (36%) to worker productivity. It ranks first in the other 18 European nations (61%) by a high percentage.

The importance of other social reasons vary by country.

- **Worker productivity** is the top social reason in Germany, selected by 41%. This puts Germany on par with Saudi Arabia and Mexico, in terms of the value placed on this factor.
- **Supporting the domestic economy** is the other top social reason in Poland, also selected by 32%, which is roughly on par with the global average influenced by this factor. A high percentage (40%) of the respondents from the other 18 European nations consider this important as well.

ENVIRONMENTAL REASONS

There is general agreement across all European respondents about the importance of **reduced energy consumption** as an environmental reason to build green. It is selected as the top factor by 71% in Germany, 71% in Poland, 65% in the UK, and 78% of the other European respondents, compared with 66% globally.

There are a couple of other environmental reasons that carry more sway in Europe than globally:

- **Protecting natural resources is selected by 48% of UK respondents,** notably higher than the other European respondents and than the global average of 37%.
- **In addition, a high percentage (32%) of UK respondents consider lower greenhouse gas emissions as a top environmental reason for building green,** compared with the global average of 24%.

Business Benefits of Green Building

Overall, the respondents from Europe report relatively consistent benefits from building green. Germany is slightly more conservative than other countries about the potential for decreased operating costs over five years. The UK is also more conservative than other European countries about payback periods for green, probably due to the relatively expensive construction market in general in the UK. Still, despite these differences, there is clear agreement among the European respondents about the benefits of building green. ■

Expected Business Benefits of Green Buildings in Europe

(Including Germany, Poland, the UK and the Average of 18 Other European Countries)

	New Green Building				Green Retrofit			
	Germany	Poland	UK	Respondents From 18 Other European Nations	Germany	Poland	UK	Respondents From 18 Other European Nations
Decreased Operating Costs Over One Year	8%	8%	8%	8%	7%	8%	7%	9%
Decreased Operating Costs Over Five Years	9%	14%	14%	14%	11%	14%	13%	13%
Payback Time for Green Investments (Years)	7	8	13	8	5	7	10	8

Data: Middle East/North Africa

Green Building Activity and Trends

in Saudi Arabia and 11 Other Nations in the Middle East/North Africa Region

The rapid growth of green building expected in the next three years in Saudi Arabia and the Middle East/North Africa (MENA) region is largely in the commercial and institutional sectors. In Saudi Arabia, business benefits are key triggers, while the rest of the region is most influenced by regulations.

Green Activity Growing at a Rapid Pace in the MENA Region

While the current level of green activity in the MENA region is roughly on par with global averages, anticipated increases in green involvement in the future suggests that the MENA region will be critical for the growth of green building globally in the next few years.

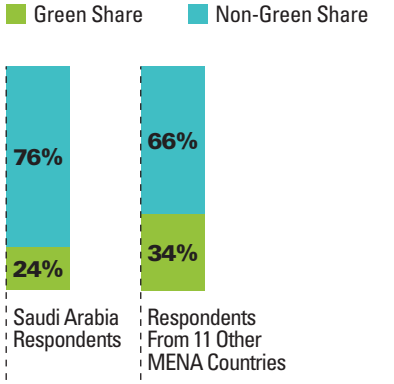
Respondents from 11 MENA countries have an average green share of about 34%, which corresponds to levels reported in the US, Mexico, Germany, Poland and Australia. Saudi Arabia, on the other hand, is currently lagging in terms of the level of green building. The green share of work is currently only 24%, 10 percentage points lower than the regional average. This is in part because nearly one third of respondents from Saudi Arabia (32%) report doing a very small share (15% or less) of their projects green.

However, the responses from Saudi Arabia also clearly indicate a commitment to building green in the future. By 2018, those who expect to do a very small share of their projects green drops to 6%, and those who expect to do more than 60% of their projects green correspondingly grows from 8% in 2015 to 32% in 2018.

The other respondents from the MENA region also report high expectations for green involvement by 2018, with the percentage of those who expect to do more than 60% of their projects green nearly doubling from 22% in 2015 to 40% by 2018.

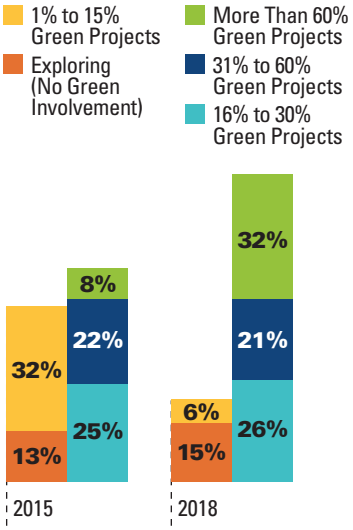
Average Green Share of Building Project Activity
(For Firms in Saudi Arabia and 11 Other Countries in the Middle East/North Africa)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in Saudi Arabia (2015–2018 Expected)

Dodge Data & Analytics, 2016



SECTORS WITH EXPECTED GROWTH

In the MENA region, including Saudi Arabia, new commercial and new institutional construction are the two sectors with the highest level of expected growth. Each are selected by nearly half of the respondents as the sectors in which they plan to build green in the next three years.

- **New Commercial Construction (e.g., office, retail, hotel):** Commercial construction ranks first in the percentage from Saudi Arabia (44%) and the rest of MENA (49%) who expect to do green projects. This puts this region roughly on par with the global average of 46%.
- **New Institutional Construction (e.g., schools, hospitals, public buildings):** Nearly as many respondents in both Saudi Arabia (42%) and the rest of MENA (44%) expect to do new green institutional projects as new green commercial projects. Both are significantly above the global average of 38%, making MENA one of the top regions for new green institutional construction. Only the US, Canada, Singapore and China have similarly high expectations for this sector. Typically, institutional construction is encouraged by active government support and engagement in green initiatives.

The only two sectors in which the percentage in MENA expecting to do work is much lower than the global average is retrofits of existing buildings and commercial interiors. This suggests a regional focus on new green construction.

- **Retrofits of Existing Buildings:** 22% of respondents from Saudi Arabia and 15% from the rest of MENA expect to do green retrofits, compared with the 37% global average.
- **Commercial Interiors:** 13% of respondents from Saudi Arabia and 7% from the rest of MENA expect to do green commercial interior projects, compared with the 20% global average.

Influence Factors for Future Green Building Activity

TRIGGERS

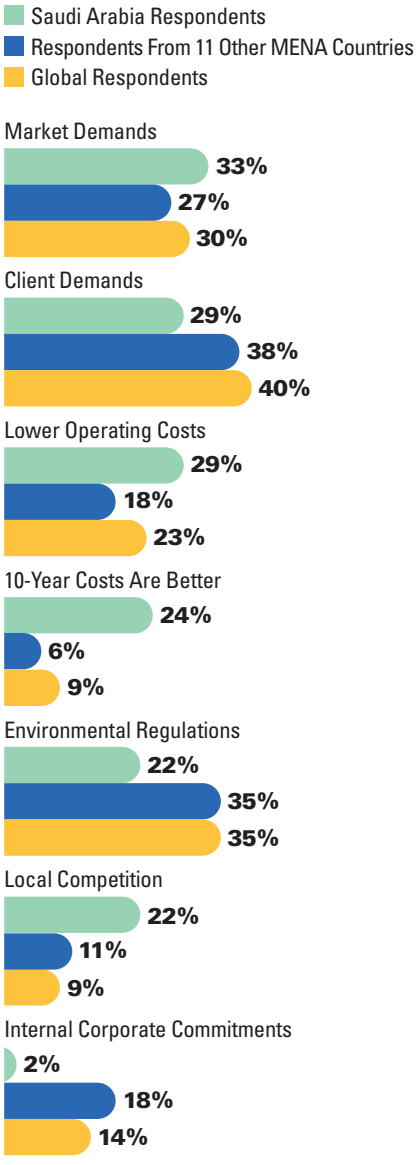
For respondents in Saudi Arabia and in the other MENA countries, client demand is an important trigger for future green building. It is ranked second in Saudi Arabia, selected by 29% and first by the rest of MENA, with 38% who consider it important.

For most of the other important triggers, Saudi Arabia diverges from the rest of the MENA region. Business benefits are bigger drivers for green in Saudi Arabia than in the rest of MENA, where more emphasis is placed on environmental regulations.

- **Saudi Arabia is aligned with the other MENA countries in the importance placed on client demands** as an important trigger for green building.
- **Market demands rank first in Saudi Arabia as a top trigger for future green building for 33% of respondents.** However, for the other MENA respondents, it ranks third at 27%.

Top Triggers Driving Future Green Building Activity in Saudi Arabia and 11 Other Nations in the Middle East/ North Africa

Dodge Data & Analytics, 2016



- **A high percentage of respondents from Saudi Arabia consider business benefits like lower operating costs (29%) and better 10-year costs (24%) important triggers,** far more than those from other MENA countries.
- **Respondents from Saudi Arabia also place more emphasis on the importance of local competition (22%) than is common regionally (11%) or globally (9%),** which suggests that respondents feel some pressure to go green in Saudi Arabia to stay competitive despite the relatively low green share of projects currently in that country.
- **One of the top triggers for the MENA countries other than Saudi Arabia is environmental regulations, selected by 35%.** However, in Saudi Arabia, only 22% consider this an important trigger.

CHALLENGES

On the other hand, Saudi Arabia aligns with the rest of MENA about the key challenges to increasing the growth of green building.

- **Lack of Public Awareness:** 33% of respondents in Saudi Arabia and 40% in the rest of MENA select this as one of the top three barriers to green building. This is on par with responses from Brazil, Colombia, India, China, Poland and Mexico, which suggests that this is a common issue for markets where green is still emerging.
- **Lack of Trained/Educated Green Building Professionals:** While the global average for this obstacle is 21%, it is selected by 29% of respondents from Saudi Arabia and 28% from the rest of MENA. The rapid acceleration of green building in these markets probably contributes to the skilled labor gap.

Social and Environmental Reasons for Building Green

SOCIAL REASONS

Saudi Arabia has the highest percentage (50%) of any country that participated in the study who select **increased worker productivity** as a critical reason for building green. This aligns with the strong influence of business benefits as triggers for future green building. It suggests that more data on how green buildings impact the health and well-being of their occupants could help increase green investments in this country.

Another social reason for building green in Saudi Arabia is the **ability to support the domestic economy**, selected by 44%. This may tie into the concerns about local competition, because that competition could be coming from companies based outside of Saudi Arabia. Certainly, it exceeds the global average for this factor, which is just 29%.

Respondents from the other MENA countries align more closely to global averages than Saudi Arabia for most of the social reasons, with the highest percentage selecting its ability to **encourage sustainable business practices** (60%).

ENVIRONMENTAL REASONS

Like respondents from the other countries in the study, the highest percentage of those from Saudi Arabia (49%) and the other MENA countries (52%) consider the **reduction of energy consumption** one of the top environmental reasons for building green. However, Saudi Arabia has one of the lowest percentages of respondents (49%) who consider this a top reason, comparable only to China (49%) in this respect. The rest of MENA is also considerably below the 66% global average for this factor.

Not surprisingly, **water conservation** is nearly equal to energy conservation among the respondents from Saudi Arabia, with 46% considering it a top factor. **Protecting natural resources** is a close third at 42%.

Interestingly, only 15% of respondents from Saudi Arabia consider **improved indoor air quality** important. While this is roughly on par with the global average of 17%, the strong emphasis on improved productivity as a social reason to build green suggests that more attention to this environmental factor is needed.

While the rankings are the same among the MENA respondents as among those from Saudi Arabia for the importance of **water conservation** and **protecting natural resources**, the percentages are notably lower (36% and 33%, respectively). This is because more than 30% also consider **lowering greenhouse gas emissions** to be an important environmental reason for building green. Only in the UK and Singapore do more than 30% of their respondents also select this factor.

Business Benefits of Green Building

Saudi Arabia and the other MENA countries are notably consistent in the level of business benefits reported from green building, both for new and renovation projects.

They are also roughly on par with global medians for estimated decreased operating costs and payback periods for new buildings. However, the estimated decrease in operating costs is notably less for renovation projects than the global medians, with global respondents reporting a 9% estimated decrease in costs over one year and 13% estimated decrease in costs over five years. Despite these apparently reduced benefits, though, the payback period is much closer to the global median of six years, suggesting that these benefits are still sufficient to drive the market. ■

Expected Business Benefits of Green Buildings in the Middle East/North Africa (Including Saudi Arabia and the Average of 11 Other Countries)

	New Green Building		Green Retrofit	
	Saudi Arabia	Respondents From 11 Other Countries	Saudi Arabia	Respondents From 11 Other Countries
Decreased Operating Costs Over One Year	8%	8%	7%	5%
Decreased Operating Costs Over Five Years	16%	14%	11%	10%
Payback Time for Green Investments (Years)	7	9	5	5

Data: United States

Green Building Activity and Trends

in the United States

The current study predicts a major shift in the percentage of those doing a majority of their projects (more than 60%) green in the US. It also suggests that more measurement of the benefits of building green could help address key obstacles facing the US green construction market.

Strong Shift to Green Still Evident in the US

US commitment to green building has been evident since Dodge Data & Analytics first began studying the adoption of green building in the US market in 2006, and this study demonstrates that there is still a strong expectation of growth for green building in the US market. Nearly half (44%) of the respondents to the study report that they are doing more than 30% of their projects green, and 58% report that they will be building green at that level by 2018.

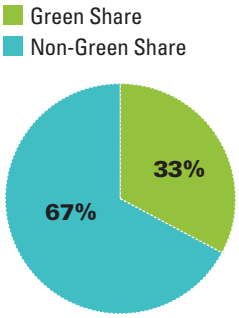
On the surface, this may appear to be a decline from the 2012 study. After all, the green share of work for the respondents to the 2012 study was a considerably higher 48%. However, it is critical to bear in mind that 82% of the US respondents in 2012 were members of a national green building council, compared with 53% in the current study, which provides a better portrait of the industry as a whole.

