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# Practice papers

## Charting a path forward: Key factors in applying sustainability to infrastructure

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**Abstract** With the ratification of the Paris Agreement at last year's COP 21 and a growing awareness that climate change poses a significant threat to business and society, regenerative communities and the methods and practices used to develop them are starting to take centre stage. Cities all over the world are facing an important crossroads; the challenges our cities and communities face, particularly when it comes to sustainable infrastructure, have never been more serious. For example, between 2013 and 2030 it is estimated that US \$57tn will need to be invested in infrastructure in order to keep pace with projected global GDP growth.<sup>1</sup> On the other hand, the performance improvement opportunities available to cities and communities that invest in the right technologies have never been more promising. Improving aging infrastructure systems can reap dramatic efficiency, resiliency and reliability results and have an impact on millions around the world. Smart community and city leadership are aware of the sustainability opportunities that transforming the built environment can generate. All over the world, cities and communities are turning towards regenerative communities that deliver innovative solutions and demonstrate the use of consistent standards and practices. These regenerative communities are helping to drive true market transformation for the built environment on a global scale.

**Keywords:** *sustainability, green building, energy efficiency, infrastructure*

### UNDERSTANDING THE MULTIFACETED BUILT ENVIRONMENT

Buildings are responsible for an enormous amount of global energy use, resource consumption and greenhouse gas emissions. According to the United Nations Environment Programme

Buildings and Climate Change Report, buildings account for more than 40 per cent of global energy use and one-third of global greenhouse gas emissions — both in developed and developing countries.<sup>2</sup> Therefore, the building sector has the largest potential for significantly reducing natural resource depletion.

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The demand for more sustainable building options is increasing and green construction is becoming increasingly profitable and desirable within the international construction market. On a global scale, the World Green Building Trends 2016 SmartMarket Report notes that green building construction is expected to double every three years and that in the coming years, emerging economies such as China, India and Brazil will be engines of green growth, with development varying from twofold to sixfold over current green building levels.<sup>3</sup> The top drivers for this growth include client demand, environmental regulation and enhanced awareness of occupant and tenant benefits of green buildings.<sup>3</sup>

Organisations that are working to develop a sustainable future, including the US Green Building Council (USGBC), see that a focus on smart, regenerative cities will form the foundation of the next generation of green building, which will seamlessly integrate sustainability in buildings to communities and to cities.

As smart city and smart grid policies emerge and leaders focus more and more on improving the performance of their communities and cities, a more holistic view of sustainability will emerge — one that incorporates wellness, energy efficiency and sustainable sites into city planning and development. The relationship between buildings and people is inextricable and makes regenerative communities and cities paramount to securing the health and well-being of millions around the world. It ensures a more sustainable future for all — a future that is inclusive regardless of one's social, economic or cultural background.

## SUSTAINABLE SOLUTIONS

The challenge of developing regenerative communities at a global scale is substantial, when energy consumed in

the building sector consists of residential and commercial end users and accounts for more than 20 per cent of the total delivered energy consumed worldwide.<sup>4</sup> Green building rating systems with established performance platforms are necessary tools to accelerate smart, regenerative cities across the globe.

In 2000, USGBC created the LEED (Leadership in Energy and Environmental Design) green building rating system, launching the multi-billion-dollar global green building industry and spurring growth in energy-efficient buildings and communities across the globe. Today, LEED is an internationally recognised standard of excellence and the most widely used green building programme in the world. Green building rating systems, such as LEED, have become a powerful economic development tool for revitalising and scaling sustainable buildings, communities and cities across the globe. In the United States, LEED supports nearly 8m jobs and contributes \$554bn to the economy annually.<sup>5</sup> LEED in particular has become a full-scale global movement — there are nearly 90,000 registered and certified projects and more than 1.78bn sqm participating in LEED across 164 countries and territories.<sup>5</sup> Every day, 2.2m sqft of building space certifies to LEED (Figure 1).<sup>5</sup>

The built environment is all around; it provides the setting for life events — big and small — and plays a huge role in natural, economic and cultural environments, since people spend about 90 per cent of their time in buildings.<sup>6</sup> The built environment also provides a context for facing and addressing humankind's greatest contemporary challenges. Those challenges are substantial, but the green building industry is helping to turn energy-guzzling and water-wasting structures into beacons of promise for better health and vitality. Over the last 20 years, green building has



**Figure 1:** LEED Madrid

delivered convenience, innovation and economic opportunity that support an improved triple bottom line.

