ESG Industry Report Card: Technology

February 11, 2020

Key Takeaways

- We view the global technology sector as having above-average exposure to social risks in the hardware and semiconductor sectors, as well as in software and services.
- Privacy and data security concerns are key for software and services since many technology companies collect, manage, and monetize sensitive information for corporations and individuals at risk of misuse.
- The hardware and semiconductor subsectors are more exposed to social risks, such as criticism over labor management, poor working conditions, and lax occupational safety standards, particularly in Asia.
- Environmental risk to credit ratings is below average for software and services, but above average for hardware sectors, in our view. In particular, data centers face environmental concerns because of their large energy consumption, mitigated by efforts to improve energy efficiency.
- Hardware and semiconductor companies' supply chains require mining of precious metals and rare earth elements to produce electronic components. Production also requires large volumes of ultrapure water; wastewater contains high amounts of heavy metals and toxic chemicals.

PRIMARY CREDIT ANALYSTS

David T Tsui, CFA, CPA
San Francisco
(1) 212-438-2138
david.tsui
@spglobal.com

Steven D Mcdonald, CFA
New York
(1) 212-438-1536
steven.mcdonald
@spglobal.com

Alison M Sullivan, CFA
New York
(1) 212-438-3007
alison.sullivan
@spglobal.com

Mark Habib
Paris
(33) 1-4420-6736
mark.habib
@spglobal.com

Raymond Hsu, CFA
Taipei
(8862) 8722-5827
raymond.hsu
@spglobal.com

Makiko Yoshimura
Tokyo
(81) 3-4550-8368
makiko.yoshimura
@spglobal.com

Analytic Approach

Environmental, social, and governance (ESG) risks and opportunities can affect an entity's capacity to meet its financial commitments in many ways. S&P Global Ratings incorporates these considerations into its ratings methodology and analytics, which enables analysts to factor in short-, medium-, and long-term impacts--both qualitative and quantitative--to multiple steps of their credit analysis. Strong ESG credentials do not necessarily indicate strong creditworthiness ("The Role Of Environmental, Social, And Governance Credit Factors In Our Ratings Analysis," published Sept. 12, 2019).

Our ESG report cards qualitatively explore the relative exposures (average, below, above average) of sectors to environmental and social credit factors over the short, medium, and long term. For environmental exposures, Chart 1 shows a more granular listing of key sectors and (in some cases) subsectors reflecting the qualitative views of our analytical rating teams. This sector comparison

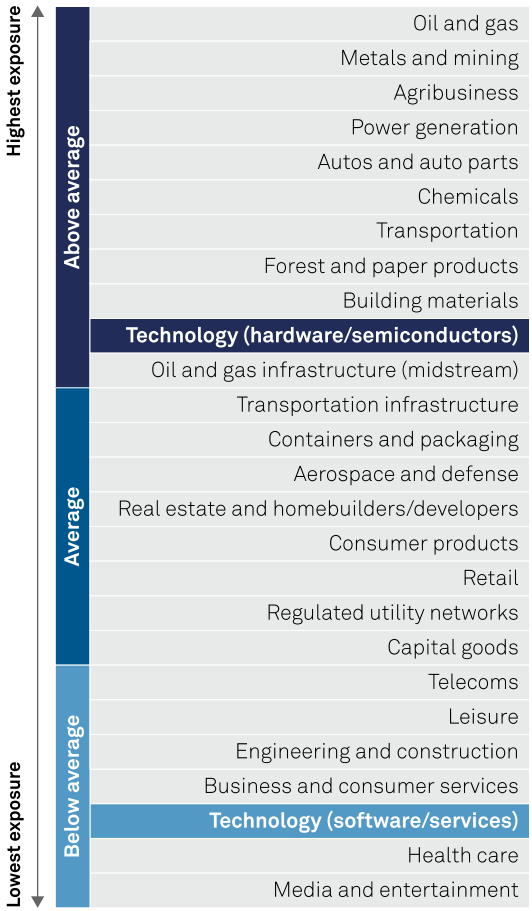
is not an input to our credit ratings and not a component of our credit rating methodologies; it is based on our current qualitative, forward-looking opinion of credit risks across sectors.

In addition to our sector views, this report card lists ESG insights for individual companies, including how and why ESG factors may have had a more positive or negative influence on an entity's credit quality compared to sector peers or the broader sector. These comparative views of environmental and social risks are qualitative and established by analysts during industry portfolio discussions, with the goal of providing more insight and transparency.

