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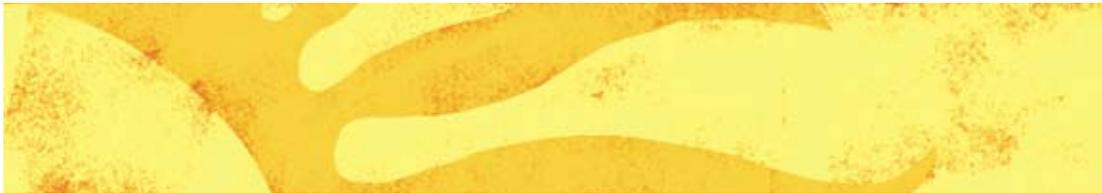
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How climate change could affect **corporate valuations**

Efforts to reduce climate change can profoundly affect the valuations of many companies, but executives so far seem largely unaware.

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Nick Hoffman, and
Jeremy M. Oppenheim**

As global warming spawns new regulations, technological remedies, and shifts in consumer behavior, its effect on the valuations of many sectors and companies is likely to be profound. The shocks to some industries could be severe—potentially as severe as, for example, the effect of the introduction of wireless telephony on the telecommunications sector during the 1990s and of shifting oil prices on the oil and gas sector during the 1970s and 1980s. Yet executives have so far paid scant attention, either because they don't understand the effects of climate change on their businesses or they believe them to be too uncertain or distant to model.

To gauge, even at this early stage, the stress that climate change will place on the cash flows of large public companies, we assessed the impact of a series of carbon mitigation scenarios on benchmark companies in six sectors.¹ The change in cash flows—compared with a business-as-usual scenario, but without explicitly considering the responses of individual companies over time—indicates how much pressure efforts to reduce carbon emissions will exert on valuations and how much volatility a sector's current business systems will face. Such an analysis *cannot*, however, predict the actual impact on cash flows, valuations, or share prices.

Not surprising, we found that carbon-abatement efforts will put dramatically different levels of stress on the cash flows and valuations of different industries. The level of change for individual public companies within a given sector could of course substantially exceed the average, depending on their current position and their ability to respond to new technologies, changes in consumer behavior, and regulation.

Varying levels of stress

We assessed company cash flows in each industry in three scenarios: a business-as-usual scenario, a scenario involving the greatest degree of change executives can now imagine

¹The six sectors are aluminum, automotive, beer, construction, consumer electronics, and oil and gas. We tested their sensitivity to three levers for reducing emissions (regulatory moves, technological shocks, and shifts in consumer demand) and analyzed the potential impact of climate change events on the cash flows and 2008 net present value (NPV) of an archetype company in each sector under different climate change scenarios and assuming different climate change drivers and levels of impact. The events that might take place in these companies and sectors were examined in the short term (2008–11), the medium term (2011–16), and the longer term (2016 onward) in the context of their carbon intensity, geographic footprint, and ability to pass through costs and to redeploy capital.

(the executive scenario), and a scenario that many scientists believe would be required to stave off a high likelihood of catastrophic climate change–related events (the experts’ scenario). We chose a basket of six industries to understand how the impact could vary. In some industries, the mitigation of climate change will become a significant corporate-investment theme, either creating fundamental shifts in demand or leading to new competitive dynamics and business models. In others, cash flows will be less stressed as short-term cost pressures are passed through to customers, thus allowing profit margins to revert to average levels in the longer run (Exhibit 1). The nature of the impact will depend on whether an industry shows underlying structural resilience or experiences fundamental shifts in demand or significantly changed competitive dynamics.