Green buildings have a record of proven performance, saving money and energy, reducing water consumption, improving indoor air quality, facilitating better product and material choices and driving innovation. For instance, LEED-certified buildings are proven to have 34 per cent lower CO<sub>2</sub> emissions, consume 25 per cent less energy and 11 per cent less water and have diverted more than 80m tons of waste from landfills.<sup>7</sup> From 2015–18, it is estimated that LEED-certified buildings in the United States alone will have more than \$2.1bn in combined energy, water, maintenance and waste savings.<sup>7</sup>

The market is also responding at a dramatic rate to the triple bottom line benefits that the green building industry generates. Research from the 2016 World Green Building Trends Smart Market Report indicates global green building will

continue to double every three years and yields a 7 per cent increase in asset value over traditional ones.<sup>8</sup> The report also found that increased consumer demand has pushed the world's green building market to a trillion-dollar industry, a surge that has led to a corresponding increase in scope and size of the green building materials market, which is expected to reach \$235bn by 2019.<sup>9</sup>

In the United States, Booz Allen's 2015 Green Building Economic Impact study analysed the economic impact of green construction on the US economy and found that LEED-certified buildings accounted for 40 per cent of green construction's contribution to the US GDP in 2015.<sup>10</sup> A 2015 survey by USGBC and Keybridge LLC of building operations and corporate sustainability executives from 48 Fortune 200 showed that 82 per cent are likely to continue using LEED for new construction or retrofits.<sup>11</sup> In the UK, the top trigger for driving future

green building is client demand.<sup>12</sup> With the promise of continued growth, it is vital to understand key drivers behind the green building and regenerative cities movement.

### **ACHIEVING REGENERATIVE CITIES AND COMMUNITIES THROUGH ADAPTIVE STRATEGIES**

A chief goal of green building practitioners and regenerative community and city leaders is to find new uses for existing structures. These buildings hold incredible promise, since many older buildings around the world are energy hogs and water sieves. With keen attention to building operations, that can be turned around drastically through adaptive reuse. Consider that it can take up to 80 years to make up for the environmental impacts of demolishing an old building and constructing a new one, even if the resulting building is extremely energy-efficient.<sup>13</sup>

Adaptive reuse is the practice of redesigning and using a structure for a use that is significantly different from the building's original use. Buildings can also be designed to prevent future obsolescence — for example, a flexible floor plan extracting materials for a new building and disposing of demolition waste. The adapted building reuses a site that is already served by infrastructure and avoids the conversion of farmland or forest to development. Designing a project to meet both current and evolving needs is key to sustainability and developing regenerative communities. The USGBC's LEED for Building Operations and Maintenance (O+M) rating system, for instance, can be applied to any number of project types — from commercial high-rises to data centres — to meet these needs. It speaks to the phrase: 'The greenest building is the one already built.'

Another strategy employed by regenerative communities and cities is adaptability in land use and municipal

infrastructure, such as roads. Once road networks are established, they can remain fixed for centuries. In Rome, the roadways that existed in ancient times have become today's motor vehicle roads. The world's infrastructure is at a critical crossroads and this issue is particularly important as society moves toward a lower-carbon future.

Alternative transport, including availability of public transport, is also essential for reducing carbon emissions. Options for alternative and public transit, including bicycling and walking, depend however on the proximity of destinations, connectivity of a community and design of surroundings. Roads that are designed for only motor vehicles do not provide the flexibility or adaptability of a transport network designed for diverse travel modes. Right now, parking structures remain a significant land use for cities, but seeking out and finding the established best practices and applying those to projects results in smarter citing and design and reimagines how we use space. For transport, industry experts developed a framework called Parksmart that advances sustainable mobility through smarter parking structure design and operation. The certification works with parking structures to address not only social and environmental concerns related to parking, but also helps facilities reduce operational costs by up to 25 per cent.

