

Innovating for Sustainability: CHALLENGES AND OPPORTUNITIES

CONTRIBUTORS

Michael J. Lenox

Professor of Business
Darden School of Business
lenoxm@darden.virginia.edu

Gosia Glinska

Associate Director of Research
Batten Institute
glinskam@darden.virginia.edu

“Innovation is exactly what’s going to help solve the environmental challenges we face today.”

Gina McCarthy, Former Head of the U.S. Environmental Protection Agency (EPA)¹

“Speed is of the essence, because climate change and its impacts are coming sooner and with greater ferocity than anticipated.”

Dr. Michael E. Mann, Distinguished Professor of Atmospheric Science at Penn State University²

There is no question the current sustainability crisis—from climate change to resource depletion—requires that the world transition to a low-carbon, environmentally friendly economy. The question is how to do this quickly.

If you ask Darden Professor Michael J. Lenox, “We need substantial innovations across many sectors and technologies if we are to address our mounting environmental concerns. Business leaders have to play a central role in fostering these innovations.”

To explore the opportunities and limitations of innovating our way to sustainability, Lenox recently led a discussion at the fall 2016 Global Innovators’ Roundtable in Singapore. Hosted by Darden’s Batten Institute for Entrepreneurship and Innovation and Temasek Management Services’ TMS Academy, the roundtable brought together senior leaders from such innovative companies as Singapore Airlines, Temasek International, PSA International, and MAS Holdings.

This *Batten Briefing* examines the growing threat of climate change to the global economy. It also explores the role of business in climate-change mitigation and argues that companies face the innovation imperative to develop environmentally friendly and economically feasible solutions. And last but not least, it looks at the business benefits and barriers to innovating for sustainability.

¹ U.S. Environmental Protection Agency Website. <https://www.epa.gov/innovation> (Accessed on 10 January 2017)

² Carrington, Damian. 2016. “2016 Will Be the Hottest Year on Record, UN Says.” *The Guardian*.

The Warming Planet: GROWING THREATS TO THE GLOBAL ECONOMY

INVESTING IN CLEANTECH

The Goldman Sachs Environmental Policy Framework acknowledges that government, business, and consumers need to take urgent action to curb greenhouse-gas emissions.⁸

**Goldman Sachs will deploy
\$150 billion
to finance clean energy by 2025.**⁹

“The Low Carbon Economy: Technology in a Driver’s Seat,” a new report from Goldman Sachs, argues that technologies such as electric vehicles, solar cells, onshore wind, and LEDs—not policies—will drive the transition to a low-carbon economy to help address climate change.¹⁰

³ Lynch, Patrick. 2016. “2016 Climate Trends Continue to Break Records.” NASA Website. <http://ow.ly/qX-Va306YYkB>

⁴ Pachauri, Rajendra K., et al. 2014. *Climate Change 2014: Synthesis Report*. Intergovernmental Panel on Climate Change. <https://www.ipcc.ch/report/ar5/syr/>

⁵ *The Global Risks Report 2016*, 11th Edition. The World Economic Forum. Geneva, Switzerland. <http://wef.ch/risks2016>

⁶ Ibid.

⁷ Hagel, Chuck. 2014. “The Department of Defense Must Plan for the National Security Implications of Climate Change.” The White House Website. <https://www.whitehouse.gov/blog/2014/10/13/defense-department-must-plan-national-security-implications-climate-change> (Accessed 10 January 2017)

⁸ The Environmental Policy Framework 2015. Goldman Sachs Group, Inc. <http://www.goldmansachs.com/s/environmental-policy-framework>

⁹ Ibid.

¹⁰ Kooroshy, Jaakko, et al. 2016. “The Low-Carbon Economy: Technology in a Driver’s Seat.” The Goldman Sachs Group, Inc.