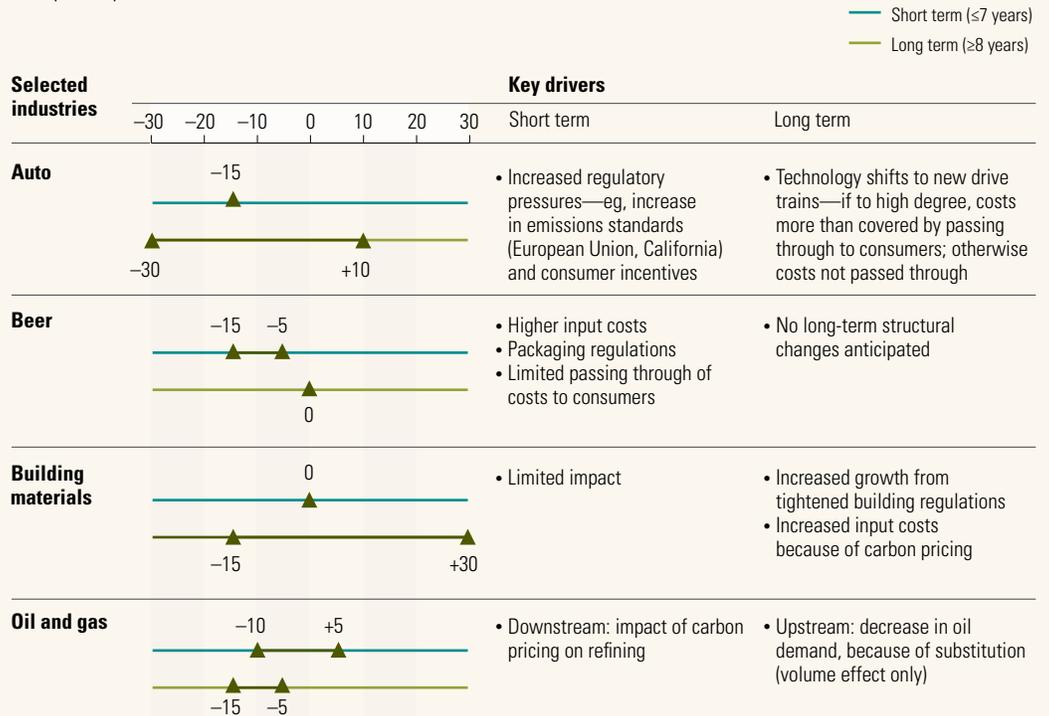
Fundamental demand shifts

In some industries, shifts in demand will have a broadly negative impact on company cash flows and therefore valuations. Oil and gas consumption, for example, would have to decrease by an average of around 0.2 percent a year from now until 2030 to meet emission reduction targets associated with success in stabilizing greenhouse gases. The upstream oil and gas industry would therefore experience falling demand over the long term (2016 and beyond) as the economy shifts toward cleaner sources of energy (including solar, wind, and carbon capture and storage), and as oil-consuming sectors (such as automotive and power generation) increase their emphasis on energy efficiency. Upstream companies could experience falling production and sales volumes by 2015, with a

Exhibit 1
Opportunity or threat?

Climate change will have a major effect on shareholder value in many, but not all, sectors.

Potential impact on industry valuation of carbon-abatement measures, given level of changes currently anticipated by executives, %



substantial impact on cash flows. If that happened, valuations would fall by around 5 percent in the executive scenario and by around 15 percent in the experts' scenario. The potential impact on value is relatively low because of the short-term nature of the valuations of upstream companies—which mostly reflect their current high-yielding discovered and developed reserves. These have an average lifespan of 10 to 15 years and will be largely depleted by the end of the next decade. The value of the cash flows affected could fall further if a dramatic decline in demand pushed down prices.

By contrast, other industries could enjoy considerable gains. Companies in the building-materials sector—particularly those that do business in places where building efficiency is not yet a major issue—will probably benefit from rising demand for improved energy efficiency and insulation products, which will increase their cash flows. In developed economies, more stringent building standards are already creating demand for such offerings, and the same thing will happen in developing markets as well. Analysts are already calculating the impact on demand of existing regulations and factoring it into company valuations. As compared with the business-as-usual scenario, the valuation of a representative building-materials company in the developed world increases by 35 percent in the executive scenario and by 80 percent in the experts' one. If more stringent regulatory measures do not materialize, valuations could fall by 10 to 20 percent as a result of possible short-term cost pressures.