Given the more representative participation in the survey, it is particularly notable that the highest level of growth in the US by 2018 is expected among those who will do more than 60% of their projects green, which shoots up by 15 percentage points, from 24% currently to 39% by 2018.

Average 2015 Green Share of Building Project Activity

(For Firms in the United States)

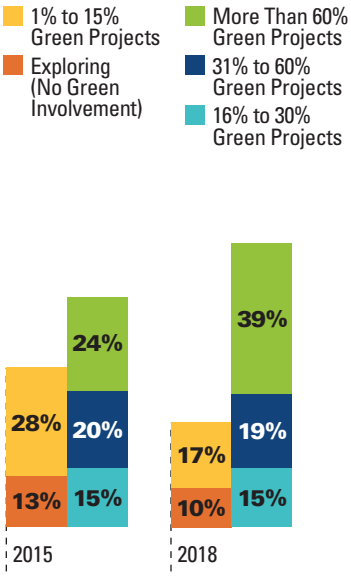
Dodge Data & Analytics, 2016



Levels of Green Building Activity for US Respondents

(2015–2018 Expected)

Dodge Data & Analytics, 2016



SECTORS WITH EXPECTED GROWTH

The institutional, commercial and existing buildings sectors will drive green growth in the US in the next three years, with over 40% of respondents reporting that they expect to be doing green projects in these sectors in the next three years. This is consistent with the 2012 study, in which these three categories were also the major drivers in the industry.

- **New Institutional Buildings (e.g., schools, hospitals):** At 46%, this is notably higher than the global average of 38%, suggesting a particularly strong market for green institutional projects in the US. Education in particular has been an important sector for green in the US, as have public buildings, according to previous US research on sustainability conducted by Dodge Data & Analytics.
- **Retrofits of Existing Buildings:** The US is also notably higher in this category than most other countries included in the study, with 43% reporting that they will be doing green retrofits in the next three years, compared with the global average of 37%. Retrofits are a particular focus in North America in general, with a similar percentage in Mexico and Canada reporting an expectation that they will be doing green retrofits in the next three years.

- **New Commercial Buildings (e.g., office, retail, hotel):** With 41% of respondents expecting to work on green commercial buildings in the next three years, the US is roughly on par with the global average of 46%.

One sector in which the US is notably lower than the global average is green high-rise residential construction. Only 15% of US respondents expect to do green building in this sector, compared with 25% of global respondents. However, it is possible that this may be due to concerns about the overall demand for high-rise residential buildings declining in the next few years, whether the projects are green or not, because that market has seen aggressive growth in the US in the last couple of years and may be becoming saturated.

Influence Factors for Future Green Building Activity

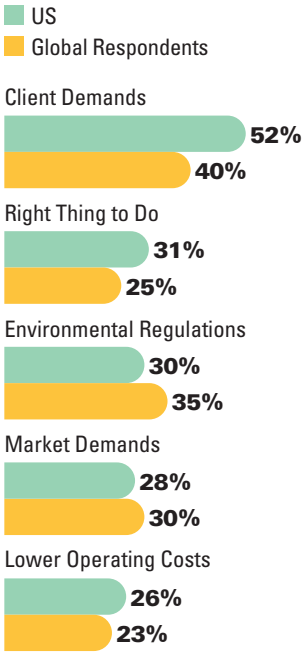
TRIGGERS

By far, the most important factor driving US respondents to build green is **client demands**. This demonstrates relatively wide recognition of the need to build green in the US, and it speaks to the maturity of the market.

The remaining four of the top five factors helping to drive green in the US market are separated by only five percentage points, suggesting that they are all of relatively equal importance. Financial factors like **market demands** and **lower operating costs** continue to be selected by a relatively high percentage, similar to the 30% who selected both categories in 2012.

Top Triggers Driving Future Green Building Activity in the United States

Dodge Data & Analytics, 2016



However, it is surprising to see **environmental regulations** emerge as a top trigger in the current study, when previously in 2012, it was only selected by 15% of US respondents. Since the majority of environmental regulatory activity for buildings in the US has shifted from the federal to the state and local levels, this increase may be due to the more representative sample of respondents. The push of regulations is more important among those who are not otherwise committed to green.

CHALLENGES

More than any other country included in the survey, respondents in the US are concerned about **higher first costs**, with 70% regarding this as one of the top three barriers to the growth of green, compared with 50% of global respondents.

The US has seen a relatively strong recovery in many construction sectors from the global recession that started in 2008, and recently concerns about rising costs for skilled labor and building materials have emerged. It is likely that these concerns are driving greater cost concerns about building green.

The other challenges that seem to influence the US market more than other global markets include:

- **Lack of Market Demand**
  - US 39%
  - Global 29%
- **Inability to Prove Business Case Because of Split Between Capital and Operating Costs**
  - US 34%
  - Global 25%

Alternatively, challenges that carry less weight in the US than globally include **concerns about public awareness, lack of trained green building professionals** and **lack of green products or solutions available in their markets**. In general, the lower rate of concern about these factors indicates the relative maturity of the US market.

Social and Environmental Reasons for Building Green

By far, the most important social reason for building green identified by US respondents is that it **encourages sustainable business practice**, selected as the most important reason by 74% of respondents in the US. This is at least 50 percentage points higher than any other reason, and 16 percentage points higher than the global average for this factor.

Reducing energy consumption is equally dominant among the environmental reasons for building green in the US, with 76% identifying it as the most important reason to build green. However, it is notable that 39% of US respondents also select **reducing water consumption** as the top environmental factor, notably higher than the global average of 31%, and particularly higher than respondents in Europe (including Germany, Poland and the UK), China and Australia. The high priority placed on reducing water consumption may be influenced by a couple of different factors, from drought-prone regions in the western US to the influence of LEED and other green certification systems placing greater priority on water consumption.

Business Benefits

US respondents lag behind their peers globally in tracking business benefits, with 43% reporting that they do not use metrics to track building performance, compared with 25% who report not tracking metrics globally. This may explain why making the business case is one of the biggest challenges in the US, and it may also hamper market demand for green.

Given that finding, it is not surprising that US respondents are much more likely to report that they do not know the impact of green buildings on operating costs:

- **One-Year Operating Costs: 21% of US respondents do not know, compared with 13% globally.**
- **Five-Year Operating Costs: 23% do not know, compared with 15% globally.**

Among those that do indicate a figure, the US respondents are more optimistic than the global medians about operating cost reductions for new buildings and retrofits. (See pages 52 and 55 for the global medians, which range from one to nine percentage points below the US averages.)

Expected Business Benefits of Green Building in the United States

	New Green Building		Green Retrofit	
	2012	2015	2012	2015
Decreased Operating Costs Over One Year	11%	11%	11%	12%
Decreased Operating Costs Over Five Years	28%	21%	14%	14%
Payback Time for Green Investments (Years)	7	8	4	7

Data: Mexico

Green Building Activity and Trends in Mexico

Mexico is leading globally in terms of expected green activity in the commercial sector. Therefore, it is not surprising that financial benefits are the key drivers for green in Mexico. However, like many developing countries, the need for greater public awareness and political support are key obstacles to green.

High Level of Green Involvement Expected in Mexico

Within the next three years, nearly half (44%) of the respondents in Mexico expect to be heavily involved with green building, with more than 60% of their projects anticipated to be green. This is more than double the percentage of Mexican respondents (21%) who currently are at that level of green involvement, and it exceeds the level of green involvement reported by respondents from other countries in North and South America. The expectation of this growth in green involvement reveals a strong commitment to green building among firms in Mexico.

These findings suggest that Mexico offers a particularly strong market for green product and service providers.

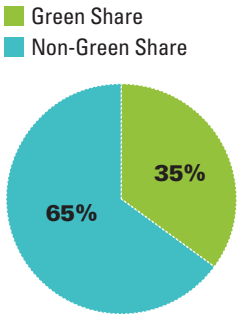
SECTORS WITH EXPECTED GROWTH

Mexico leads the other nations included in the study in the percentage of respondents who expect to build new green commercial projects in the next three years. In addition, retrofits of existing buildings and commercial interiors are also key sectors for growth in green building in Mexico.

- **New Commercial Buildings (e.g., office, retail, hotel):** 65% of respondents from Mexico say they will be doing new green commercial buildings in the next three years, compared with the 46% who expect to do this work globally.

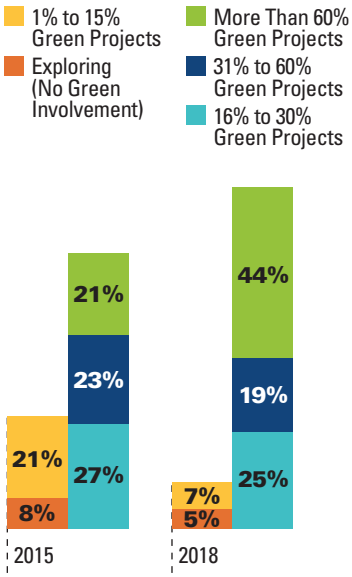
Average 2015 Green Share of Building Project Activity (For Firms in Mexico)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in Mexico (2015–2018 Expected)

Dodge Data & Analytics, 2016



- **Retrofits of Existing Buildings:** 46% of respondents from Mexico expect to do green retrofits of existing buildings in the next three years. This is consistent with the focus on retrofits in North America in general, with the US and Canada reporting comparable expectations for green activity in this sector. All of the North American percentages exceed the 37% of global respondents expecting to do green retrofits.
- **Commercial Interiors:** 33% of respondents from Mexico expect to do green commercial interiors, compared with just 20% globally. As with new commercial buildings, this is the highest percentage from any country included in the study, and significantly exceeds the 20% global average.

These findings suggest that building product manufacturers and service providers specializing in green commercial products should consider Mexico to be an important growth market.

Influence Factors for Future Green Building Activity

TRIGGERS

No single trigger is critical in the Mexican green building market, with only a six-point spread across the top five triggers driving the market. However, four out of five of those triggers involve business or financial factors, including **market demands**,

client demands, **lower operating cost** and **higher ROI**, suggesting that Mexico is driving toward green commercial work because of the positive impact of green on the bottom line of businesses that make that investment.

Generally, these top triggers correspond with global averages, although there is a lower percentage of Mexican respondents for client demand and a higher percentage who consider higher ROI important in Mexico than the percentages globally.

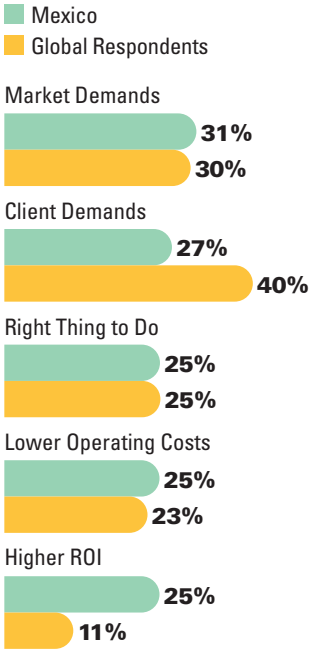
CHALLENGES

Similar to the other North American countries, the top barrier to further green growth in Mexico is **higher first costs**, selected by 54%. However, Mexico is closer to the global average of 50% who consider this an important challenge than the respondents from the US (70%) or Canada (76%).

Unlike the more developed markets in the US or Canada, though, the respondents from Mexico also have a high percentage reporting concerns about **lack of public awareness** (38% compared with 28% globally) and **lack of political support or incentives** (38% compared with 30% globally). This puts Mexico more in line with Brazil, Colombia, South Africa, India and Poland, all developing countries that need more green awareness to help support growth in their markets. However, Mexico's emphasis on commercial markets places it in a strong position for continued growth.

Top Triggers Driving Future Green Building Activity in Mexico

Dodge Data & Analytics, 2016



Social and Environmental Reasons for Building Green

The emphasis on the commercial market in Mexico is also influencing the top two social reasons for building green in that country.

- **67% of Mexican respondents consider encouraging sustainable business practices the most important social reason for building green,** compared with 58% globally.
- **44% of Mexican respondents select increasing worker productivity as the top social reason,** much higher than the 29% globally, and second only to Saudi Arabia in the percentage who consider this the top reason.

As with most countries, **reducing energy consumption** is the top environmental reason for building green in Mexico, selected by 58%. However, that is slightly under the global average of 66% for this factor. Other important environmental reasons for building green in Mexico include:

- **Protecting Natural Resources: 42% (compared with 37% globally)**
- **Lowering Greenhouse Gas Emissions: 31% (compared with 24% globally)**

Business Benefits of Green Building

Consistent with their focus on the financial benefits of green, 92% of the respondents from Mexico report using at least one measure to track the performance of their green buildings.

For new buildings, the respondents from Mexico report a bigger decrease in operating costs for one year and a relatively low payback time for their new green buildings, compared with their global peers. ■

Expected Business Benefits of Green Building in Mexico

	New Green Building	Green Retrofit
Decreased Operating Costs Over One Year	12%	12%
Decreased Operating Costs Over Five Years	8%	8%
Payback Time for Green Investments (Years)	5	4

Data: Singapore

Green Building Activity and Trends in Singapore

Singapore is still in the midst of a robust increase in the level of green activity, with a high percentage of respondents reporting an expectation to build green projects in every building sector measured in the survey. While the mandate passed in 2012 is the clear driver, business benefits are emerging that encourage wider adoption.

Robust and Growing Levels of Green Involvement in Singapore

Nearly all respondents (97%) in Singapore have engaged in at least some green building, the highest level of green building involvement of all the countries included in the survey.

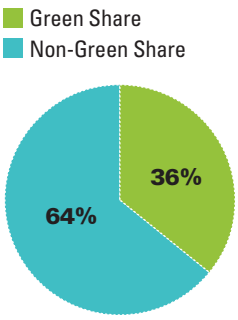
In addition, **the growth in the level of green activity in Singapore by 2018 is expected to be robust.** The highest level of growth in this country is expected among those doing more than 60% of their projects green, with a 15 percentage point gain from 23% currently to 38% by 2018. This is a higher percentage than that from any country included in the survey, other than South Africa and India. Clearly Singapore is an important, growing market for green product manufacturers and service providers.