SUSTAINABILITY IS AN ACUTE CHALLENGE CONFRONTING THE WORLD. The planet is warming. According to the scientists at NASA’s Goddard Institute for Space Studies, the period from January to June 2016 was the earth’s warmest half-year on record, with an average temperature 2.4 degrees Fahrenheit warmer than in the late nineteenth century.³

Experts overwhelmingly agree that the underlying reason for the rising temperatures is atmospheric concentrations in greenhouse gases, which are the result of human activity, primarily the burning of fossil fuels.⁴

Coupled with explosive population growth, the warming climate threatens food security and exacerbates the water crisis especially in the developing economies, all of which undermines geopolitical stability and security.⁵

The situation is so dire that the 2016 Global Risks Report listed climate change as one of the biggest threats to the global economy. The report, prepared by the World Economic Forum (WEF), argues that the failure of climate-change mitigation poses a bigger risk to the business community—and everyone else, for that matter—than the spread of weapons of mass destruction, the water crises, large-scale involuntary migration, or a severe energy price shock.⁶

The U.S. Department of Defense views the environmental issues as national and global security risks and has been planning for them since the first term of the George W. Bush administration. As the former GOP senator and Secretary of Defense Chuck Hagel put it in his White House blog, “In our defense strategy, we refer to climate change as a ‘threat multiplier’ because it has the potential to exacerbate many of the challenges we are dealing with today – from infectious disease to terrorism.”⁷

Will business save the planet?

Business, in particular “big business,” is usually seen as the source of, not the solution to, environmental challenges. But companies are under increasing pressure to develop new products, services, business models, and manufacturing processes that substantially reduce their impact on the natural environment. Business leaders can be either reactive to external, nonmarket pressures, or they can be proactive and harness the power of innovation to ameliorate environmental damage.

The Innovation Imperative: WILL BUSINESS RISE TO THE CHALLENGE?

WE NEED GREEN INNOVATION ON A MASSIVE SCALE. In recent years, many companies have adopted inspiring goals and guidelines with respect to innovation and the environment that seek to not only reduce the company's carbon footprint but also provide a healthier planet for employees, investors, and the wider community.

Businesses are also measuring and reporting the environmental impact from their activities. In 2011, just under 20% of S&P 500 Index companies published sustainability reports, but by 2015, this number reached 81%.¹¹ According to a 2014 report released by the World Wildlife Fund in partnership with Ceres, 43% of Fortune 500 companies set targets for greenhouse gas reduction, renewable energy, energy efficiency, or a combination of these goals.¹²

However, experts believe that those efforts are a drop in the ocean.

An influential study by the Princeton Environmental Institute estimated that in order to keep carbon emissions flat over the next 50 years, we need to trim our projected carbon output by roughly 8 billion tons per year by 2060.¹³ The study's authors identified 15 strategies—from wind, solar, and nuclear energy to energy efficiency and carbon capture—to achieve these reductions. They emphasized that no one strategy is sufficient if we are to succeed in lowering carbon emissions.

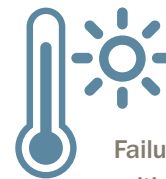
"We need green innovation on a massive scale," said Lenox. "We need new products, services, business models, and production processes that fill customer needs while minimizing environmental impacts."

Innovation has to be commercially viable

As Lenox put it, "We can't lose sight of the fact that green innovations have to work in the marketplace. They must create value for individuals who are willing to subsidize the development, installation, and scaling of a new technology."

Take solar cells. Innovation has helped improve their efficiency and significantly lower the cost of manufacturing. This, in turn, attracted investment and helped spread adoption. But photovoltaic cell technology has not yet captured the hearts and minds of the public. However, there are grounds for optimism. According to the International Energy Agency, 2015 was a turning point for clean energy. In China, two wind turbines were installed every hour. Around the world, about half a million solar panels were installed every day.¹⁴

TOP 5 GLOBAL RISKS IN TERMS OF IMPACT



Failure of climate-change mitigation and adaptation

Weapons of mass destruction

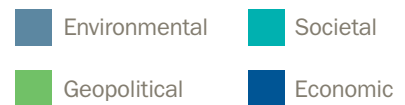


Water crises

Large-scale involuntary migration



Severe energy price shock



Source: World Economic Forum, 2016 Global Risks Report

¹¹ Governance & Accountability Institute, Inc. <http://ow.ly/YkbU306Z2bZ>

¹² Baker, Bryn, et al. 2014. *Power Forward 2.0, How American Companies are Setting Clean Energy Targets and Capturing Greater Business Value.* <http://ow.ly/DHIR306Z4ma>