Sustainable design ensures that buildings and communities will survive and thrive for generations, no matter what the future holds.

### **REGENERATIVE PROJECTS**

Initially, green buildings were intended to reduce damage to the environment and human health caused by creating and maintaining buildings and neighbourhoods. As the concept of sustainability was applied to the built

environment, it has become clear that simply doing less damage is not enough.

Regenerative projects support the health of local communities and regional ecosystems, generate electricity and send the excess back to the grid, return water to the hydrologic system cleaner than it was before use, serve as locations for food production and community networking, regenerate biodiversity and promote many other relationships that link the projects to the whole system of life around them.

Regenerative projects strive toward 'net-zero' — using no more resources than they can produce and, sometimes, giving back more than they take from their local communities. For example, net-zero energy projects use no more energy from the grid than they generate on site and sometimes provide excess energy that they generate from renewables to their local communities. These projects may be connected to the grid, drawing electricity from it at night and contributing energy from onsite renewable energy systems during the day, such that their total energy cost is zero. Other projects strive for carbon neutrality, emitting no more carbon emissions than they can either sequester or offset. Still other projects are designed to achieve a more even water balance: they use no more water than that which falls on site as precipitation, or they produce zero waste by recycling, reusing, or composting all materials. Not all projects can achieve those levels of performance. Nevertheless, on average, green buildings save energy, use less water, generate less waste and provide more healthful, more comfortable indoor environments.

Leaders in the field now speak about buildings and communities that are regenerative, meaning that these sustainable environments evolve with living systems and contribute to the long-term renewal of resources and life. Some practitioners have begun to explore what it would mean to move beyond 'sustainable'

and participate as a positive developmental force in ecosystems and communities.<sup>14</sup>

The focus is on building a comprehensive understanding of the place in which the project is located, recognising the site's patterns and flow of life. Accordingly, such projects contribute to the healthy co-evolution of humans and all life in that place. They thrive on diversity and clean the air rather than pollute it. Regenerative projects and communities also involve stakeholders and require interactivity.

In the US, the New Orleans Festival and Recreation Complex (Figure 2) was created by repurposing an abandoned golf course into a 55.7-acre open space in the middle of a major urban area.<sup>15</sup> The resulting project delivered four multi-sport fields, a one-mile walking/biking path, public lavatories, a workout area with adult and child exercise equipment, a large constructed wetland area with meditation paths and boardwalk, playground and a large 'Reunion Pavilion' for seating, eating and socialising.<sup>16</sup> The project worked to gain an extensive understanding of the land that was being developed using the Sustainable SITES Initiative (SITES) certification programme. SITES is a comprehensive rating system for designing, developing and maintaining sustainable landscapes. Through the design process, the project team identified an opportunity to incorporate a wetland into the site, which, according to the World Wildlife Foundation, increases resilience against flooding, hurricanes and rising sea levels, all of which threaten the New Orleans area.<sup>17</sup> Understanding the local challenges and using natural systems in the design enabled the team to create a project in a major urban area that provided both environmental and social benefits.

## INVESTORS TURN TOWARD SUSTAINABILITY

As more and more buildings continue to adopt green business practices, investors



Figure 2: New Orleans Festival and Recreation Complex

are beginning to take notice of the impact of environmental, social and governance (ESG) factors and are starting to evaluate prospective investments against green performance. There is growing understanding that climate change is a threat to the financial system and that investors need to view the green building movement not just as a collection of buildings, but also as an economic driver for the marketplace.