These findings are strong compared with the other global findings in this study, but they do appear on the surface to be a step back from the 2012 findings, where 64% of respondents reported doing more than 60% of their projects green. However, 2012 was also the year in which Singapore launched a major government mandate for green. Three years of experience with living under the mandate have tempered the responses as knowledge about green building has grown in Singapore.

Average 2015 Green Share of Building Project Activity

(For Firms in Singapore)

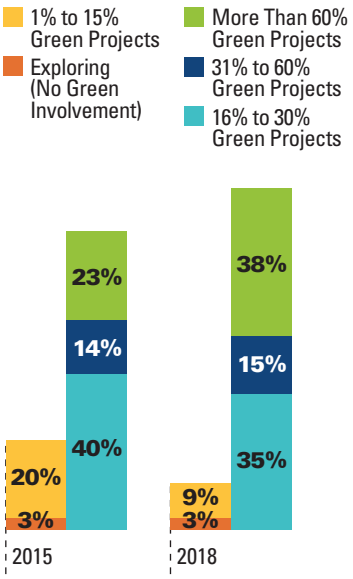
Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in Singapore

(2015–2018 Expected)

Dodge Data & Analytics, 2016



SECTORS WITH EXPECTED GROWTH

Singapore is poised to be a leader globally in four sectors for green building in the next three years.

- **Retrofits of Existing Buildings:** Singapore has the highest percentage of respondents (55%) among the countries included in the study who state that they will do green retrofits of existing buildings in the next three years.
- **New Commercial Construction (e.g., office, retail, hotel):** 53% of respondents from Singapore expect to do new green commercial construction projects in the next three years, above the global average of 46%. However, developing regions like Mexico, India and Colombia do exceed Singapore in the percentage of respondents expecting to do green work in this sector.
- **New Institutional Construction (e.g., schools, hospitals, public buildings):** 48% of respondents from Singapore expect to do new green institutional construction, compared with 38% globally. Again, this is the highest percentage of respondents from any country included in the study.
- **New High-Rise Residential:** Singapore also leads globally in this category with 48%, tied only with India.

In fact, Singapore exceeds global averages for all other categories,

including low-rise residential, commercial interiors and communities. There is a far more broad-based commitment to green evident in Singapore than in other global markets.

Influence Factors for Future Green Building Activity

TRIGGERS

Given the influence of the 2012 green mandate in Singapore, it is not surprising that **environmental regulations** are the top trigger by far, selected by 58%. This places Singapore with a small group of countries, including the UK and India, where regulations are clearly the driving force for adoption.

However, more market-based triggers, such as **lower operating costs** and **market demands**, are also very influential in Singapore and roughly equivalent with global averages.

CHALLENGES

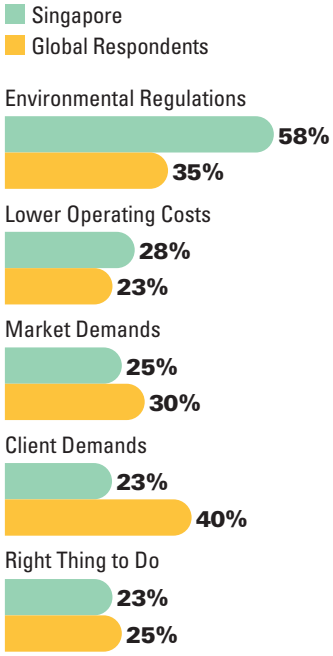
The biggest challenge faced by the burgeoning green market in Singapore is the **lack of trained green building professionals**, selected by 43% as a top obstacle, at least nine percentage points above any other country in the study.

The second most important challenge, and the only other challenge selected by a notably higher percentage of respondents from Singapore than other countries, is the **concern about affordability and perception that green is for high-end projects only**, selected by 38%.

A much lower percentage of respondents from Singapore, on the other hand, are concerned that **higher first costs, lack of public awareness** or **lack of political support/incentives** are obstacles to green building, compared with their global counterparts.

Top Triggers Driving Future Green Building Activity in Singapore

Dodge Data & Analytics, 2016



Social and Environmental Reasons for Building Green

The most important social reason for building green in Singapore is that it **encourages sustainable business practices**. It was selected by 64% of Singapore respondents, putting Singapore roughly on par with the UK, the US, Mexico and Colombia in terms of this driver.

While **reducing energy use** is the most important environmental reason for building green in most countries, it is more dominant in Singapore than in other countries. 84% of respondents selected this as the most important reason, with next highest factors, **reducing water consumption** and **lowering greenhouse gas emissions**, each a distant second at 31%.

Business Benefits

Nearly all (95%) of the respondents in Singapore use some metrics to actively track building performance. This finding is not surprising, given the fact that tracking metrics on the benefits of green is included in the government mandate.

Tracking these metrics has led to a refinement since the 2012 survey in the estimates for five-year operating cost savings for new green buildings. Respondents from Singapore are now slightly more conservative about the longer-term reductions. However, overall, these respondents still report robust savings and can clearly make the business case for green building. ■

Expected Business Benefits of Green Building in Singapore

	New Green Building		Green Retrofit	
	2012	2015	2012	2015
Decreased Operating Costs Over One Year	9%	10%	9%	9%
Decreased Operating Costs Over Five Years	16%	13%	14%	13%
Payback Time for Green Investments (Years)	7	8	6	7

Data: China

Green Building Activity and Trends in China

Robust growth is expected in the level of green activity in China. This market is differentiated by its drive to build green for benefits beyond energy use reduction, including protecting natural resources and improving indoor air quality. A focus on healthy communities also differentiates the Chinese green building market.

Rapid Level of Growth in Green Involvement Expected in China

China still has an emerging green building market. One third (33%) of respondents from China report that they are doing less than 16% of their projects green currently, and very few (5%) are doing the majority of their work (more than 60% of their projects) green.

Within three years, though, respondents from China expect to be more highly engaged in green. Very few (5%) expect to still be doing less than 15% of their projects green, and those who believe that they will be doing a majority of their work green increases more than fivefold to 28%.

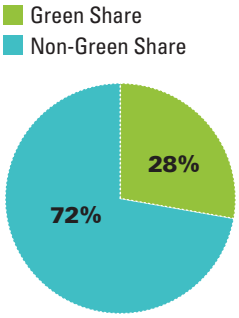
SECTORS WITH EXPECTED GROWTH

China significantly exceeds global averages for respondents who plan to do green projects in three sectors.

- **New Commercial Buildings (e.g., office, retail, hotel):** 55% of respondents from China expect to build new green commercial buildings, compared with the 46% who expect to do this work globally. Other countries with a similarly high percentage of those expecting to do commercial green building include Mexico, Singapore, India and Colombia, underscoring the role of commercial construction as an important driver of green building in some developing countries.

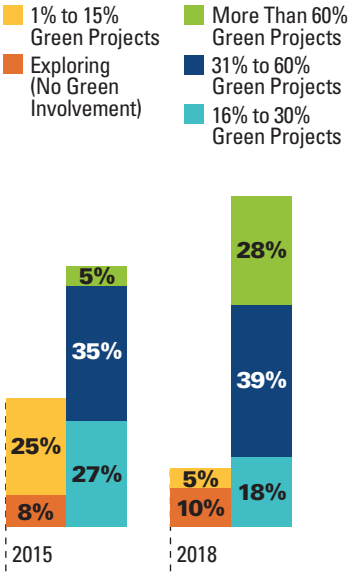
Average 2015 Green Share of Building Project Activity (For Firms in China)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in China (2015 and Expected 2018)

Dodge Data & Analytics, 2016



- **New High-Rise Residential (4 floors and above):** 45% report that they will do new green high-rise residential buildings, far exceeding the global average of 25% and putting China on par with other developing green markets like Singapore, India and Brazil.
- **Communities (mixed-use development combining residential and commercial buildings):** At 36%, China has the highest percentage of respondents globally who expect to be working on communities. This finding is not surprising given China's focus on developing sustainable mega-cities. Only respondents from Singapore and Brazil, two other urbanizing areas with significant opportunities for greenfield development, report a similar interest in green communities.

A notably lower percentage of Chinese respondents (19%) expect to do green retrofits of existing buildings in the next three years than the global average (37%).

Influence Factors for Future Green Building Activity

TRIGGERS

Market demands are the most widely recognized trigger for future green activity in China. However, in addition to the pull of the market, the push of **environmental regulations** is also critical in China.

The biggest difference between the top triggers globally and those in China is the importance of **healthier neighborhoods** in China, with twice the percentage (30%) of Chinese respondents who consider it important compared with global respondents (15%).

CHALLENGES

The challenge considered important by the highest percentage of Chinese respondents (60%) is **higher first costs** for building green. This is a higher percentage than the global average of 50%. It is a surprising finding given the relatively low payback period for green investments for projects in China (see below).

Other major challenges in China include **lack of public awareness** and **concerns about affordability**, but the percentage of respondents from China for each of these top challenges largely correspond to global averages.

One concern that ranks much higher in China than it does globally is the **level of corruption in the industry and/or government**. 21% reported this concern in China, compared with a global average of 13%.

Social and Environmental Reasons for Building Green

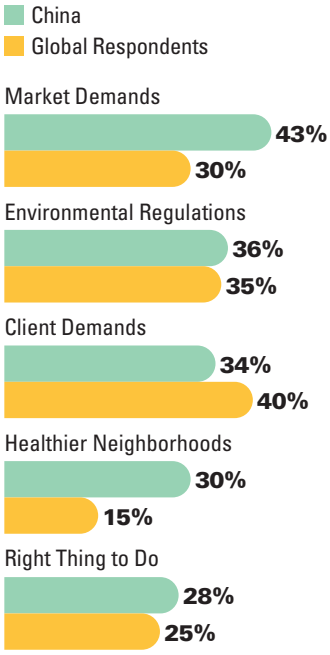
The top social reason for building green in China is to **encourage sustainable business practices**, selected by 49%. However, China still falls below the global average of 58% for this factor.

On the other hand, the percentage of respondents in China who select the next two most important social reasons for building green exceed the global averages.

- **One third (33%) of Chinese respondents consider the ability to create a sense of community a top reason for building green,** compared with 29% globally.
- **One third (33%) also select the support of the domestic economy,** compared with 29% globally.

Top Triggers Driving Future Green Building Activity in China

Dodge Data & Analytics, 2016



Unlike many countries included in the survey, several environmental reasons for building green are selected by over 40% of respondents as among the most important, rather than just reducing energy consumption:

- **Reduce Energy Consumption: 49%** (compared with 66% globally)
- **Protect Natural Resources: 49%** (compared with 37% globally)
- **Improve Indoor Air Quality: 42%** (compared with 17% globally)

The concern with indoor air quality, combined with the focus on healthier neighborhoods, reveals that health and well-being is a key priority for green building in China, more than in many other countries included in this study.

Business Benefits of Green Building

All respondents from China report using metrics to track the performance of their green buildings. However, the results they report are very conservative compared with the global medians, especially the reduction in operating costs over one year for both new buildings and retrofits, which at 4% is less than half of the 9% global median. However, low construction costs in China result in shorter payback periods than the global median, which can help encourage green investment. ■

Expected Business Benefits of Green Building in China

	New Green Building	Green Retrofit
Decreased Operating Costs Over One Year	4%	4%
Decreased Operating Costs Over Five Years	9%	9%
Payback Time for Green Investments (Years)	6	5

Data: India

Green Building Activity and Trends in India

Environmental regulations have helped the green building market in India to flourish, especially in the private sector. However, India faces challenges typical of developing countries, including the lack of public awareness about green and concerns about corruption, and respondents from India see the need for more public incentives.

Strong Green Market Currently With an Even Higher Level of Engagement Expected in India

In India, green building already accounts for 37% of the total work of the survey respondents, a notably higher share than in the UK, China or Saudi Arabia. However, by 2018, that share is expected to be 57%, the second highest among all of the countries included in the survey.

The high green share is the result of an anticipated shift in activity toward a very high level of engagement with green. While 20% of respondents from India currently report that more than 60% of their projects are green, over half (52%) of all Indian respondents expect to be that engaged with green building by 2018. This increase makes India a particularly strong market for green building products and services.

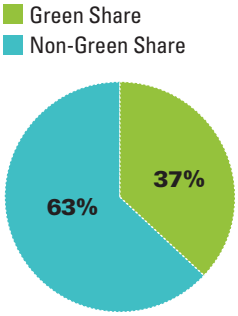
SECTORS WITH EXPECTED GROWTH

India significantly exceeds global averages for anticipated activity in two sectors: new commercial buildings and new high-rise residential buildings.

- **New Commercial Buildings (e.g., office, retail, hotel):** 61% of respondents from India say they will be doing new green commercial buildings in the next three years, compared with 46% who expect to do this work globally. This high level of activity is only exceeded by Mexico, although a high degree of green commercial activity is evident in many other developing countries, including Colombia and China.
- **New High-Rise Residential (4 floors and above):** 48% of respondents from India expect to work on green high-rise residential projects in the next three years, compared with 25% globally. Again, high levels of activity in this sector are also evident in several other developing countries, including Brazil, China and Singapore.

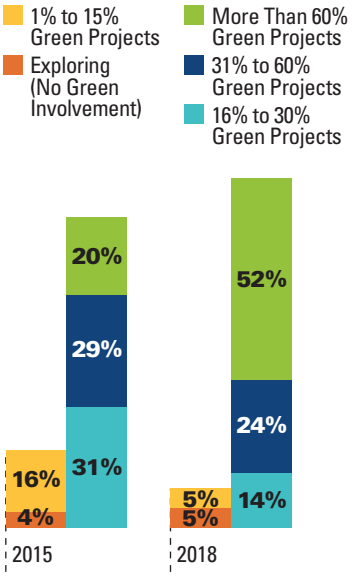
Average 2015 Green Share of Building Project Activity (For Firms in India)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in India (2015 and Expected 2018)

Dodge Data & Analytics, 2016



A much lower percentage of respondents from India believe they will be doing new green institutional construction (26%) or existing building retrofits (24%) than the global averages (38% and 37%, respectively). This, combined with the importance of environmental regulations in India (see below), suggests that green building in India is largely driven by the private sector.