¹³ Princeton University—Carbon Mitigation Initiative Website. <http://cmi.princeton.edu/wedges/intro.php>

¹⁴ "Medium-Term Renewable Energy Market Report 2016." 2016. International Energy Agency. www.iea.org

The Innovation Imperative [CONTINUED]

WHAT IS SUSTAINABILITY?

There seems to be a sense of confusion about the definition of sustainability. The terms “sustainability,” “sustainable development,” and “corporate social responsibility” (CSR) are used interchangeably and mean different things to different firms.

CSR refers to business practices involving initiatives that benefit society. A business's CSR can encompass a wide variety of tactics, from giving away a portion of a company's proceeds to charity, to implementing “greener” business operations.

The often-used definition of sustainability comes from the *Report of the World Commission on the Environment and Development*, known as the Brundtland Commission:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”¹⁶

As John Ehrenfeld eloquently advocates in his book *Sustainability by Design*, our sustainability challenge is really a question of how we build a future where humankind can flourish, not just survive.¹⁷

“To have more customers willing to pay for sustainable technologies,” said Lenox, “it’s necessary to drive up the efficiency and drive down the cost of renewable energy so that it can compete with fossil fuels.” As Lenox explained, this goal can be achieved by improving the underlying technology—such as photovoltaic cells—or by innovating around any number of complementary technologies such as energy storage (batteries) and electrical distribution (smart-grid technology).

Business is a critical player in advancing innovation

Business has always played an important role in diffusing innovation in society. For example, the first gasoline-powered combustion-engine cars were invented in the 19th century, but what helped spread those inventions to the consuming public were firms such as the Ford Motor Company that found a way to mass produce them while making a profit.

Today, business plays a similar role in spreading green technologies. Green innovation tries to create both environmental and economic value, but it’s the companies and their entrepreneurial leaders who capture that value and turn it into profitable products and services without sacrificing performance and user satisfaction.

Electric car manufacturer Tesla Motors (Tesla) is a case in point. Tesla’s Model S and Model X sport-utility vehicles rival the best-performing internal-combustion cars. They reconcile comfort and power with environmental sustainability. To achieve its goal “to accelerate the advent of sustainable transport by bringing compelling mass market electric cars to market,”¹⁵ Tesla is currently developing the more affordable Model 3.

Entrepreneurs are often the disruptors

Entrepreneurs and entrepreneurial business leaders such as Henry Ford are ultimately the ones who advance new technology. As Lenox put it, “We need entrepreneurs to pioneer new sustainable technologies across critical sectors of the economy, such as energy, transportation, and agriculture, and to disrupt the existing technologies that put stress on the planet.”

One such entrepreneur is Tesla’s CEO Elon Musk. Musk views Tesla as not just an automaker but an “energy innovation company” that plays a significant role in the

¹⁵ Tesla Motors Website. <https://www.tesla.com/blog/mission-tesla>

¹⁶ United Nations World Commission on Environment and Development (WCED) 1987. *Report of the World Commission on Environment and Development: Our Common Future*. <http://www.un-documents.net/wced-ocf.htm>

¹⁷ Ehrenfeld, John R. 2009. *Sustainability by Design: A Subversive Strategy for Transforming Our Consumer Culture*. Yale University Press.

quest for zero-emission power generation.¹⁸ To this end, Musk recently unveiled solar roof tiles that convert sunlight into electricity, the new PowerWall battery system which stores that electricity, and a home charger for a Tesla car.

During his press conference at Universal Studios in Los Angeles, California, Musk said, “The goal is to make solar roofs that look better than a normal roof, generate electricity, last longer, have better insulation, and have an installed cost that is less than a normal roof plus the cost of electricity. Why would you buy anything else?”¹⁹

Why, indeed.