Environmental risks we considered include greenhouse gas (GHG) emissions, including carbon dioxide, pollution, and waste, water and land usage, and natural conditions (physical climate, including extreme and changing weather conditions, though these tend to be more geographic/entity-specific than a sector feature). Social risks include human capital management, safety management, community impacts, and consumer-related impacts from customer service and changing behavior to the extent influenced by environmental, health, human rights, and privacy (but excluding changes resulting from broader demographic, technological, or other disruptive industry trends). Our views on governance are directly embedded in our rating methodology as part of the management and governance assessment score.

Chart 1

Qualitative Sector Listing Of Relative Environmental Exposure: Technology
Greenhouse gas emissions, waste, pollution, and land use



Source: S&P Global Ratings.
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The list of entities covered in this report is not exhaustive. We may provide additional ESG insights in individual company analyses throughout the year as they change or develop, with companies expected to increasingly focus on ESG in their communication and strategy updates.

Software And Services

Environmental exposure

Companies in the software and services industry have limited use of physical infrastructure or facilities, and most do not have manufacturing operations. Overall, they produce lower GHG emissions, pollution, or environmental waste, and have low land and water use. However, companies that operate data centers or provide hosting services carry more significant risk exposure to GHG emissions. As companies increasingly rely on cloud computing to offload the data and services consumers use, in social media and gaming in particular, they have an exponentially increasing need for computing and data storage. Data centers consume large amounts of energy. Mitigating factors include greater environmental risk awareness, leading data center companies to improve their energy efficiency, use environmentally friendly Leadership in Energy and Environmental Design (LEED)-certified buildings, and increase renewables in their energy mix.

Social exposure

In our view, the most relevant social risks in this sector are privacy and data security because many technology companies collect, manage, and monetize sensitive information for corporations and individuals at risk of misuse. Data security breaches can cause significant reputational and monetary damage to companies, weakening their credit risk profile because their competitive position could be harmed and, in turn, hurt revenue and profitability. Moreover, these concerns could invite increased regulatory scrutiny, which could lead to a more restrictive business environment and additional operational costs to comply.

Other important social risk factors include gender inequality, lack of workforce diversity as it affects employee turnover, and talent retention critical to tech firms' intellectual property (IP).

Hardware And Semiconductors

Environmental exposure

Environmental risk is more relevant for hardware and semiconductor companies in the broader technology sector because of significant exposure to water and waste management. Manufacturing semiconductors requires large volumes of ultrapure water. As water becomes scarcer around the globe, robust management of water usage is key to avoiding higher supply costs and potential loss of access to water-scarce areas. This could disrupt production and affect revenues.

Wastewater generated in the production process contains high amounts of heavy metals and toxic chemicals, often requiring high clean-up costs. Higher operating costs and capital expenditures to deal with hazardous waste, as well as poor management of waste disposal can also put companies at higher risk of regulatory fines.

Given the outsourcing of manufacturing activities by most tech hardware and semiconductor companies in recent decades, GHG emission, waste disposal, and other hazardous waste concerns transfer to their vast supply chain partners. However, as hardware original equipment manufacturers (OEMs) and semiconductor design firms have significant influence over the manufacturing process, regulatory and industry emphasis has increased on these companies' efforts to establish, implement, and enforce best practices to mitigate their scope 1 (direct emissions from owned or controlled sources), scope 2 (indirect emissions from generation of purchased energy), and scope 3 (all indirect emissions not included in scope 2) impact in their supply chain networks. Furthermore, because many manufacturing operations are outsourced to Asia-Pacific, the tech hardware and semiconductor global supply chain is more exposed to chronic or acute natural events such as floods and earthquakes. For example, severe flooding across Thailand in November 2011 significantly disrupted the manufacturing of hard disk drives, a crucial component for personal computers, causing global industry supply shortages and elevated component costs for almost two years. Not only did it hurt vendors' financial performance, it lowered unit sales of PC and storage systems, weakening those vendors' credit profiles.

While it's often difficult to assess the associated costs that pressure hardware and semiconductor companies' operating margins and operating cash flow generation, we believe their efforts to mitigate environmental risk exposure should help protect brand value and avoid unnecessary cost increases stemming from supply chain disruptions, brand damage, regulatory fines, or litigation.