Changing competitive dynamics
Efforts to offset climate change will structurally transform certain sectors—including automotive and aluminum—which will experience more volatile returns and increased

rates of entry and exit as new technologies or regulatory restrictions emerge and the competitive landscape changes.² The way a company reacts to changing technologies and business systems will determine its performance.

In the automotive sector, novel technologies will create new competitive dynamics and transform business systems in the next one to five years. Cash flows could be affected both positively and negatively. In the short term, tighter emission standards will have an impact on the mix of cars sold, helping manufacturers with lineups of smaller, more fuel- and emission-efficient cars. Such standards will affect the margins of both winners and losers and thus their cash flows and valuations, which may already reflect some potential changes in value.

Changed fuel efficiency and emissions standards, combined with high oil prices, will spur the introduction of new drivetrain technologies, such as electric and hydrogen, which could start to reach scale by 2015.³ A number of competing technologies, including more efficient internal-combustion engines and hybrids, will be introduced, and so will vehicles powered by compressed natural gas, hydrogen, or electricity. The impact on valuations will depend both on which of these proves dominant and on the ability of the automotive OEMs to pass along the costs of new technologies and parts to consumers or to capture value from other segments of the value chain.

While the actual impact on industry valuations is highly uncertain, it is not unimaginable that its discounted value could rise by 10 percent as compared with the business-as-usual scenario if the electric or hydrogen technologies become dominant, in combination with a new and cheaper way of generating power, which

²During similar periods of discontinuity in other sectors in the past, levels of entry and exit rose significantly. As the telecom sector moved to wireless, for example, only 17 of the top 30 global telecom companies (by market capitalization) in 1997 were still in the top 30 in 2007.

³In some scenarios, 1 percent of global penetration by 2015.

Exhibit 2

Winners and losers

Regional regulatory differences and the access of companies in some regions to cheaper power will make margins within the primary aluminum industry more volatile, creating both winners and losers.

Impact on EBITDA¹ in primary aluminum industry from introduction of direct emission costs and increases in carbon pricing

Hypothetical event: Direct emission costs are introduced in European Union, and cost of carbon increases to \$55 (from \$25) per metric ton in 2013. Increased costs are not passed through to EU customers, as marginal prices are set outside region. Primary producers in Asia, North Africa, Middle East, and rest of world are not yet subject to direct emission costs.²



¹EBITDA = earnings before interest, taxes, depreciation, and amortization.

²In a scenario in which aluminium prices increase to reflect additional carbon-related costs (ie, costs are fully passed through to consumers), EBITDA margins of benchmark and losing companies will remain constant while EBITDA margin of winning companies will rise from 28 to 40%.

could let OEMs raise margins by charging higher prices. Certain types of regulatory interventions, however, could raise the industry's costs, with no concurrent price offsets. In that case, the industry's value could fall by as much as 65 percent. Nonetheless, well-positioned players with clear leadership in technologies and products should always be able to outperform their competitors.

In the aluminum industry, carbon reduction efforts will affect the cash flows and valuations of primary aluminum producers in three ways:

- *Direct effects.* Although the aluminum industry does not face direct emissions costs at present, they may be introduced in the European Union under phase III of the EU Emissions Trading Scheme. The impact on valuations will depend on carbon pricing and the extent to which the industry receives free emission allowances. Without any subsidies or offsets, a carbon price of \$55 per metric ton would raise production costs by 11 percent.⁴
- *Indirect effects.* Since energy represents more than 30 percent of the costs of