Experts predict that as Teslas and other electric cars integrated with rooftop energy-storage systems become widespread, they will disrupt Rust Belt car manufacturing and the fossil-fuel industry, while accruing environmental benefits.

Innovation emerges out of the broader socioeconomic system

Lenox also emphasized that innovation involves a lot more players than “two guys in a garage coming up with a brilliant invention.” Said Lenox, “Innovation often arises out of the rich tapestry of various stakeholders—what is often referred to as the innovation or entrepreneurial ecosystem. Venture capital, university research and licensing, and patent policy are vital parts of that ecosystem.”

Lenox noted that challenges such as global warming, localized air and water pollution, and resource depletion are best addressed by multiple stakeholders acting together: entrepreneurs and innovators who champion new sustainable technologies; investors who see market opportunities in these sustainable technologies; customers who are willing to pay for these sustainable technologies; activists who pressure businesses to invest in green innovation; and governments that incentivize new sustainable technologies through regulation, taxes, and other policy levers. Each of these players influences the degree to which businesses invest in environmentally beneficial innovations.

Large, established companies that span the globe and entrepreneurs who bring new technologies to market are powerful sources of change. They are also essential institutional players capable of harnessing market forces and unifying diverse stakeholders to accelerate progress on widespread environmental challenges. Therefore, as Lenox put it, “Meeting our sustainability crisis requires the active attention and engagement of business.”

WHAT ARE SUSTAINABLE TECHNOLOGIES?

We define sustainable technologies as those products, services, business models, and production processes that promise to reduce or eliminate the negative environmental impact of existing technologies. Through continuous innovation, companies can reduce or eliminate natural-resource depletion and environmental degradation and increase the prospects for future generations to flourish, as John Ehrenfeld envisioned.

CHIEF SUSTAINABILITY OFFICER (CSO)

As sustainability plays an increasing role across many industries, leading firms are creating the position of CSO, often reporting directly to senior leadership.

COMPANIES WITH CSOs INCLUDE:

3M	Nike
AT&T	SAP
Coca Cola	Siemens
DuPont	Unilever
Kellogg	Walmart

¹⁸ Tesla Motors Website. <https://www.tesla.com/presskit/teslaenergy>

¹⁹ Elon Musk Unveils Solar Roof (2016.10.28). <https://www.youtube.com/watch?v=dRqSkR4ENAg>.

The Business Value of Sustainability

THE LARGEST CONTRIBUTOR TO GREENHOUSE GAS EMISSIONS

The building sector has a high environmental impact. Buildings use about 40% of global energy and 25% of water. They are also responsible for about 30% of greenhouse gas emissions.

Buildings use about

40%

OF GLOBAL ENERGY

Buildings also offer the least costly opportunities for significant reductions of greenhouse gas (GHG) emissions. Existing commercially available technologies can reduce energy consumption in buildings by 30% to 80%.²²

City Developments Limited (CDL), a real-estate management and development firm based in Singapore, is committed to mitigating the environmental impacts of its buildings by introducing at least one eco-friendly innovation for every development.

²⁰ SDG Compass: The Guide for Business Action on the Sustainable Development Goals. <http://sdgcompass.org/>

²¹ Unruh, Gregory, et al. 2016. "Investing for a Sustainable Future." MIT Sloan Management Review. 57(4): 3-29.

²² United Nations Environment Program Website. <http://www.unep.org/sbci/AboutSBCI/Background.asp>

THERE IS A GROWING RECOGNITION among business leaders that sustainability is no longer just an issue of compliance or corporate social responsibility; it is, in fact, a fundamental business concern, essential to their companies' future competitiveness.

Firms that develop innovative, environmentally friendly solutions through sustainable business models and production practices capitalize on a number of benefits.

Attracting and retaining customers

Around the world, attitudes toward sustainable business practices are shifting. Consumers, especially in Europe and the U.S., increasingly base their purchasing decisions on their perception of a company's sustainability performance. Firms that offer transparency into their production practices boost their reputations and, as a result, are able to attract and retain customers who care about the environment.