Influence Factors for Future Green Building Activity

TRIGGERS

Environmental regulation is considered one of the top triggers for new green building by the highest percentage (52%) of Indian respondents. This puts India on par with other countries like Singapore and the UK, and greatly exceeds the global average of 35%.

There are no other triggers selected by more than 30% of Indian respondents as important. However, 28% do consider **healthier neighborhoods** an important trigger, nearly double the global average of 15% and second only to China at 30%. This reinforces the importance of the residential market for driving growth in green building in India.

CHALLENGES

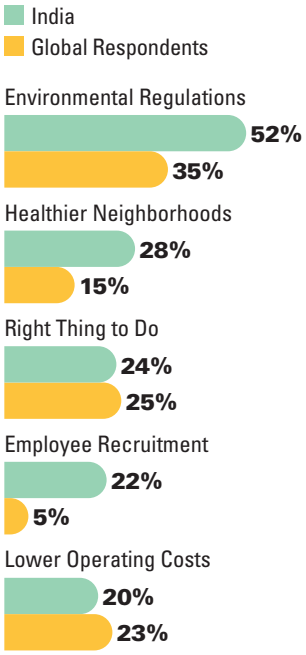
Like many other developing countries, **lack of public awareness** and **concerns about corruption** are considered to be among the top barriers preventing growth of the green market in India, by 48% and 41%, respectively. The challenge of **higher first costs** is also noted by 35%, but an equal percentage consider **lack of political support or incentives** a serious obstacle to green. Combined with the importance of environmental regulations among the triggers, this suggests that the market is seeking more incentives as a balance to the regulatory green requirements.

Social and Environmental Reasons for Building Green

India is unique among the countries that participated in the survey in the high percentage (51%) who consider **creating a sense of community** among the most important social reasons for building green. This is 22 percentage points higher than the global average, and 18 percentage points or more than the levels of responses from all other countries included in the study. This finding corresponds with the focus on the residential sector for green growth in India.

Top Triggers Driving Future Green Building Activity in India

Dodge Data & Analytics, 2016



Two other social reasons were selected by 40% or more of the respondents from India:

- **46% see encouraging sustainable business practices as an important reason to build green,** although this percentage is lower than the global average (58%).
- **40% believe that supporting the domestic economy is an important social reason to build green,** and in this case, this is much higher than the global average (29%).

Like those from many other countries, respondents from India most frequently consider **reducing energy consumption** to be an important environmental reason to build green, selected by 62%. The only other environmental factor selected by more than one third of the respondents is the **protection of natural resources** (48%, much higher than the global average of 37%).

Business Benefits of Green Building

Most of the respondents from India (91%) use metrics to track building performance. For new buildings, they report results that are slightly higher but overall consistent with global medians on operational savings over one year and five years. However, the quick payback period suggests that their construction costs are generally lower than most of the other countries in the study. They also report bigger operating cost decreases for retrofits than are reported globally, which may eventually encourage more growth in that market in India. ■

Expected Business Benefits of Green Building in India

	New Green Building	Green Retrofit
Decreased Operating Costs Over One Year	10%	11%
Decreased Operating Costs Over Five Years	15%	16%
Payback Time for Green Investments (Years)	4	5

Green Building Activity and Trends in Australia

Australia is a relatively mature green building market, with stable growth and a clear commitment to green building. An increased focus on health and concern about the perception that green building is for high-end projects only are the key factors that differentiate Australia from other global markets.

Stable Green Market With a Moderate Shift to More Green Activity in Australia

The findings of the current study demonstrate a stable and mature green market in Australia, with a moderate shift to higher levels of green involvement by the respondents expected in the next three years.

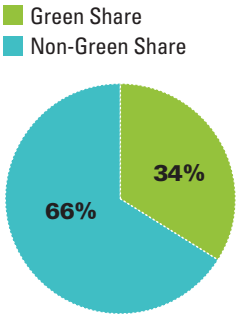
By 2018, nearly half (48%) of the respondents expect that more than 30% of their projects will be green, an increase of 14 percentage points over those currently engaged with green at that level. The majority of that growth comes in those who expect to do 31% to 60% of their projects green.

However, it is notable that 10% of Australian respondents do not expect to do any green work by 2018, the same percentage as those not doing any green work currently. Therefore, the entire shift comes from those already doing green who expect to increase their level of green involvement. This suggests a relatively mature and stable market, where those who are likely to do green projects have already engaged in at least some green work.

Another indication of the stability and maturity of the Australian green building market is the relatively high green share indicated. While only 15% of the respondents in the current study are members of a green building council, the share of green work is still 34%. The high level of use of certification despite the low participation in the study by Australia Green Building Council members suggests widespread use of green building certification throughout Australia.

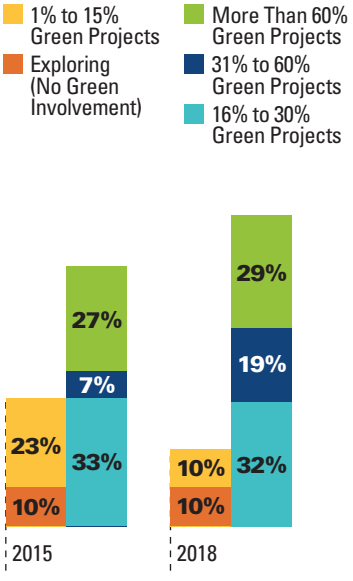
Average 2015 Green Share of Building Project Activity (For Firms in Australia)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents in Australia (2015 and Expected 2018)

Dodge Data & Analytics, 2016



SECTORS WITH EXPECTED GROWTH

The top sector for expected green growth in Australia is new low-rise residential construction, followed by retrofits of existing buildings and institutional construction.

- **New Low-Rise Residential (1-3 floors):** This is the only category in which the percentage of Australian respondents (39%) exceeds global responses (27%). A similar high percentage is reported in the UK and Singapore. These three countries also have higher percentage than average reporting that environmental regulations are important drivers for green, suggesting the importance of those regulations to push low-rise residential green construction.
- **Retrofits of Existing Buildings:** 33% of Australian respondents believe that they will work on a green retrofit in the next three years. This is roughly comparable to the global average of 37%.
- **Institutional Construction (e.g., schools, hospitals, public buildings):** 30% of respondents from Australia believe they will engage in institutional green building, slightly lower than the 38% global average.

Influence Factors for Future Green Building Activity

TRIGGERS

Environmental regulations and **healthier neighborhoods** are the top triggers for green building in Australia.

- **Environmental regulations are considered a top trigger by 46%.** This is in sharp contrast to the 2012 findings, in which environmental regulations were only selected by 12%. The high level of green activity in Australia by the survey respondents suggests the effectiveness of environmental regulations in Australia, although the limited growth in the future suggests that regulations are limited in the degree of green activity they can drive.
- **Healthier neighborhoods are considered a top trigger by 30%, double the global average who consider this important.** In 2012, only 11% of Australian respondents considered this important, suggesting an increased focus of the impact of buildings on health in this country.

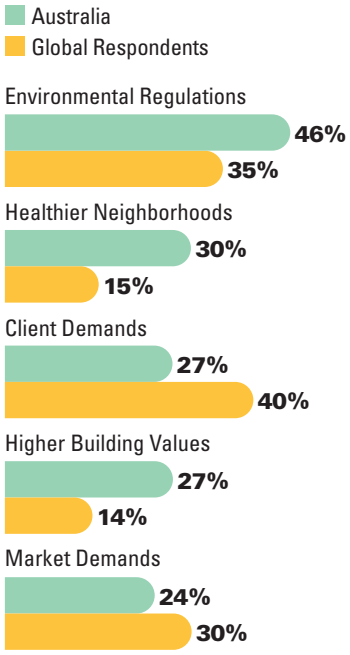
CHALLENGES

The top challenge for green building growth in Australia is the **perception that green building is not affordable, and is for high-end projects only**. Australia has the highest percentage (42%) concerned about this issue globally. This finding is consistent with the 2012 study, where roughly the same percentage (44%) report this as a top obstacle.

Concerns about **access to capital** also rank higher in Australia than they do elsewhere, with 24% selecting this as a top obstacle.

Top Triggers Driving Future Green Building Activity in Australia

Dodge Data & Analytics, 2016



However, a much lower percentage of Australian respondents (30%) consider **higher first costs** important than globally (50%). The lower level of concern about cost may be due to the long history of green building in Australia, which contributes to the availability of skilled labor and creates a competitive market for green products and services.

Social and Environmental Reasons for Building Green

There are two top social reasons for building green in Australia.

- **Supporting the domestic economy is a top social reason according to 46% of respondents,** the highest of any country covered in the survey and far more than the global average of 29%.
- **39% find that encouraging sustainable business practices is a top social reason for building green.** While this is the second most important factor, it lags behind the global average of 58%.

Reducing energy consumption and **protecting natural resources** are each cited as the top environmental reasons for building green by 50%. While energy consumption is typically a top environmental factor, it is rare for another factor to be considered equally important by respondents, emphasizing the importance of protecting natural resources for Australian respondents.

Business Benefits

Australians report strong benefits driving green. They are roughly consistent with the global medians, although they are more optimistic about one-year operational cost savings in new buildings and five-year operational cost savings in retrofits than the global medians. ■

Expected Business Benefits of Green Building in Australia

	New Green Building		Green Retrofit	
	2012	2015	2012	2015
Decreased Operating Costs Over One Year	8%	11%	8%	7%
Decreased Operating Costs Over Five Years	14%	13%	14%	13%
Payback Time for Green Investments (Years)	9	8	7	9

Data: South Africa

Green Building Activity and Trends in South Africa

South Africa is emerging as a leader in green building, but one of its main challenges is finding enough skilled green professionals. Reducing water consumption is a priority, and the importance of achieving healthy communities is also a key driver distinguishing this market.

South Africa Demonstrates a Major Commitment to Building Green

Green building is already well established in the South African market, with survey respondents indicating that 41% of their work is currently green. However, respondents believe the green activity so far is just laying the groundwork for an overall shift in the market, with nearly two thirds (61%) reporting that they expect over 60% of their projects to be green by 2018.

If this degree of commitment to green building holds, South Africa will be a leader in the global green market in the next three years.

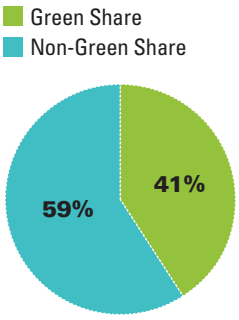
SECTORS WITH EXPECTED GROWTH

South Africa is one of the few countries included in the study where the highest percentage of respondents expect to be doing green retrofits of existing buildings in the next three years. Commercial building and low-rise residential projects are also expected to be relatively strong sectors for green in South Africa.

- **Retrofits of Existing Buildings:** 46% of South African respondents expect to build green in this sector in the next three years, notably more than the 37% global average, and roughly on par with the activity expected in the US, Mexico, the UK, Singapore and Brazil.

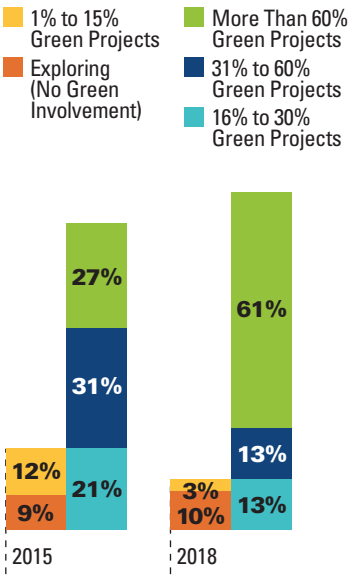
Average 2015 Green Share of Building Project Activity (For Firms in South Africa)

Dodge Data & Analytics, 2016



Levels of Green Building Activity for Respondents From South Africa (2015 and Expected 2018)

Dodge Data & Analytics, 2016



- **New Commercial Buildings (e.g., office, retail, hotel):** 40% of South African respondents report expecting to do new green commercial buildings. While this is the second biggest growth area for South Africa, that is actually slightly below the global average of 46%.
- **New Low-Rise Residential (1–3 stories):** 31% of the South African respondents expect to do new green low-rise residential projects, roughly on par with the global average of 27%.

Influence Factors for Future Green Building Activity

TRIGGERS

Consistent with the 2012 findings, **the right thing to do i**s the top trigger driving future green activity in South Africa, selected by 40%. This is much higher than the global average.

Another trigger that is consistent with the 2012 findings is **healthier neighborhoods**, which again is higher than the global average for that factor. This puts South Africa roughly on par with Australia, China and India in terms of the emphasis on health as a key factor, and may be associated with the relatively high level of green low-rise residential projects activity expected in the next three years.

On the other hand, **client demands** and **market demands** are both much more important triggers in the current study than they were in the past, suggesting increased understanding in the South African construction market of the value of green buildings.

CHALLENGES

Despite wider recognition of the value of green in the market, the highest percentage of South African respondents (37%) consider the **lack of public awareness** to be a top barrier limiting the growth of green building.

Three additional challenges were selected by 34% of South African respondents:

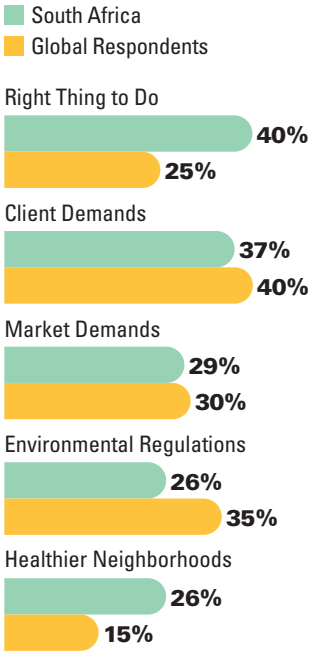
- **Higher First Costs:** The percentage who select this as an obstacle in South Africa are considerably less than the global average of 50%.
- **Lack of Trained Green Building Professionals:** The percentage exceeds the global average of 21%. Other burgeoning green markets like Singapore, India and Brazil share this concern.
- **Lack of Political Support and Incentives:** The percentage is roughly on par with the global average.