Another important issue for the industry is product lifecycle management and e-waste. The high turnover rate for electronic equipment fueled by innovation and fashion trends has created an ever growing challenge for dealing with the end-of-life product disposal. Robust product life cycle management programs can help companies mitigate increased regulatory costs and realize cost savings by recovering precious and rare earth metals by recycling electronic equipment.

Social exposure

Electronics manufacturers face high scrutiny and criticism over human capital management. Long hours, poor working conditions, and lax occupational safety standards are major areas of concern, particularly in Asia. Improving working conditions and labor relations can help increase productivity and avoid production disruptions and work stoppages, which could affect sales volumes and revenues. It can also prevent reputational damage and fines linked to labor-related scandals.

There is also social risk exposure in the supply chain. Precious metals and rare earth elements such as tin, tantalum, tungsten, gold, and cobalt are mined, often in geopolitically unstable areas. Cobalt, for instance, a crucial component for lithium-ion batteries, is mostly mined in the Democratic Republic of Congo, where child and forced labor are common. Robust management of labor risks and adherence to international covenants on human rights throughout the supply chain can help mitigate production disruptions and avoid costly scandals, which can cost companies their social licenses to operate.

Governance

Overall, governance is company-specific because it usually reflects corporate culture, strategy, and ownership structure. At the sector level, certain technology companies have a dual-class ownership structure that favors founders with super-voting power and antitrust disputes.

Founder-led companies with super-voting power can reduce the board's effectiveness; however, it

isn't necessarily a weakness because in many instances founder-led companies can pursue longer-term growth objectives by prioritizing corporate culture and product innovations rather than short-term shareholder remuneration. Companies must take steps to manage their key-person risk when the founder's presence, absence, or behavior hinders performance. Some technology companies also have excessive executive compensation practices to ensure that incentives are well aligned with corporate strategy and do not encourage unnecessary risk-taking.

Litigation, specifically antitrust disputes, are common in IP-centric segments of the technology sector, such as software applications, hardware devices, and semiconductor designs. Legal infractions can disrupt and threaten an organization's long-term survival, so they're an important factor in our credit rating assessment.

ESG Risks In Software and Services

Table 1

Company/Rating/Comments	Analyst
Alibaba Group Holding Ltd. (A+/Stable)	**Cliff Kurz**
Social risks are key for Alibaba, while environmental risks have less impact in our rating assessment. The most significant social factors are the assurance of safety and fraud prevention for transactions on its platforms, and the protection of user data and privacy. Consumers' trust in Alibaba's core e-commerce platforms, Tmall and Taobao, are critical to its success. Preventing fraudulent transactions, ensuring payment security, and security of user and merchant data are key concerns. To counter these risks, Alibaba uses algorithms to detect and remove high-risk merchants and product listings from its platform, and sophisticated encryption technology to protect transactions conducted through Alipay (an online payment platform operated by Ant Financial). To ensure the security of its user and merchant data, Alibaba employs various measures including strict information-sharing protocols across its affiliates. We believe Alibaba has good governance, with balanced oversight between firm partners, major shareholders including Softbank, and independent directors. The board is well represented by six executive directors and five independent directors.	
Alphabet Inc. (AA+/Stable/A-1+)	**Chris Frank**
Alphabet's credit quality is more exposed to social factors than are global peers, with increasing regulatory scrutiny in the U.S. and Europe. In the U.S., the Department of Justice, House Judiciary Committee, and 51 state and territorial attorneys general are investigating the company for antitrust violations. Various presidential candidates advocate breaking up big tech firms. In our view, actions against Alphabet are likely to take several years, but a breakup is unlikely. We think fines and changes to business practices are much more likely outcomes, which we believe the company would manage within the current rating, given its large cash balance and flexible business models. Increased antitrust scrutiny could make acquisitions more difficult, potentially limiting a key tool that would allow Alphabet to enter new markets and diversify its business. Additionally, politicians of both major parties have proposed modifying rules that limit liability of platforms for user-generated content. If these safe harbor protections were revoked, it would open the possibility for more litigation. In Europe, the European Commission (EC) issued fines totaling €8.2 billion in three cases in which it found the company infringed on European competition law related to AdSense for Search, Android distribution agreements, and display and ranking of shopping search results. Alphabet is appealing, but it has previously recognized these expenses and maintains an accrued liability, which it would have to pay if the matters are resolved against the company. In the privacy area, since it came to light that Cambridge Analytica gained access to millions of Facebook users' data, we believe the public may be reconsidering how much data it shares with digital advertising platforms, and politicians across the globe may be considering regulatory actions that will also affect Alphabet's business. In May 2018, the European Union (EU) implemented the General Data Protection Regulation, creating new compliance obligations aimed at giving EU residents more control over their personal data. This added costs and could cause Alphabet to change its business strategies. Violations could carry fines up to 4% of global annual turnover for the preceding financial year for the most serious infringements. U.S. federal and state lawmakers could adopt similar regulations, as California has done. Increasing transnational, national, state, and local privacy regulations would increase the cost and complexity of managing Alphabet's businesses. Co-founders CEO Larry Page and President Sergey Brin together control 51% of the voting power through their super-voting Class B shares, based on ownership as of April 22, 2019. Despite their good track record of leading the business, we think this structure, combined with their propensity to make big bets, increases the risk of a credit-negative, high-impact, low-probability event.	
Atos SE (BBB+/Stable)	**Thierry Guermann**
Atos' exposure to environmental and social risks are comparable to those of the broader software sector. These center on possible cyberattacks, security breaches, and customer data leakage. If data is mismanaged, Atos could face significant litigation, monetary damages, claims from customers, or fines. However, we are not aware of any recent material breaches and believe Atos complies with laws and best practice in this regard. For instance, Atos implemented a computer security incident response team to manage security events and incidents worldwide. We assess Atos' exposure to environmental risk factors to be low. We note that it took steps to lower carbon emissions from its data centers. We view the company's management and governance as satisfactory, reflecting our positive view of its strategic planning and risk management process. Atos ensures that its suppliers and partners adhere to its ethics and compliance policy, which helps mitigate the risk of human rights violations, environmental damage, and health and safety problems in its supply chain.	