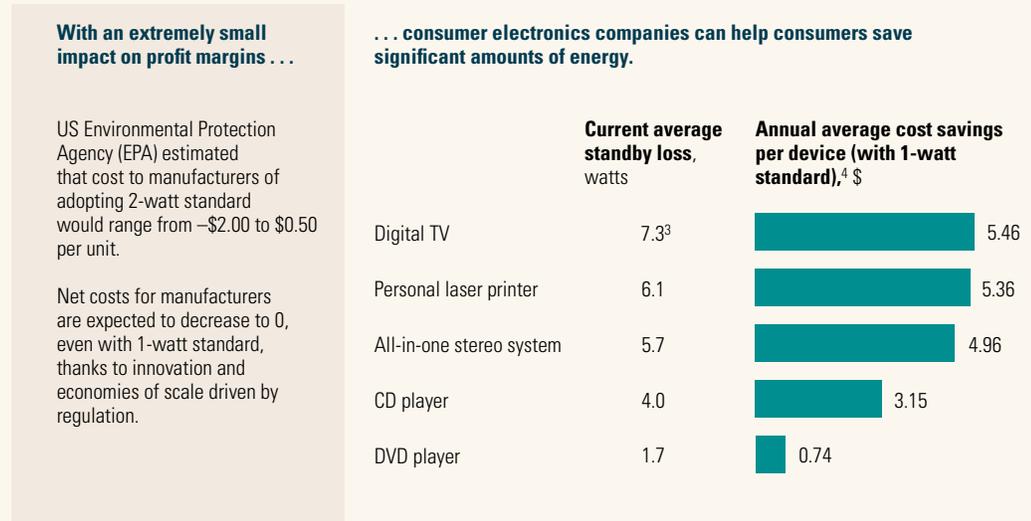
⁴Based on initial cash production costs of \$1,853 per metric ton.

Exhibit 3

Lower consumption, lower costs

Stringent standards in the consumer electronics industry would reduce energy consumption and even reduce costs.

Consumer cost savings from adoption of 1-watt standby standard¹ (based on implementation in California)²



¹Reduction of power consumption for device on standby to ≤ 1 watt.

²In 2006, California had 45% higher residential electricity prices (\$0.15 per kWh) than US average but lower than EU.

³Based on CNET.com energy-consumption test of 53 popular digital TV models in United States in 2006.

⁴Assumes product in use 20% of time, except for TVs (in use 30% of time); does not account for any efficiency savings while in use.

Source: Australian National Appliance & Equipment Energy Efficiency Committee; Consumer Electronics Association; Energy Information Administration, US Department of Energy; IDC; Nielsen; US Environmental Protection Agency; McKinsey analysis

primary aluminum producers, more expensive power from higher carbon pricing will put significant pressure on margins. Without any subsidies or offsets, for example, a carbon price of \$55 per metric ton would raise production costs by 17 percent.

- *Changing demand.* As cars become lighter to reduce emissions, demand for aluminum from the automotive sector is expected to rise. This increase, however, may be offset by lower demand from the packaging industry (as a result, for instance, of stricter regulation of nonreturnable containers) and by a shift toward the use of secondary aluminum from increased recycling. If carbon emissions are strictly limited, demand for primary aluminum may fall dramatically as less-energy-intensive materials replace it.

Regional regulatory differences and the access of companies in some areas to cheaper power will make margins in the primary-aluminum industry more volatile, creating both winners and losers. In the short to medium term, efforts to reduce carbon emissions will probably exacerbate the margin differentials between players with facilities in Asia, the Middle East, and North Africa, on the one hand, and in Europe (and potentially North America), on the other (Exhibit 2). Take, for example, a company with only coal-powered European production facilities. If carbon prices increase to \$55 per metric ton, from \$25, but the price of aluminum doesn't increase to cover them, the company's EBITDA⁵ margins would fall to 7 percent, from 19 percent.

In the long term, however, the short- to medium-term advantage enjoyed by alumi-

⁵Earnings before interest, taxes, depreciation, and amortization.

num producers in lower-cost regions like China, the Middle East, and North Africa will probably fall: the global standardization of carbon costs will erode margin differentials.

Structural resilience

Some sectors will experience minimal long-term stress from carbon-abatement efforts: they will be able to pass along any short-term cost pressures to customers and will not face substitution by other products or significant shifts in demand. In such cases, profit margins would revert to average levels over the medium to long term. The consumer electronics industry, for example, will probably have the technology to deal with regulation in a way that will not harm the bottom line.