Social and Environmental Reasons for Building Green

The highest percentage (63%) of South African respondents by far consider **encouraging sustainable business practices** to be an important social reason for building green, but this is relatively consistent with many other countries in the survey.

Top Triggers Driving Future Green Building Activity in South Africa

Dodge Data & Analytics, 2016



However, **increasing worker productivity** was named by 41% of South African respondents as an important social reason for building green, which is notably higher than all other countries included in the study except Mexico (44%), Germany (41%) and Saudi Arabia (50%). This, combined with the emphasis on healthier neighborhoods as a trigger for green, suggests a focus on health and well-being is important in the South African green building community.

South Africa is consistent with the global consensus on the importance of **reducing energy consumption** as an environmental reason for building green. In contrast, a much higher percentage (49%) of South Africans consider **reducing water consumption** important than respondents in China and India, and countries in North America and Europe, whose percentages range from 13% to under 30%. Finally, like many other developing economies in the survey such as China, India, Saudi Arabia, Brazil and Colombia, South Africa also considers **protecting natural resources** important, with 46% regarding this as a key environmental reason to build green.

Business Benefits

Most of the respondents in South Africa (87%) use metrics to measure the performance of their green buildings. While more modulated compared to the 2012 findings, South Africans still see operational cost savings on new buildings to a much greater degree than those in other countries included in the study. However, their payback period for their green investments of eight years is the same as the global median, possibly suggesting higher premiums to build green. ■

Expected Business Benefits of Green Building in South Africa

	New Green Building		Green Retrofit	
	2012	2015	2012	2015
Decreased Operating Costs Over One Year	7%	18%	12%	9%
Decreased Operating Costs Over Five Years	33%	19%	37%	29%
Payback Time for Green Investments (Years)	7	8	5	6

Data: Business Benefits of Green Building

Important Business Benefits of Green Building

Survey participants were asked to select the most important benefits of green building in their market from a list of 10 possible options, with no limit in terms of the number of benefits they could select. The chart at right shows the countries with the highest and lowest percentage of respondents who selected that benefit, along with the global averages. Overall, the findings reveal patterns in terms of the benefits valued most by developing countries, compared with those valued in more well-established green markets.

By far, the most widely reported benefit globally is lower operating costs. This corresponds to the findings in the 2012 study. However, as the country data demonstrates, there are significant variations by market in terms of the importance of this benefit. A particularly high percentage consider it important in the Americas, including in the US (81%), Colombia (79%), Mexico (73%) and Brazil (65%). Respondents from China (38%) and Saudi Arabia (29%), on the other hand, consider other benefits more important, including future proofing assets (66% and 38%, respectively) and a higher value at point of sale (47% and 31%), both of which may have stronger financial implications than operating costs.

Globally, 30% to 31% of respondents consider three additional benefits important in their markets:

- **Documentation and Certification Providing Quality Assurance**
- **Education of Occupants About Sustainability**
- **Higher Value at Point of Sale**

Interestingly, the four countries in which a high percentage of respondents consistently selected each of these benefits (Brazil, China, Mexico and Singapore) are all still actively developing a green market, though in the case of Singapore, mandates are driving the market quickly. In contrast, the three countries where these benefits are least frequently selected (the UK, Germany and the US) are developed markets with a long history of green building. Clearly, each of these is more critical in a market in which green is still being established.

Flexibility of design built into green is considered more important in developoing markets and less important in Europe and North America. It is the only category with five countries with roughly the same percentage of respondents at the upper end (39% to 40%), and all of those countries are developing markets in Asia, Africa and South America.

Most Important Benefits of Green Building

(Countries With the Highest and Lowest Percentage of Respondents and the Global Average)

Dodge Data & Analytics, 2016

	Top Two Countries		Global Average	Lowest Two Countries	
Lower Operating Costs (e.g., energy costs, total lifecycle costs)	US 81%	Colombia 79%	69%	China 38%	Saudi Arabia 29%
Documentation and Certification Providing Quality Assurance	China 51%	Brazil 49%	31%	Australia 21%	Germany 18%
Education of Occupants About Sustainability	Brazil 51%	Singapore 45%	31%	UK 19%	Germany 9%
Higher Value at Point of Sale	Mexico 50%	China 47%	30%	US 20%	UK 20%
Future Proofing Assets	China 66%	UK 39%	26%	Colombia 17%	US 13%
Flexibility of Design Built Into Green Buildings	South Africa/ Singapore/ China 40%	Brazil/ India 39%	25%	Poland 21%	US 15%
Increased Productivity for Tenants	Mexico 38%	India 37%	22%	Australia 12%	Germany 9%
Higher Rental Rates	Germany 36%	Poland 29%	17%	South Africa/ US 14%	UK/ Singapore 13%
Higher Occupancy Rates	China 36%	Singapore 28%	16%	Colombia 12%	Australia/ UK 9%

Productivity is also a key issue for some developing countries, carrying particular weight in Mexico (38%) and India (37%), but with little emphasis in Australia (12%), Germany (9%) or the UK (13%). Mexico and India are also the two countries with the highest percentage of respondents expecting to do commercial green projects in the next three years, which perhaps influences the importance of productivity as a green benefit in these markets.

Metrics Used to Measure Benefits of Green Building

Three quarters (75%) of the total study participants report using metrics to track green building performance. This is a 12 percentage point gain over those who reported using metrics in 2012. The findings on the business benefits of green reported in this study are thus informed by the metrics that are actively tracked by respondents, in addition to their expectations about the benefits of building green.

However, there is notable variability in the use of metrics by country. The US (57%) and UK (61%) have the lowest percentage using metrics to measure the impact of green buildings. On the other hand, many markets that are expecting the most dramatic growth in green over the next three years (see page 10) are also those that have the highest levels of measurements, including Mexico (92%), Brazil (96%) and Saudi Arabia (87%).

Market maturity, however, is not a gauge for the likelihood of measurement. Respondents in Australia (87%) and Germany (87%) report a high level of measurement, similar to those in the developing markets cited above.

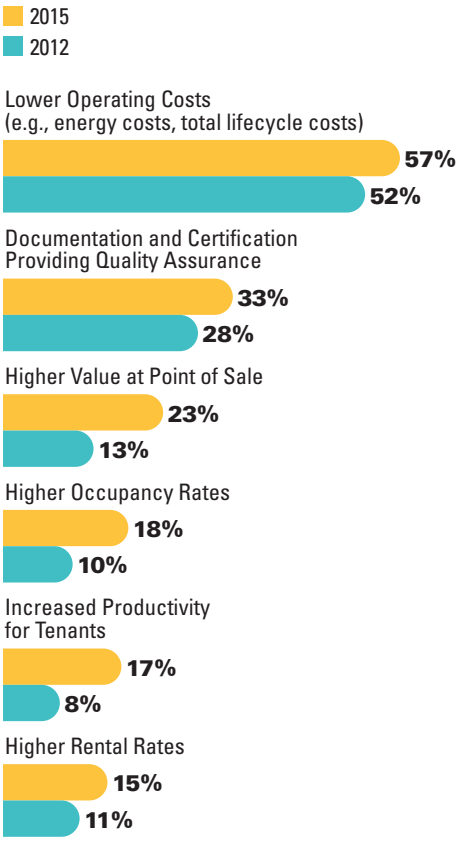
Not surprisingly, respondents from firms with a higher level of green involvement also report doing more measurements. 81% of those at a high level of green involvement (more than 60% of their projects green) report using metrics, compared with 53% of those doing 15% or less of their projects green.

As the chart at right reveals, operating costs are the most frequently tracked metric. It also demonstrates a directional increase between 2012 and 2015 in the use of most of the metrics, with significant increases in 2015 for metrics tracking higher values at point of sale and higher occupancy rates.

Metrics Used to Measure the Business Benefits of Green Buildings

(2012 and 2015)

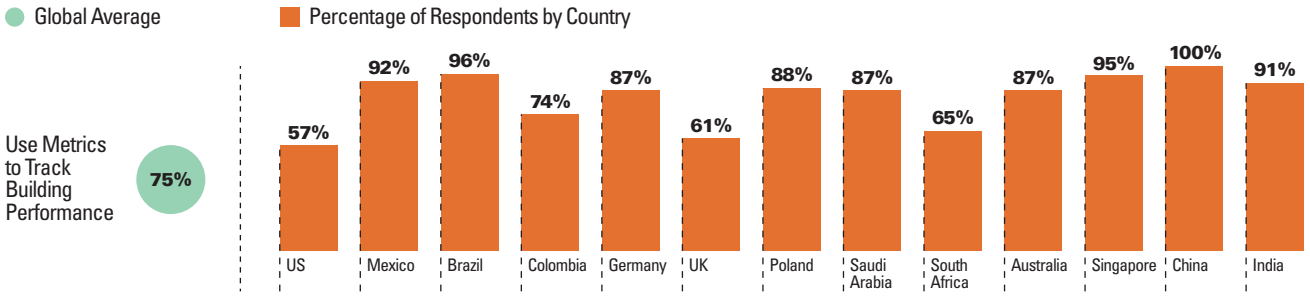
Dodge Data & Analytics, 2016



Percentage of Respondents Using Metrics to Track Building Performance

(Global Average and by Country)

Dodge Data & Analytics, 2016



Benefits of New Green Building Investments

As the findings on the top triggers for green building demonstrate, information about the business benefits resulting from green building investments is essential to encourage more green building activity in every global market. (See pages 14 and 15 for more information.)

The benefits measured in the current study—operating cost decreases compared with traditional buildings, average payback periods for green investments and increased asset value compared with traditional buildings—frequently matched or exceeded those reported in the 2012 study. This finding reinforces the compelling business case for green and demonstrates the validity of the findings in both studies. It is also particularly notable since only 33% of the 2015 study participants are green building council (GBC) members, compared with 75% of study participants in 2012. This demonstrates that a more industry-representative group of participants still expects the same level of benefits from green as those who are committed enough to green building to join a GBC.

One factor that may contribute to the level of knowledge about the benefits of green demonstrated by the 2015 study participants is that three quarters (75%) of them are tracking metrics on these benefits (see page 51), which also reinforces the validity of the findings.

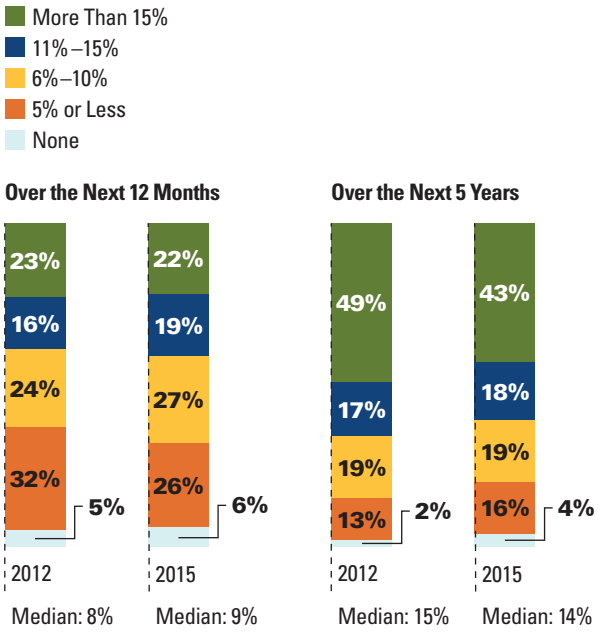
Lower Operating Costs

As the chart at right makes clear, the findings for operating costs in new green buildings in the current study are largely consistent with those reported in the previous study.

- **The 2015 respondents report slightly lower operating costs during the first 12 months after the building is complete.** The median decrease in operating costs in 2015 is 9%, versus 8% in 2012. In general, there is a slightly more even distribution across the various levels reported in 2015 than in 2012, with a slight reduction in those reporting decreases of 5% or less, which mostly shifts to those reporting increases between 5% and 15%.
- **The overall pattern is similar between 2012 and 2015 for operating cost reductions over the next five years in new green buildings compared with traditional buildings.** The slight difference in the median drop in operating costs from 15% in 2012 to 14% in 2015 is largely due to a six percentage point drop in those who report that the savings are more than 15%.

Expected Operating Cost Decreases for New Green Building Efforts Over 12 Months and Five Years (2012 and 2015)

Dodge Data & Analytics, 2016



VARIATION BY LOCATION

By and large, the countries that report the biggest one-year reductions in operating costs in green buildings differ from those reporting the largest five-year reductions. One exception is the US, which reports large reductions across both the time frames.

- **Countries that exceed the global average (22%) of those reporting operating cost reductions greater than 15% in the first 12 months include the US (32%), Mexico (33%), Colombia (33%), Australia (37%) and Singapore (27%).**
- **Countries that exceed the global average (43%) of those reporting operating cost reductions greater than 15% over the first five years include the US (53%), Brazil (52%), South Africa (52%) and Saudi Arabia (50%).**

VARIATION BY LEVEL OF GREEN INVOLVEMENT

Firms with a high level of green involvement (more than 60% of their projects green) are more likely to find that new green buildings have larger decreases in operating costs for the first 12 months and for the first five years, than those doing little or no green building (less than 15% of their projects green).

- **44% of those highly involved in green report that new green buildings lower operating costs in the first year by more than 15%, compared with 15% of those doing little or no green building.**
- **40% of those highly involved in green report that new green buildings lower operating costs in five years by more than 15%, compared with 23% of those doing little or no green building.**

Average Payback on New Green Building Investments

73% of respondents find that new green building projects cost more than non-green building projects. That additional cost has a median value of 8%.