Some of the world's biggest consumer-facing brands, such as Unilever, Coca-Cola, Procter & Gamble, General Mills, and Walmart, which are particularly attuned to emerging consumer interests, recognized that need and acted on it. Unilever and P&G, for example, have been focusing on products such as cold-water detergents, which reduce the need for hot water—laundry's big carbon footprint.

Winning the war for talent

Enhancing one's brand reputation through responsible business practices and concern for the environment can also help attract and retain the best talent. Millennials, especially, care about environmental degradation and prefer working for companies with strong sustainability performance.²⁰

“With the millennials, in particular, sustainability is a very important issue. When you hire someone, you're selling them a story, and you have to sell a credible one.”

Alan Thompson, Managing Director, Private Equity Fund Investments, Temasek International

Attracting capital

Sustainability is also emerging as an important factor in the ability to attract investors. As a recent study conducted by the Boston Consulting Group (BCG) and MIT Sloan Management Review attests, investors see a strong link between corporate sustainability performance and financial performance. As a result, they increasingly use sustainability-related data as a rationale for making their investment decisions.²¹

When the Singapore Exchange (SGX) surveyed institutional investors in 2015, it found that more than 90% of respondents considered environmental, social, and governance (ESG) aspects of business and strategy when investing.²³ In response to the growing global interest, the SGX will require sustainability reporting from listed companies on a “comply or explain” basis.

Risk management

Companies that incorporate sustainability into their long-term decision making strengthen engagement with customers, employees, and other stakeholders. They also keep pace with policy developments. Companies that fail to address those issues open themselves to growing legal and reputational risks, not to mention the environmental ones.

But there are even greater risks of not addressing sustainability—being disrupted by competitors, said Lenox. Experts predict that a number of companies will crumble under the pressures of what the Austrian economist Joseph Schumpeter called “creative destruction.”

“ It’s also about risk mitigation. If you’re not sustainable, you’ll open yourself up to disruption. How do you quantify that?”

Ranil Vitarana, Chief Technology Officer, MAS Holdings

“Take cables,” said Bob Jordan, the founder and CEO of BOM Quote Manufacturing, a maker of custom-designed products, including electronic and mechanical assemblies, based in Shenzhen, China. “Cables for headphones are already history. Wireless charging is already happening. What’s the next step? What’s the future going to look like? In the future, we probably won’t have any cables. I should start thinking about the disruptor for my R&D.”

Business leaders should approach sustainability from a business angle, asking the questions: What does it mean from a risk and opportunity perspective? How is this affecting my business model?

For example, CDL’s Tree House Condominium boasts one of the world’s largest vertical gardens, which covers nearly 2,800 square yards. The garden filters carbon dioxide out of the air and decreases the estate’s carbon footprint by reducing heat absorption and lowering the energy needed to cool indoor spaces.



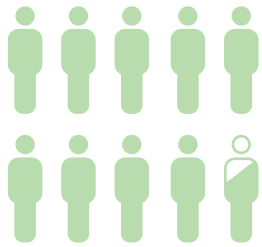
In 2015, the Tree House won the World Gold Award in the sustainable development category at the prestigious FIABCI World Prix d’Excellence Awards.

Source: City Development Limited, *Integrated Sustainability Report 2016*

²³ SGX News Release, “SGX Consults on ‘Comply or Explain’ Sustainability Reporting Rules and Guide.” 5 January 2016. <http://ow.ly/FDb5306Z6vi>

The Business Value of Sustainability

[CONTINUED]



97%

of the world's leading CEOs surveyed by Accenture believe that sustainability is important to the future success of their business.

Source: The 2016 United Nations Global Compact-Accenture Strategy CEO Study.

Uncovering new market opportunities

Increasingly, companies recognize that environmental stewardship does not have to be a burden on the bottom line; on the contrary, being environmentally friendly presents significant market opportunities.