Consumer electronics represents a large and growing portion of residential electricity demand. Using technologies that exist today, the industry can make its products dramatically more efficient at low and diminishing costs (Exhibit 3). We expect increased efficiency-improvement pressures, including limits on standby and active power consumption, as well as efficiency-labeling requirements. The overall impact on the value of the industry will in our view be limited. Some of its revenue and margin opportunities could have a positive impact of up to 10 percent on its discounted cash flows in the executive scenario, or up to 35 percent in the experts' one. Higher costs that could reduce the industry's value by 7 percent could, however, offset these opportunities.

The value of preparation

Much uncertainty remains over the course of regulation and the pace of change for the other climate change-related forces, such as technology, that will influence abatement levels. The value of companies is likely

to change as these factors start to affect their performance. The immediate impact on cash flows (and therefore discounted valuations) might be limited, but it will eventually be significant in some industries.

As nations and companies start acting more aggressively to reduce carbon emissions, major shifts in the valuations of sectors and companies will start to become clearer and more predictable. Over the next 18 to 24 months, a number of regulatory and policy events, such as the December 2009 Copenhagen conference to replace the Kyoto treaty, will probably reduce the uncertainty and spark a rethinking of how carbon reduction efforts will affect valuations across a wide range of industries.

Several steps can help companies and their executives as they start to position themselves to thrive in a low-carbon economy.

Assess the impact of abatement efforts

A critical first step is reviewing a company's exposure to regulatory measures (such as carbon pricing, new standards, taxes, and subsidies), new technology, and changes in consumer behavior. In our experience, the strategy mind-set required for this analysis doesn't come naturally to most executives. They will have to ask themselves, for example, how specific changes would affect a company's competitive position if other companies adopted new business models or how a company can gain a competitive edge by moving more quickly.

Strengthen regulatory capabilities

Companies should ensure that they have a consistent strategy, informed by analysis, to participate in regulatory-policy discussions and to engage with policy makers effectively and coherently across business units. The best companies will bring public and private stakeholders together to shape

the regulatory environment—both policy principles and specific regulations—so that socially efficient solutions are also economically attractive.

Build capabilities to deal with uncertainty
The type of analysis we have conducted only scratches the surface of what is possible. Sophisticated scenario-planning techniques can give managers an overall view of how the economy—and their markets, in particular—might evolve under different climate change outcomes. Many companies will succeed in managing the major transformations their sectors face only if they invest in generating more sophisticated forecasts and deeper insights into climate change–related developments.

Adjust investment review processes
In accordance with the realities of climate change, decisions about new corporate investments should be geared toward carbon- and energy-efficient technologies that will remain competitive over investment life cycles. As part of a portfolio of options, companies may find it necessary to make bets (in new technologies, for example) that are specifically related to climate change.

Develop new external links
Venture capital firms, universities, and scientists are logical starting points in efforts to build external networks that can help

companies understand and manage the impact of climate change. In the hope of developing new solutions, some companies in the electric-car segment, for instance, are creating consortia that include power companies, suppliers of high-tech car batteries, and local governments.

Review investor relations
Companies will need to focus on how and when to signal the value of their climate change bets so that investors can assess them. Each company will have to explain its overall level of preparedness for the future, the way climate change–related events could affect its specific cash flows, and what differentiates it from its competitors in these respects.

So far, companies have had limited success in communicating their climate change–related activities, often because these moves form only a small part of a larger portfolio. In 2008, for example, the Spanish power generator Iberdrola spun off part of its renewables division—among other reasons, to access greater value. BP has looked for ways to realize the value of its alternative-energy investments, proposing a partial flotation. However, very few public companies have succeeded in explaining the more deeply hidden effects of climate change on their cash flows and competitive strategies. **MoF**

This article is based on a project that McKinsey undertook jointly with the Carbon Trust during the spring of 2008 to assess the impact of climate change on investments. In September 2008, the Carbon Trust published a long report on that subject, titled “Climate change: A business revolution?” It is available at www.carbontrust.com.

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