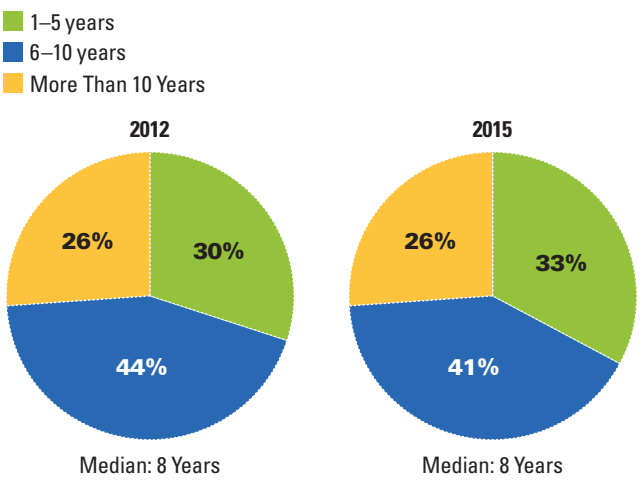
Given the high percentage of respondents still experiencing a green building premium, the payback period for the investment in green is critical. Payback period is particularly essential for certain commercial markets such as office, multi-residential housing or hotels, in which properties regularly change ownership.

The median payback period in the current 2015 study is eight years, the same as it was in 2012. As the chart at right reveals, the distribution of responses is also similar between the two studies, with a third of respondents in the current study reporting paybacks of five years or fewer.

Payback Period for Additional Cost of a New Green Building

(According to All Global Respondents)

Dodge Data & Analytics, 2016



Higher Asset Value

OWNERS

Owners were asked about the degree to which the asset value of new green buildings is higher than that of new non-green buildings. **The findings from owners are the most striking difference from the 2012 findings, with the owners reporting a median 7% asset value increase in the 2015 study, compared with 5% from 2012.**

This finding gains particular importance because of the median payback window of eight years also reported in the study. Commercial buildings often change owners in five-year intervals or less. Since the investment in green may not be paid off in operating cost savings in that short window, owners are still encouraged to build green in order to achieve a higher asset value when putting their buildings on the market.

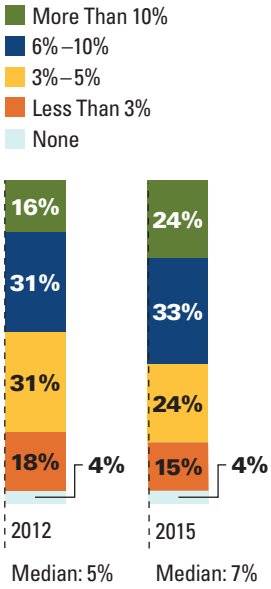
There is also a notable trend for owners with a higher level of green involvement to report higher asset value for their green buildings. Owners with 15% or fewer of their building projects green report a median increase in asset value of 4%, but those doing more than 30% green projects report a median increase of 8%.

ARCHITECTS AND CONTRACTORS

Architects and contractors were asked to estimate the percentage by which being green increases a new building's value. In the current study, as in 2012, they believe the increase is even higher than that reported by the owners. While the median increase in value they estimated only grew by one percentage point between 2012 and 2015, it is notable that those who felt the increase was more than 10% grew dramatically between studies, from 19% to 27%. This expectation of increased value may help them convince owners unfamiliar with the benefits of green building to make the necessary investments.

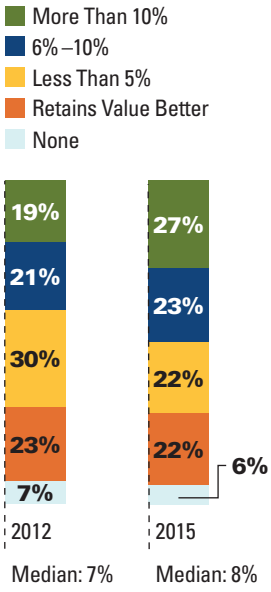
Expected Increase in Asset Value for a New Green Building (According to Owners)

Dodge Data & Analytics, 2016



Expected Increase in Building Value for a New Green Building (According to AEC Respondents)

Dodge Data & Analytics, 2016



Benefits of Green Retrofit and Renovation Projects

About half (48%) of respondents report that they have done a green retrofit/renovation project in the last three years, and more than one third of respondents (37%) report that they expect to do a green retrofit/ renovation project in the next three years. Retrofit/ renovation activity is unevenly distributed globally, with few respondents in Poland, Saudi Arabia, China and India expecting to engage in retrofit work in the next three years (see pages 11 and 12 for more information). Data that makes a compelling business case for green retrofits, therefore, is essential to help the existing building stock globally improve its performance.

Operating Cost Decreases

Respondents were asked to what degree operating costs declined due to green retrofit/renovation projects over two time periods: the first 12 months after the project was completed and the next five years.

As the chart at right indicates, **the current study's reported declines over the next 12 months closely mirror those from the 2012 study, with both yielding a median of 9% in operating cost decreases.** The fact that the operating costs decreased more for retrofit/renovation projects than for new construction is consistent with the findings from other studies about green building conducted by Dodge Data & Analytics. It also speaks to a generally higher level of building performance on energy and other green factors expected currently in new buildings than was common decades ago.

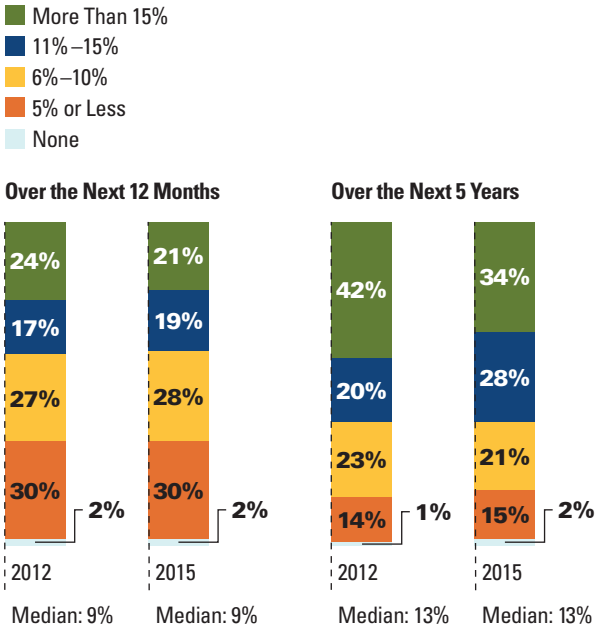
While the median expected cost decreases for one year are higher for retrofits/renovation than for new buildings, they are slightly lower when considering the next five years. This may be due to expectations that retrofits/renovations may not always be able to achieve the same level of high performance as a building designed and built to be green from the start. However, the gap between the two is slightly less in 2015 than it was in 2012, possibly suggesting that the potential for high-performance retrofits is more widely recognized.

In addition, while the median value turns out to be the same, there are differences in the distribution of respondents across the different levels of cost decreases expected in five years. Between 2012 and 2015, there was a drop of eight percentage points between those who believe that green retrofits save more than 15%. This drop is offset in part by an eight percentage point increase in those who report an 11% to 15% operational savings.

Expected Operating Cost Decreases From Green Retrofits or Renovations

(2012 and 2015)

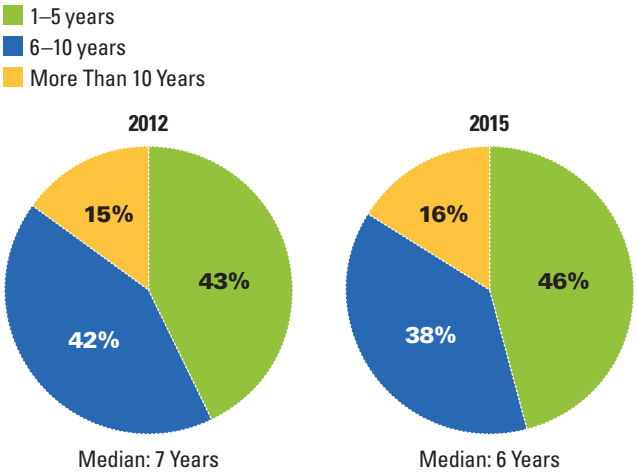
Dodge Data & Analytics, 2016



Payback Period for Cost of a Green Retrofit/Renovation Project

(According to Global Respondents)

Dodge Data & Analytics, 2016



Benefits of Green Retrofit and Renovation Projects CONTINUED

VARIATION BY LEVEL OF GREEN INVOLVEMENT

As with the new green buildings, respondents with a high level of green involvement (more than 60% of their projects green) also report much greater cost reductions than those doing little green work (between 1% and 14% green projects).

- **Only 7% of those doing little green work find that green retrofits yield savings of more than 15% during the first 12 months, compared with 35% of those with a high level of green involvement.**
- **20% of those doing little green work report savings of more than 15% in the next five years compared with 32% of those with a high level of green involvement.**

These differences may be influenced by multiple factors. For example, those with more experience with green building may simply have more knowledge about the benefits. It is also possible that more green experience may help create higher-performing buildings, which would therefore yield stronger savings.

Average Payback on Green Retrofit/ Renovation Investments

The median payback period for a green retrofit/ renovation reported by respondents is six years. While this is a slight improvement over the 2012 findings, in general, the findings are quite similar.

There is no significant difference in terms of predicted payback period between respondents with a high level of green involvement and those with less. This is surprising, given the much higher operating cost improvements reported by those doing more green building projects. It may suggest that they are also investing more in their green retrofit projects, with improved performance on other factors than energy as the result.

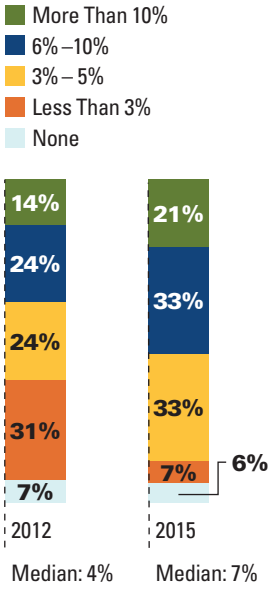
Higher Asset Values

Similar to the findings on new green buildings, the most dramatic difference from the 2012 findings is the increase in asset value reported by owners, which leapt up from a 4% median in 2012 to a 7% median in 2015. Again, this is particularly important in building sectors where the average length of ownership of buildings is less than the six-year payback period indicated.

Unlike with new buildings, however, the estimates of new building value increases reported by architects and contractors are more in line with those reported by owners, especially in 2015, where the median value is the same.

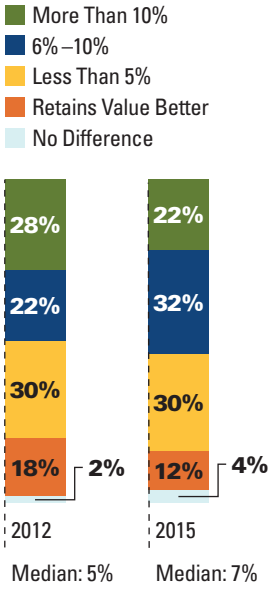
Expected Increase in Asset Value From a Green Retrofit or Renovation Project
(According to Owners)

Dodge Data & Analytics, 2016



Expected Increase in Building Value From a Green Retrofit or Renovation Project
(According to AEC Respondents)

Dodge Data & Analytics, 2016



Interview: Thought Leader

Lisa Bate: 2012–2015 Managing Principal, Shanghai/ EVP Asia; As of January 1, 2016, Regional Managing Principal, North America, B+H Architects

Lisa has project experience across Canada, China, the US, the Caribbean and India. She is a Board Member of the World Green Building Council (WGBC) and a Fellow of the Royal Architectural Institute of Canada, as well as a member of the Shanghai Management Committee, Mainland China Urban Land Institute (ULI).

How does sustainability influence your approach to building an international practice across several continents?

BATE: The way that I look at it, and the way B+H looks at it, is sustainability is just good design.

You have worked extensively in Canada and China. What priorities do you see from your clients in these markets?

BATE: It has always [previously] been about the cost of operating and the capital cost of the building [in both countries]... Now if we look at today, China is still very focused on energy, but the tides are starting to turn. Health, materials, indoor air quality monitoring [are becoming more important]. A year ago 90% of Chinese staff would have switched jobs for higher pay alone, but 56% of Chinese staff [now] view office health as a reason for switching jobs. That's staggering.

So let's look at Canada. In most offices today, twenty to sixty percent of office inhabitants have some symptoms of sick building syndrome. What I am finding interesting is the technology and innovation that is given birth in China, often in collaboration with Westerners ... who are focused on sustainability and developing green global databases that are free to suppliers. Suppliers can feed their information into the database, and it is third-party verified. And then it goes out to all the designers. So you can create the most green spec possible ... For occupants, it's an amazing staff retention, engagement and attraction tool. But you have to be careful because you are disclosing what is going on, so there is a lot of transparency that is happening too.

So what I really like right now is that in some things, the East is starting to lead the West because there are requirements in China to make broad moves and to get things really moving.

What are the biggest challenges facing the wider adoption of sustainable building practices?

BATE: I think it is actually time ... how rapidly we can make this change. There has got to be collaboration at a global scale. Air and water don't respect borders ... When the airpocalypse happened in China, December 2013, if you looked at the skyline of Paris, the air shifted there. There is just so much more of a global effort that has to happen because there are no boundaries for our largest carbon sinks, which are the oceans and air ... NIMBYism has to stop.

In countries like China, with a Communist government, often they can make tremendous change [happen] very quickly. In democratic societies, we have to be able to make rapid change and for people to realize that this is a top priority for health and well-being.

What can drive the growth of sustainability globally?

BATE: I think [green] is on everyone's agenda globally. Governments, global organizations ... are doing great research. The World Green Building Council brings everybody together, and it is a common platform to make sure everybody's talking and that tools are developed and disseminated to countries. But we have to figure out how to assist and help emerging economies.

What has influenced your perspective on sustainability?

BATE: My family did a fair amount of travel [because] my father was a physician and assisted internationally, so I was exposed to lots of levels of living standards. Food and clean water scarcity is real. Human health is paramount, and the cost of environmental degradation is in every country.