As a multi-year study of sustainability initiatives at 30 large corporations attests, sustainability can be a rich source of “organizational and technological innovations that yield both bottom-line and top-line returns.”²⁴

A more recent study conducted by McKinsey found that “sustainability programs are not only strongly correlated with good financial performance but also play a role in creating it.”²⁵

Leading companies are discovering new growth opportunities in sustainability by developing “green” products and services, developing new business models, and creating next-practice platforms.²⁶

Developing a new business model requires exploring alternatives to current ways of doing business as well as understanding how companies can meet customers’ needs differently. Executives must learn to question existing models and to act entrepreneurially to develop new delivery mechanisms. To do that, companies need the capacity to understand what consumers want and figure out different ways to meet those demands.

Waste Management, Inc., is a case in point. In 2007, the company was a garbage disposal business. It estimated that some \$9 billion worth of reusable materials might be found in the waste it carried to landfills each year. Its customers also began to realize that they were throwing away money. Waste Management set up a unit, Green Squad, which partnered with Sony in the U.S. to collect electronics that used to end up in landfills. Instead of being just a garbage collector, Waste Management was helping customers to not only reduce waste but also to recover value from waste.²⁷

Today, Waste Management is not only the largest residential recycler in North America but also a renewable-energy provider. It recovers the naturally occurring gas inside landfills to generate electricity. In 2014, the company’s landfill-gas-to-energy projects produced enough energy to power nearly 500,000 homes.²⁸

²⁴ Nidumolu, R., Prahalad, C.K., and Rangaswami, M.R. 2009. “Why Sustainability Is Now the Key Driver of Innovation.” *Harvard Business Review*. 87(9): 56-64.

²⁵ Bonini, Sheila, and Steven Swartz. 2014. “Profits with Purpose: How Organizing for Sustainability Can Benefit the Bottom Line.” McKinsey & Co.

²⁶ Nidumolu, R.

²⁷ Ibid.

²⁸ Waste Management, Inc., Website. <http://www.wm.com/about/index.jsp>.

The Impediments to Innovating for Sustainability

WHILE THERE'S BEEN SOME PROGRESS, most companies still face a number of impediments to bringing sustainability into long-term decision making. Five key areas that need attention to advance corporate sustainability are learning, leadership, cost, supply chains, and innovation.

Learning

Many companies find themselves at relatively early stages of learning. They are figuring out not only how to implement sustainability in their organizations but also what it really means for their business. As Ranil Vitarana put it, “People narrow sustainability too much. For one person it’s about the environment or whether you’re compliant. I haven’t seen a good definition of what is sustainability is. If you define it, maybe it will be easier to drive it.”

Leadership

Leadership is crucial to advancing sustainability. While some organizations have appointed chief sustainability officers (CSOs) who report to the CEO and are responsible for reaching sustainability goals, in many companies there is a lack of clear responsibility for sustainability at a senior level. To succeed, sustainability must be driven from the top, and senior-level buy-in is essential.

But it’s easier said than done. In a recent survey of 700 companies conducted by sustainability consultancy 2degrees, 65% of respondents said that convincing senior leadership to support sustainable practices was the greatest challenge. However, once the benefits of sustainability were established, leaders remained engaged in creating a greener business.²⁹

Cost

Concerns over cost are certainly an important issue. The fear that sustainable practices will raise expenses relative to competitors is an often-cited impediment to furthering sustainability.

To many companies the financial benefits of sustainability are hard to quantify, but an understanding of where the economic advantages are—in particular lower operational costs and where the untapped growth opportunities are—can be helpful. “There’s a lot of low-hanging fruit as businesses look at sustainability,” said Lenox, “but it’s hard to understand whether there’s true return on investment.”

THE WORLD'S 10 MOST SUSTAINABLE COMPANIES

BMW

Germany | Automobile

DASSAULT SYSTEMS

France | Software

OUTOTEC

Finland | Construction & Engineering

COMMONWEALTH BANK OF AUSTRALIA

Australia | Banks

ADIDAS

Germany | Textiles, Apparel & Luxury Goods

ENAGAS

Spain | Gas Utilities

DANSKE BANK

Denmark | Banks

STARHUB

Singapore | Wireless Telecom Services

RECKITT BENCKISER GROUP

United Kingdom | Household Products

CITY DEVELOPMENTS

Singapore | Real Estate Management & Development

Source: Corporate Knights. 2016 Global 100 Most Sustainable Corporations in the World Index.