Capgemini SE (BBB+/Watch Neg) — **Thibaud Laguache**

Capgemini's exposure to environmental and social risk factors is comparable the broader software sector. Risks mostly encompass social issues that we believe have a high potential to affect earnings, such as reputational damage, information security, and data protection. To our knowledge, Capgemini complies with all laws and regulations to protect customers' and personal data. We believe Capgemini positioned itself well to mitigate social risks. For example, it runs programs like its workforce health and safety management program and diversity initiatives to foster gender diversity and promote ethics. The company aims for 30% of executive leadership and 40% of its total workforce to be women. Additionally, Capgemini, like its competitors, requires suppliers to adhere to high standards on the environment, labor, health and safety, ethics, and management systems, an important risk-mitigating factor.

Dassault Systèmes SE (A-/Stable) — **Thibaud Laguache**

Dassault Systèmes' exposure to environmental and social risk factors is comparable the broader software sector. Environmental risks can support Dassault Systèmes' business as its helps industrial customers reduce their environmental footprint. The company's business is by design focused on virtual simulation of products and processes ahead of implementation, so customers can eliminate waste, reduce mistakes from production to end-of-life disposal, and optimize products, manufacturing, and processes, while reducing raw materials and energy consumption.

Finastra Ltd. (B-/Stable) — **Sebastian Sundvik**

We assess Finastra's management and governance as fair, and we consider it to be more exposed to governance risk factors than its peers. This is because its high recent management turnover and relative lack of board independence reflect strategic shifts and execution issues. Finastra (formerly Misys) has had three chief financial officers (CFO) in the past five years, with Mark Miller joining in May 2019. CEO Simon Paris joined in June 2018. In addition, Finastra's board, composed of two representatives of the controlling financial sponsor (Vista Partners) along with the CEO, CFO, and chief operating officer, contains no independent directors. This is partly mitigated by the appointment of independent directors on the board of owner Tahoe Topco Ltd. in May 2018. Finastra's management discontinuity, coupled with a lack of independent board representation to provide effective oversight, coincided with a failed IPO in 2016 and subsequent aggressive leveraged buyout of D+H in 2017.