We are only as good as what is being done in the underdeveloped and emerging market countries. [As manufacturing shifts from China to other countries], now the problem is hitting Indonesia, Cambodia, Vietnam...These countries want to emerge and have a good quality of life. So how do we break the vicious cycle [of pollution and carbon emission]? It is not just about building. It is trying to stop the cycle of the next emerging economy getting drawn into this. ■

Property Investors Prioritizing Green

Worldwide, an increasing number of institutional real estate investors are getting serious about their buildings' sustainability performance. While it is widely recognized that green buildings are good for the environment, many of the investors are finding that it is good for their portfolios too.

In 2015, 707 property companies from around the world, representing over 61,000 properties, with an asset value of US$2.3 trillion, reported on the sustainability of their operations as part of the Global Real Estate Sustainability Benchmark (GRESB).

Benchmarking

GRESB, which has become standard practice for the world's leading real estate investment and asset management companies, is a framework that identifies industry best practices on a global scale and then provides annual participants with the chance to measure their performance against the benchmarks and against their peers.

"By stimulating a race to the top and providing actionable intelligence on global industry best practices, GRESB creates a virtuous cycle among decision-makers concentrated at the highest levels of the real estate industry," says Dan Winter, head of North America for GRESB.

Since the launch of GRESB in 2009, the average global sustainability score has been climbing steadily from the Green Starters category to its entry for the first time in 2015 in the Green Stars category, albeit with significant regional variations.

- Oceania is well out in front.
- Europe, Asia and North America cluster around the average.
- Africa and South America are currently following the rest.

Key trends from the data include:

- Sustainability goals and transparency with regard to environmental, social and governance (ESG) practices are now well established among property companies and funds, with 93% of survey participants incorporating sustainability into their business objectives.
- The real estate sector is increasingly considering the effects of climate change, with 54% of participants having policies in place to address climate risks.
- Recognition of issues affecting the health, safety and well-being of occupants, the community and the supply chain is also on the rise.

Better Together

While all this is undoubtedly good for green building practices, independent studies are establishing that it is also good for the investors. A June 2015 study from the University of Cambridge, for example, found that real estate investment trusts with higher GRESB scores tend to show higher returns on equity, higher returns on assets and stronger risk-adjusted stock performance.

These findings tally with the results of an extensive literature survey from the Smith School of Expense and Environment at the University of Oxford, published in March 2015, which identified an impressive set of correlations:

- In 90% of studies, strong sustainability standards lowered the cost of capital.
- In 88% of studies, strong ESG practices correlated with superior operational performance.
- In 80% of studies, strong sustainability practices correlated with superior stock price performance.

Room for Improvement

But there's still plenty of room at the top. Out of a possible score of 100, this year's GRESB global average sits at 56. An adage in the industry says that it's easy to participate in GRESB, but it's hard to do well.

Winter sums up the main challenge to improvement as "a mix of organizational inertia combined with a dose of fear getting started." It takes upfront work to create management systems, pursue data capture methods and implement the organizational policies that underlie a quality GRESB submission," he says. "Companies with their eyes on the ball, however, who commit to tracking the energy, water and waste data within their asset holdings, who have engaged with rating systems like LEED over the years, and who exhibit strong internal governance practices tend to do very well, and more easily differentiate from their peers."

With links between sustainability and financial performance increasingly understood, more companies are likely to be making the effort. ■

Data: Green Building
Products and Services

Current and Future Expected Use
of Green Building Products and Services

Study participants were asked to identify the green product categories that they currently use on their projects, and then were asked which project categories they were expected to use by 2020. **Nearly all (91%) of respondents reported using at least one type of green product on their projects, but no category of green product is used by more than 54% of respondents.**

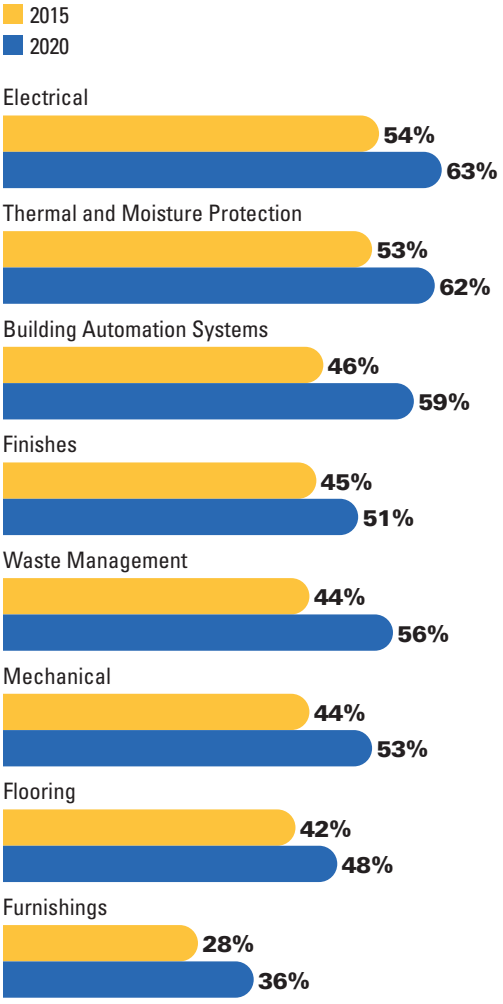
As a whole, the findings generally correspond to the level of green building activity findings (see pages 9 and 10), demonstrating that green is already widely adopted across the construction industry, but at moderate levels overall. They suggest the opportunity for much wider implementation of green in the future, and reveal that the industry's expectations are that it will become more green in the near future.

There are also no product categories that dominate the list, with the majority of the categories included in the survey within 10 percentage points of each other.

- An overall global focus on energy conservation (see page 17) is evident in the popularity of **electrical products**, which can yield a high degree of energy savings for relatively small investment. This may be why there is little variation in the level of use reported by country, with nine of the 13 countries in the study within 10 percentage points of the global average.
- However, **mechanical systems**, such as heating and air conditioning systems that are critical to energy savings, see much lower use, possibly due to the investment required and the fact that they are less likely than lighting to be included in renovation/retrofit projects. Certainly, there are wide disparities among the countries participating in the study in their use of green mechanical systems. Top countries include the UK (72%) and the US (67%), while there is very little market penetration in China (13%), Saudi Arabia (20%) or Colombia (21%).
- Growing interest in how green buildings impact the health of their occupants may be evident in the relatively strong performance of **thermal and moisture protection** (53%). Use of these products is particularly strong in the US (63%), Mexico (67%), the UK (67%) and Australia (58%), and low levels of use are reported in Saudi Arabia (20%).
- The growing interest in smart cities may be driving the expected growth in the use of **building automation systems**, which sees a 13 percentage point jump between those currently using them in 2015 and those expecting to use them in 2020. Singapore (68%) is the top country for use of these products, while Australia (21%) sees relatively low use.
- **Waste management** is also expected to see strong growth globally by 2020, with a 12 percentage point gain. Like electrical products, use is relatively consistent across different countries, with the highest use in Singapore (58%).

Current and Expected Use of Green Building Product Categories
(Current Use in 2015 and Expected Use in 2020)

Dodge Data & Analytics, 2016



Criteria for Identifying Green Products

Study participants were asked to select the top criteria that they use to identify the green products that they have specified or installed.The same question, with largely the same options, was asked in the 2008 and 2012 studies.

Being highly energy efficient was selected by 70% of respondents in the current study, making it the top criterion, as it was in 2008 and 2012. However, the percentage selecting this as a top criterion have steadily declined since 2008. While energy efficiency is still of high importance globally, other factors are also being recognized as critical.

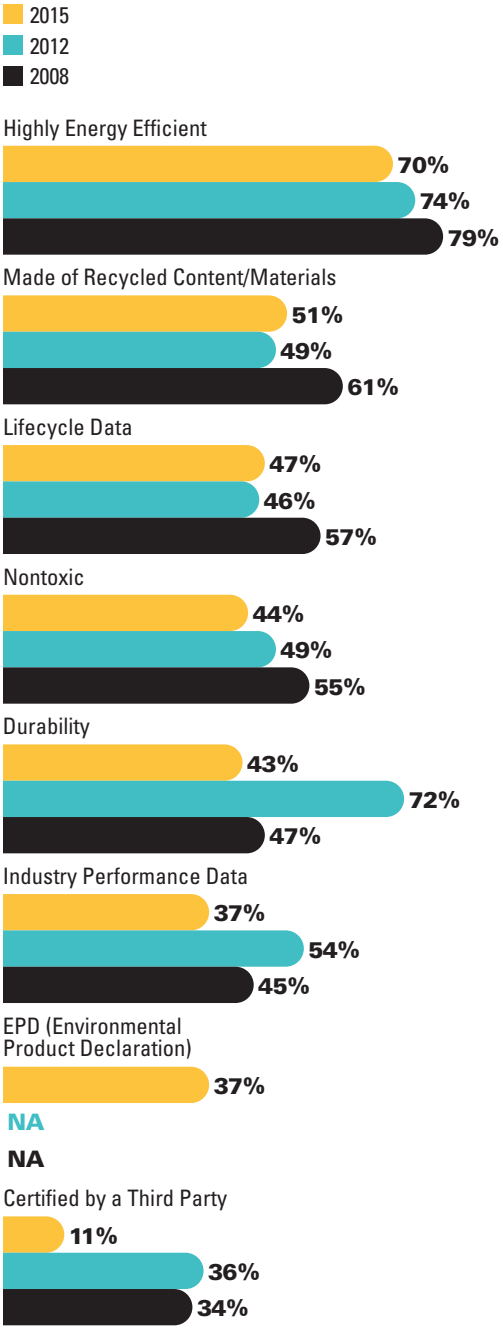
There is only an eight percentage point spread between the next four criteria, suggesting that most respondents look at multiple factors when determining which products are green.

- Products **made of recycled content/materials** have been consistently considered important by about half of the respondents since 2012, although they were selected by 61% in 2008. This is a particularly important criterion in Colombia, where it was selected by 71%.
- The importance of **lifecycle data** has also remained consistent since 2012, after dropping from the 2008 percentage. The US (53%), UK (56%), Singapore (57%) and Colombia (53%) respondents most frequently use this criterion.
- As with energy efficiency, consideration of whether building materials are **nontoxic** has remained important but steadily declined since 2008. Respondents from Brazil (60%), Colombia (61%) and China (70%) most frequently consider whether products are nontoxic.
- The leap to 72% for **durability** in 2012 has subsided in the current study to 43%, which is relatively consistent with the percentage in 2008. It is selected in South Africa (67%) as the top criterion for identifying green products and also carries weight in Mexico (56%).

This is the first year in which **environmental product declarations (EPDs)** (37%) were included, and they are already selected by a much higher percentage than third-party certifications (11%). Unlike a third-party label like Green Seal, an EPD provides a transparent declaration of impact, not a guarantee of good environmental performance. Singapore (60%) and Brazil (57%) lead the rest of the countries included in the survey on the use of EPDs. Lowest use is reported in the US (27%), Germany (23%) and the UK (25%), perhaps due to established practices for determining which products are green. In contrast, no country had more than 17% of respondents selecting third-party certifications.

Criteria Used to Evaluate If a Product Is Green (According to All Respondents in 2008, 2012 and 2015)

Dodge Data & Analytics, 2016



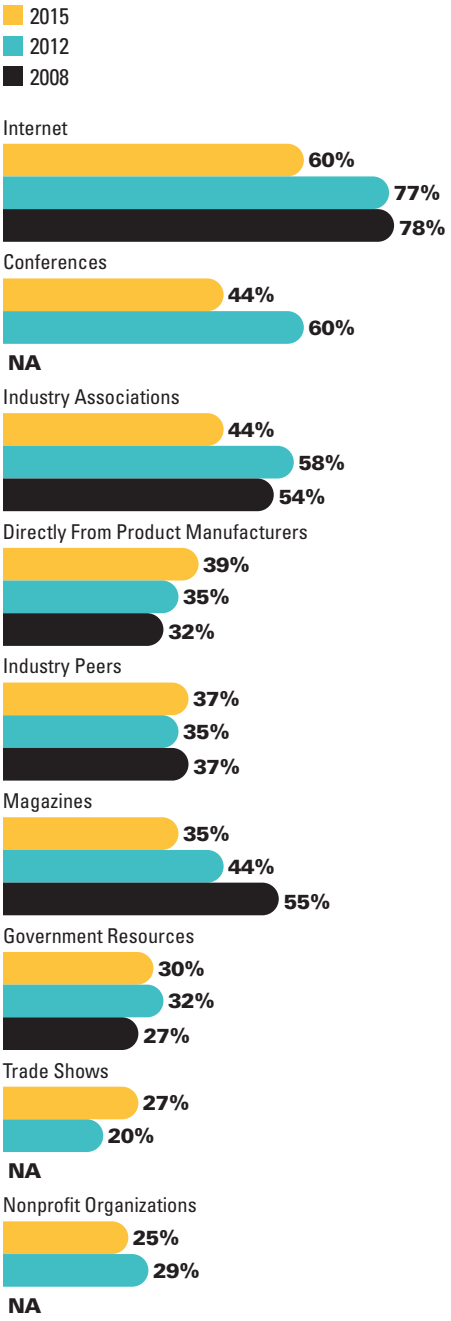
Sources of Information on Green Building

Study participants were asked to select the sources of information about green building trends that they rely on most. This question was also asked in the 2008 and 2012 studies, and a few key trends emerge in terms of the responses.