²⁹ 2degrees Sustainable Business Trends Tracker Website. <http://ow.ly/IqG2306BEdt>

“When you are not a startup, you need to have a separate part of the company for disruptive innovation.”

Vivek Ramchandani, Head of Discovery Labs, MAS Innovation

“It’s important to understand what’s going on in the world. Disruption doesn’t necessarily come from your existing competitors; they may not be the ones that will disrupt you.”

Ranil Vitarana, Chief Technology Officer, MAS Holdings

Oh Bee Lock, Head of Group Technology at PSA International, a global port operator headquartered in Singapore, brought up the cost considerations when operating in competitive markets. “In B2B, one of the challenges you face is whether the customer is ready to work with you on sustainability, especially in industries where they are primarily concerned with their own survival.”

Global supply chains

MAS Holdings’ Chief Technology Officer Ranil Vitarana pointed to the challenge of identifying and reducing companies’ environmental footprints across their supply chains. “You’d have to change the whole supply chain,” he said. Supply chains, which are integral to the company’s business operations, are complex, and involve relationships that aren’t always transparent. Identifying suppliers that match one’s business needs and sustainability values can be challenging.

Many global companies, however, have the resources and expertise to help their suppliers become sustainable. Unilever, for example, not only maps and manages water and climate risk in its supply chain, but is also working with its agricultural suppliers on better irrigation techniques to reduce the water used to grow their crops, especially in water-scarce countries.³⁰

Innovation

The increasing environmental pressures facing businesses present great market opportunities to innovate and drive growth. But large, established companies are notoriously bad at new-market creation. “As companies mature,” said Lenox, “their core capabilities become core rigidities. What made you successful becomes your disadvantage.”

Innovation is a messy, complex process, and the additional constraints of sustainable development only make it more so. Nevertheless, faced with increasing pressure to consider sustainable development, leading organizations are investing in innovation and are revising their business models.

Walmart, for instance, has pledged to become 100% powered by renewable energy and has an aspirational goal of achieving zero waste across its global operations.³¹ Dell promised to reduce emissions from its facilities and logistics operations by 50% by 2020 over 2011 levels and reduce the energy intensity of their product portfolio 80% by 2020.³²

³⁰ Unilever’s Sustainable Living Plan Website. <http://ow.ly/xo0y306Z7Tw>

³¹ Walmart Website. <http://ow.ly/fCjG306Z7ZQ>

³² World Resource Institute. 2015. “114 Companies Commit to Set Ambitious Science-Based Emissions Reduction Targets, Surpassing Goal.” <http://ow.ly/dGhS306Z8f0>

Some experts, including Lenox, believe that in order to change the present unsustainable industrial patterns we need to unleash the Schumpeterian “gales of creative destruction” and transform the economy. According to this line of reasoning, incremental innovation is not enough to meet our sustainable development needs. What’s required is competency-destroying radical innovation.³³ This will offer opportunities for new entrants and potential threats for the incumbents unless they demonstrate solid sustainability performance.

Are companies ready for radical, disruptive, “green” innovation?

As Temasek’s Alan Thompson put it, “It’s hard to disrupt yourself.”

One of the biggest challenges in pursuing disruptive innovation is, to quote Vitarana, “getting the rest of management on board.” There are many reasons for that. “Management is used to the status quo,” said Vitarana. In addition, executives are not measured on their environmental performance, and, as Vitarana put it, “people react to the way they are measured.”

Final Thoughts

THERE IS MOUNTING EVIDENCE that the current sustainability crisis calls for a global shift toward renewable energy sources and the low-carbon economy. Neither government nor business—nor any other single stakeholder—can address these challenges alone, but business must be part of the solution, for its own sake and for the sake of society as a whole.