According to a report from United Nations Global Compact, United Nations Environment Programme, Oxfam and World Resources Institute, an analysis by the World Bank and US Geological Survey found that an investment of \$40bn to reduce disaster risk as a result of climate change could prevent disaster losses of \$280bn.<sup>18</sup> In Europe, infrastructure has proven to be a resilient investment and despite some regulatory changes, renewables have become a popular asset class worthy of investment.<sup>19</sup>

Sustainable infrastructure is starting to pique the interest of investors around the world. The 2015 Preqin Investor Outlook found that 52 per cent of institutional investors, including banks, insurance companies, pension funds and sovereign wealth funds, now consider ESG factors when investing in infrastructure funds — a higher percentage than for private equity, real estate or investments in natural resources.<sup>20</sup>

In 2014, ten global infrastructure investors representing \$1.5tn in assets under management collaborated with GRESB, an investor-driven organisation committed to assessing the ESG performance of real assets globally, to create GRESB Infrastructure, an annual assessment of ESG performance specifically to the industry.<sup>21</sup> The 2016 GRESB assessment (Figure 3) showed a high level of adoption of environmental policies, indicating that managing environmental risks is key for most infrastructure business activities.<sup>22</sup>

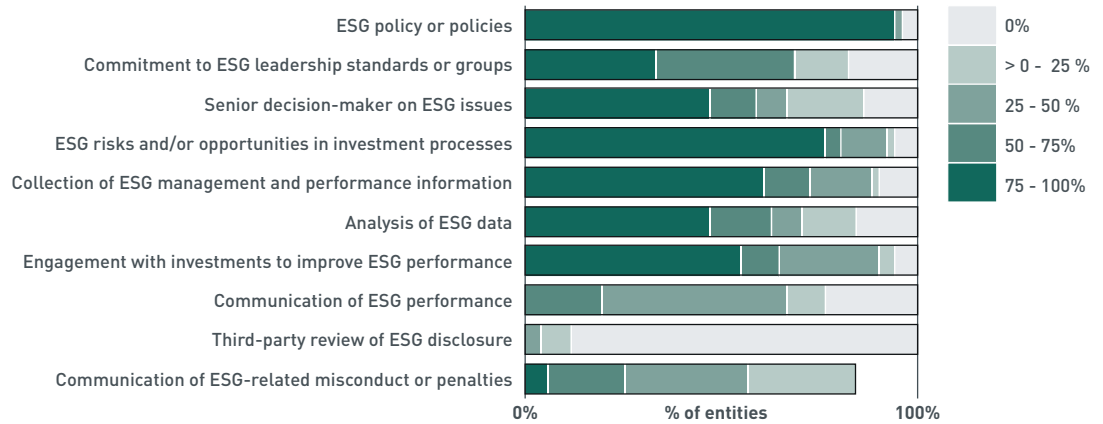


Figure 3: ESG Indicators graph from 2016 GRESB Infrastructure Report

Assessing ESG factors brings a new level of transparency for investors to make more informed decisions, particular when it comes to infrastructure.

The world is more connected than ever and over the coming years, flows of information, searches, communication, video, transactions and intra-company traffic will only continue to surge. In addition to transmitting valuable streams of information and ideas in their own right, data flows enable the movement of goods, services, finance and people. Virtually every type of cross-border transaction now has a digital component. Global data of all types support growth by raising productivity and data flows are amplifying this effect by broadening participation and creating more efficient markets. Last year, a new technology company called Arc Skoru Inc. launched a digital platform to help buildings, cities and communities benchmark and track sustainability performance. Using real-time data, users monitor performance and can identify new opportunities for improvement, while comparing progress to similar projects locally, regionally and globally. It is another example of how technology is bringing data to the forefront of sustainability.

According to a recent McKinsey Global Institute report, all types of data flows

acting together have raised world GDP by 10.1 per cent.<sup>21</sup> The ability to analyse and make decisions based on this global data is what will drive change. In many respects, data is the new natural resource. Collecting and acting on it builds a bridge to improving investments, creating more efficiency and improving triple bottom line performance.

### CONCLUSION

Green buildings have a direct impact on the people who eat, live, work and play in them; these high-performing buildings boost the health, productivity and happiness of millions across the globe. Sustainability is not just about better buildings or good design — it is about making better decisions that deliver financial savings, environmental stewardship and improve the quality of life for all. A key component to reaching those goals is tracking and understanding performance at the city and community level. Regenerative cities have the ability to connect all actions — including water, waste, energy, transport and human experience — in one place, allowing teams to be transparent about their efforts and uncover new opportunities. A more holistic approach to sustainability

combined with today's innovative technologies that track performance has the power to disrupt the market and usher in a new era of green building.

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