- **Internet: While still the most relied upon source of information on green building by a large margin, in fact the percentage of respondents who report that they rely on the Internet (60%) has declined since 2012 (77%).** Countries with the highest percentage who rely on the internet include Colombia (74%), Poland (77%), South Africa (80%) and China (85%). The percentage in each of these countries is about double of those at the opposite end of the spectrum, including Singapore (38%) and Australia (33%).
- **Conferences and Industry Associations: Each of these were selected by 44% of the respondents globally.** They demonstrate the ongoing importance of organizations that directly promote green building to inspire and inform the industry. Industry associations are particularly critical in Singapore (60%) and China (62%), and are least relied upon in Saudi Arabia (24%) and Colombia (22%). The majority of the responses from most countries for conferences fall within a 10 percentage point range of the global average. The exceptions include Singapore (58%) and Colombia (57%) on the high end, and Germany (27%), the UK (31%), Australia (21%) and China (26%) on the low end.
- **Directly From Product Manufacturers: Selected by 39% in 2015, the influence of product manufacturer information is growing, one of the few sources of information where this occurs.** Countries that rely most on direct information from manufacturers include South Africa (60%), Australia (55%), Mexico (54%) and the UK (53%).
- **Industry Peers: Consistently, over one third of respondents (37% in 2015) have relied on their peers for information of respondents since 2008.** Using industry peers as influencers is particularly important in China (57%), Singapore (45%) and the US (46%), which are all well above the global average.
- **Magazines:** Magazines have experienced a decline in their influence since 2008 on a global basis, and even experienced a nine percentage point drop between 2012 and 2015. The markets where they still carry the most influence are the US (43%), UK (45%) and South Africa (46%), but few indicate that they are influential in Brazil (18%), Germany (18%) or Saudi Arabia (20%).

Most Relied Upon Sources of Information on Green Building (According to All Respondents)

Dodge Data & Analytics, 2016



Health and the Growth of Cities

Human health is intricately tied to our built environments. Key aspects—physical activity, injury, access to healthy food, air and water quality, climate change effects, mental health, strength of social fabric and equity of access to livelihood, education and resources—all rise and fall with the form and functioning of urban neighborhoods, now home to a majority of the world's population.

Globally, the urban population is increasing by about 70 million per year, with most growth occurring in low- and middle-income cities in Africa and Asia, followed by Latin America. For design and building projects in these cities, health is often the strongest driver for change.

The Health Effect

"When we stand in front of a community, and present five strategies to boost their income, or put their place on the map," says Sheba Ross, a senior urban planner and architect with HKS, who has worked with communities in Asia, the Middle East, Africa and North America, "we get maybe 50% to 60% of their interest. But when we say, 'Here are five strategies to improve your children's health and the health of your community,' we get their rapt attention."

The strength of health as a driver of environmental change can be expected to increase even further as a health, well-being and productivity campaign, now in development at the World Green Building Council, builds momentum.

Getting a Handle on Urban Health

To get a handle on the role of health in planning and building in low- and middle-income cities, Howard Frumkin, dean of the School of Public Health at the University of Washington, suggests three categories.

The first category comprises cities in which sustainability is an established priority, and health factors play an explicit role. Curitiba, Brazil, and, more recently, Bogota, Colombia, provide well-known examples. Exemplifying this category's shared focus on sustainability and health is Bogota's innovative public transportation network: the city's 300-kilometer bike path network and separated, high-capacity rapid transit bus system have together reduced fuel consumption and greenhouse gas emissions, improved air quality and traffic safety, increased the accessibility of the city's jobs and services, promoted physical activity, and provided a model emulated by other highly congested cities.

The second category comprises new eco-cities being cut from whole cloth in Asia and the Middle East, and whose sustainability aspirations often incorporate health priorities by corollary. Tianjin Eco-City provides an example of the walking paths, green spaces, renewable energies and relatively clean air that characterize these new cities. Prone to controversy, delay and outright cancellation, however, cities in this well-intentioned category affect only a small portion of the world's urban population.

The third category comprises the cities where most of the world's urban growth is occurring, such as Lagos, Jakarta, Mumbai and myriad smaller cities. Here, population growth often overwhelms the city's capacity to provide basic infrastructure, and poorer residents suffer mightily. In Mumbai, for example, informal settlements accommodate more than half of the city's 11 million residents on 8% of its area with no municipal services. Exemplifying a health-driven project in this category is Mumbai's Slum Sanitation Program, in which two- and three-story community-maintained toilet blocks provide sanitary facilities to reduce disease transmission; more than that, many of these buildings also serve as community centers where people can take a class or hold a meeting.

Act Locally

Within these general categories, the health opportunities of any building project will be unique, and a variety of frameworks for identifying and maximizing them are now available. These range from informal yet effective community consultations to formal and comprehensive health impact assessments.

"It's important to find out what health factors are significant in each community, and to make our design relevant to the health data," says Ross. "And to do that every chance we have." ■

Interview: Thought Leader

Terri Wills
CEO, World Green Building Council

Before becoming CEO of the World Green Building Council, Terri Wills was the Director of Global Initiatives with the C40 Cities Climate Leadership Group, the London City Director for the Clinton Climate Initiative, and worked for the British Broadcasting Corporation as a Head of Strategy.

What are the biggest global challenges for green building?

WILLS: We face great hurdles when it comes to renovating the existing [building] stock. In London, UK ... 80% of buildings we have now will still exist in 2050, and the building stock must be renovated to become green. This is why WorldGBC's European Regional Network has launched the Build Upon Project—the world's largest program of strategies for deep retrofit, with 13 GBCs and WorldGBC receiving €2.35m of support from the European Union's Horizon 2020 program to address this major retrofit challenge.

As some countries begin to emerge from the global recession, what do you think that will mean for green building?

WILLS: As economies strengthen around the world, we will see a great shift toward buildings that benefit not only the environment, but also people—the greatest asset of the world's most advanced companies. Workers from the Millenial generation are demanding [that] their employers provide green buildings because of the value they place on environmental responsibility, [and] because they are also happier and healthier places to work. I believe we'll see green building as an essential benefit to employees as companies compete for top talent.

What influence does green have in developing countries?

WILLS: Green building is playing a critical role in the development of many emerging economies, particularly as their populations grow and create a pressing need for a more sustainable built environment. India, for example, already has the world's second biggest green building footprint ... And that's just today—two thirds of the buildings that will exist in India in 2030 are yet to be built, so there is an enormous opportunity to get buildings right from the start and prevent greenhouse gas emissions being "locked in" for future generations.

Socioeconomic development in these countries is a top priority ... Green Building Councils in the WorldGBC Americas, Middle East North Africa, Africa and Asia-Pacific Regional Networks are focused on sustainable affordable housing, for example, which can bring not only environmental benefits, but healthier homes, more jobs and happier communities.

What gives you the greateast optimism about the future of the green building movement?

WILLS: Three key developments indicate a turning point in green building. The first is the Paris Agreement. The implementation of this treaty, signed by 195 nations, will only be possible with green building becoming 'business-as-usual.'

Second, and related, is that we are seeing an unprecedented level of collaboration between governments, businesses and civil society. Buildings Day at the COP21 in Paris in December launched a Global Alliance for Buildings and Construction: 18 countries and over 60 organizations representing thousands of businesses will work together to meet country emissions reduction targets through green building.

And third, the increasing awareness of the link between green building and health and well-being is leading to an increased demand for green building by owners and occupiers. Our Better Places for People project is a great example of how companies are looking for ways to better measure the health and well-being benefits of their own green buildings, and use this data to continuously improve the benefits of their building to people.

What is necessary for the future of green building?

WILLS: What is needed for that future is the same as what is needed today—leadership from companies, countries, cities to adopt ambitious goals and plans ... We have seen with the COP21 that even before the countries signed on the dotted line, major companies like Saint-Gobain, Philips, Lend Lease, City Developments Limited and so many more put forward ambitious commitments to decarbonize. The market signals sent by companies like these will unleash a green building innovation the likes of which have never been seen before. ■

Methodology:

World Green Building Trends Research

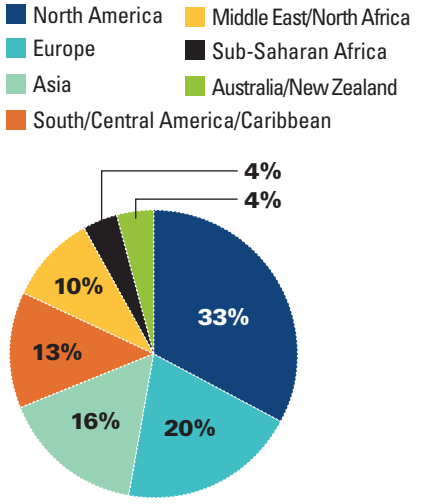
The 2015 World Green Building Trends study was conducted to achieve the following objectives: 1) Identify triggers and obstacles relating to the adoption of green building; 2) Measure past, current and future levels of activity in green building; 3) Identify important construction sectors for growth in green building; 4) Measure the impact of green building practices on business operations; 5) Profile the use of green building products and/or methods; and 6) Uncover trends in the industry through comparison with relevant findings from the 2008 and 2012 Global Trends in Green Building Studies.

The study was conducted between May and August 2015. It was fielded using panel providers, email blasts and association broadcast to members or by forwarding the link to the other groups:

- The World Green Building Council (WGBC) sent email invitations to members of Green Building organizations worldwide. The WGBC also invited Green Building members to forward the survey to practitioners in the field within their country.
- Several other associations (AIA, ACE, BIM Hub, CIOB, FIDIC, RICS and USGBC) sent the survey link to members.

Location of Respondents

Dodge Data & Analytics, 2016



Study Participants

All respondents were required to be employed construction professionals and to have non-building projects account for no more than 50% of their office's revenue.

1,026 architects, engineers, contractors, owners and specialists/consultants responded to the survey. For the distribution of respondents by type in the 2015 study, and how it is different from the 2012 study, see the chart at right.

Respondents were located in 69 countries. A full list of the countries can be found on page 2. Sufficient responses were provided for statistically significant analysis to be conducted in 13 countries: Australia, Brazil, China, Colombia, Germany, India, Poland, Mexico, Saudi Arabia, Singapore, South Africa, UK and US. In addition, sufficient responses were drawn from other countries in Europe, the Middle East and South America/Caribbean to conduct regional analyses as well.

The distribution of total responses by region is presented at left.

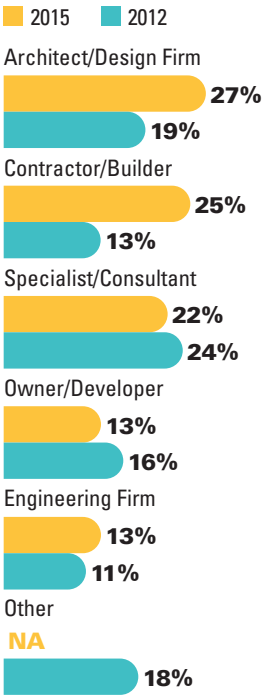
Benchmark of Accuracy

The total sample size benchmarks at a high degree of accuracy: 95% confidence interval with a margin of error of +/-3.0%.

Findings showing a significant difference at a 95% confidence interval for several variables are cited in the report. These include: **1) 2008–2015 Comparison** (703 respondents in 2008, 803 in 2012 and 1,026 in 2015), **2) Current Green Involvement:** Exploring, 1-15% (Low), 16-30% (Moderate), 31-60% (High) and Over 60% (Very High); **3) Organization Type:** Owner/Developer, Architect/Design Firm, Engineering Firm, Contractors/Builders, and Specialists/Consultants.

Types of Firms

Dodge Data & Analytics, 2016



Definition of Green Building

Green building was defined in the study as a construction project that is either certified under any recognized global green rating system or built to qualify for certification. ■

Resources

Organizations, websites and publications to help you get smarter about green building trends occurring around the world.

DODGE DATA & ANALYTICS

Dodge Data & Analytics
Main Website: **construction.com**
Dodge: **construction.com/dodge**
Research & Analytics: **construction.com/dodge/dodge-market-research.asp**
Sweets: **sweets.com**
SmartMarket Reports: **analyticsstore.construction.com**

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The American Institute of Architects: **aia.org**
Architects' Council of Europe (ACE EU): **ace-cae.eu**
Autodesk: **autodesk.com/bim**
the BIM Hub: **https://thebimhub.com/sustainability/ https://thebimhub.com/sustainability-and-energy-efficiency/**
Chartered Institute of Buildings (CIOB): **ciob.org**
International Federation of Consulting Engineers (FIDIC): **fidic.org**
Royal Institution of Chartered Surveyors (RICS): **rics.org**
World Green Building Council: **worldgbc.org**

Other Resources:

ASHRAE: **ashrae.org**
Building Owners and Managers Association International (BOMA): **boma.org**
Climate Action Network International: **climatenetwork.org**
C40 Cities: **c40.org**
Consortium for Energy Efficiency: **cee1.org**
ENERGY STAR: **energystar.gov**
Green Building Initiative: **thegbi.org**
International Code Council: **iccsafe.org**
International Facility Management Association: **ifma.org**
Organization for Economic Co-operation and Development (OECD): **oecd.org/greengrowth/**
United Nations Environment Programme—Sustainable Buildings and Climate Initiative (UNEP-SBCI): **unep.org/sbci**
United Nations Framework Convention on Climate Change (UNFCC): **unfccc.int/2860.php**
UN-Habitat: **unhabitat.org/**
World Business Council for Sustainable Development: **wbcsd.org/home.aspx**

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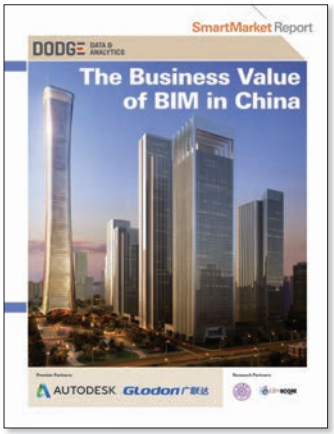

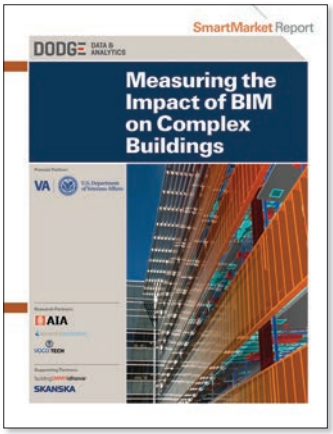

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