The private sector has a critical role to play through the development of innovative solutions to the global climate and energy crisis. Innovation requires an investment of time and capital, and business has a track record of combining innovation capabilities with access to finance.

Many leading companies view sustainability as innovation’s new frontier—a rich source of technological and organizational innovations that result in both bottom-line and top-line returns. They are shifting into high gear. Others are playing catch-up. And many struggle, because the journey to sustainability is not easy. However, early movers with a clear vision and commitment can develop the competencies that will put them way ahead of the competition.

³³ Hall, Jeremy, and Harrie Vrendenburg. 2003. “The Challenges of Innovating for Sustainable Development.” *MIT Sloan Management Review*. 45(1): 61-68.

ESSENTIAL READING

Embedded Sustainability: The Next Big Competitive Advantage.

Chris Laszlo and Nadya Zhexembayeva. Stanford University Press. Stanford, CA. 2011.

The Market for Virtue: The Potential and Limits of Corporate Social Responsibility.

David Vogel. Brookings Institution Press. Washington, DC. 2006.

The Necessary Revolution: How Individuals And Organizations Are Working Together to Create a Sustainable World.

Peter M. Senge, et al. Broadway Books. New York, NY. 2008.

Sustainability by Design: A Subversive Strategy for Transforming Our Consumer Culture.

John R. Ehrenfeld. Yale University Press. New Haven, CT. 2009.

SIMULATIONS FOR GROUP LEARNING

World Climate: Negotiating a Global Climate Change Agreement

mitsloan.mit.edu/LearningEdge/simulations/worldclimate/Pages/default.aspx

Online Tools and Simulations from Climate Interactive

climateinteractive.org/tools/

ACKNOWLEDGMENTS

Portions of this briefing came from Prof. Lenox’s book on innovating for sustainability, forthcoming in 2018 from Stanford University Press.

THE GLOBAL INNOVATORS' ROUNDTABLE

For the past six years, executives from some of the world's largest and most innovative companies have been getting together to talk about innovation in an interactive and candid environment. They are members of the **Global Innovators' Roundtable**, an initiative of Darden's Batten Institute for Entrepreneurship and Innovation. Led by Darden's top-ranked faculty, they explore the latest research on corporate innovation, share best practices, and discuss common challenges.

The ninth roundtable, co-hosted by the Batten Institute and Temasek Management Services' TMS Academy, on 4 October 2016 in Singapore brought together executives from seven corporations based in Singapore, Sri Lanka and China. This *Batten Briefing* expands on the themes that emerged during the discussions facilitated by **Professor Michael J. Lenox**.

Future roundtables will convene in Washington, DC, the Bay Area, India, China and other locations.

COPYRIGHT INFORMATION

BATTEN BRIEFINGS, March, 2017. Published by the Batten Institute at the Darden School of Business, 100 Darden Boulevard, Charlottesville, VA 22903.

email: batten@darden.virginia.edu
www.batteninstitute.org

©2017 The Darden School Foundation.
All rights reserved.

CORPORATE MEMBERS

ASIA TMT

Matthew Aujla,
Principal

PSA INTERNATIONAL

Oh Bee Lock,
Head of Group Technology

TEMASEK INTERNATIONAL

Lim Fung Jen,
Managing Director, Corporate Finance

Tan Suan Swee,
Managing Director, Investments

Alan Thompson,
Managing Director, Private Equity Fund
Investments and Enterprise
Development Group

BOM QUOTE MANUFACTURING

Bob Jordan,
Chief Executive Officer

PEDRA TECHNOLOGY

Kareen Looi,
Chief Executive Officer

SINGAPORE AIRLINES

Ng Yung Han,
Vice President, Product Innovation

MAS HOLDINGS

Ranil Vitarana,
Chief Technology Officer

Vivek Ramchandani,
Head of Discovery Labs

DARDEN FACULTY LEADER

Michael J. Lenox
Tayloe Murphy Professor of Business Administration
Senior Associate Dean and Chief Strategy Officer