International Business Machines Corp. (A/Negative/A-1) — **David Tsui**

IBM's exposure to environmental and social risk factors are comparable to those of the broader technology sector. These factors may include carbon dioxide emissions associated with the generation of electricity IBM consumes and the company's obligations to take back hardware it has sold or leased for end-of-life management. But these are not material rating drivers. While IBM has transitioned its business model to more services-oriented from product sales-based, its services still involve operating data centers globally and the technology infrastructure they house. Despite IBM's massive scale and global reach, we find it has done a good job mitigating these risks through energy conservation, mineral sourcing, renewal energy use, and waste reduction efforts. IBM requires its suppliers to adhere to the same high environmental standards and advocates for transparency in the supply chain by requiring audits and public disclosures.

Intuit Inc. (A-/Stable) — **Shailendra Pamnani**

Intuit's credit quality is more exposed to social factors than global peers, given the potential for changes by the U.S. Internal Revenue Service (IRS) that could harm the company's consumer tax business, which we view as a high-impact but low-probability event. The company has received the scrutiny of lawmakers recently, including Sen. Elizabeth Warren (D-Mass.), because of allegations that it suppressed its Free File product from search results and its lobbying efforts. Intuit is a member of the Free File Alliance, a consortium of private-sector companies that entered into an agreement with the federal government to provide online federal tax preparation and filing services at no cost to eligible federal taxpayers, and the federal government agreed not to provide a competing service. But this commitment was removed in January 2020. If the IRS were to build its own online tax filing website, it could harm Intuit's business. We view this as a low-probability risk as the cost of creating such a platform would likely be too large under strained government budgets when the Free File Alliance works to achieve the government's goals of access to tax preparation services, and Intuit's prices for paid tax services are already lower than professional tax preparers'.

Microsoft Corp. (AAA/Stable/A-1+) — **Andrew Chang**

We view favorably Microsoft's environmental risk profile and find its social risks to be comparable to those of the broader technology sector. Although not a material ratings driver, Microsoft faces long-term environmental risks from GHG emissions, pollution, and waste. To mitigate its environmental risk exposure, Microsoft not only enforces a strong energy conservation, mineral sourcing, renewal energy use, and waste reduction culture, but it also holds its suppliers to the same high standards. Microsoft announced in April 2019 that it will nearly double its internal carbon fee to $15 per metric ton on all carbon emissions. This internal "tax" was established in 2012 to hold its business divisions financially responsible for reducing their carbon emissions, with the funds from the higher fee used to maintain Microsoft's carbon neutrality and improve sustainability. Furthering this cause, in January 2020, Microsoft pledged to be "carbon negative" by 2030 and to remove the equivalent of its lifetime emissions by 2050. Through these initiatives, Microsoft will also expand its internal carbon fee to all of its business divisions' scope 3 emissions, starting a $1 billion fund for developing carbon reduction/removal technology, and targeting its supply and value chains to implement new sustainable procurement processes. The company's hardware, software, and advertising products face customer privacy and data security risks, which could cause significant reputational and monetary damages to Microsoft if compromised. That said, we believe Microsoft greatly emphasizes its products' security features, and we believe its security enforcement efforts and financial resources are key factors in mitigating any potential vulnerabilities. We assess Microsoft's management and governance as strong, reflecting our positive view of its strategic planning, risk management processes, and consistency in

achieving its operational goals despite challenging economic and market conditions.

Northpole Newco S.a.r.l. (B/Stable) — **Osnat Jaeger**

There are more social and reputational risks for Northpole (dba NSO Group) than the broader technology software and services sector. They are related to a potential misuse of NSO's software or data by its customers or employees. This risk has exposed NSO to several litigation attempts by social rights organizations, and more frequently by Facebook. NSO's software is particularly sensitive as it enables government agencies to access mobile devices of targets. The software is intended to only be used for counterterrorism, but NSO cannot fully prevent a potential misuse once a sale and installation are completed. It can only shut down systems after it verifies a misuse. NSO puts great effort into minimizing this risk with a rigorous vetting system when considering a new contract, including a predominantly external business ethics committee, which determines whether to accept a customer based on key factors including security needs, political stability, corruption, and other factors. Nevertheless, we reflect this above-average risk in our weak business risk assessment despite NSO's strong growth and profit margins.

Nuance Communications Inc. (BB-/Positive) — **Steven Mcdonald**

Social risk factors such as security and data breaches are ongoing risks for the software industry, but we believe Nuance has a higher sensitivity to these risks following its 2017 breach and with its focus on health care. Nuance fell victim to the global NotPetya malware incident, which affected certain systems used by its health care customers, primarily for transcription services, as well as systems used by its imaging division to receive and process orders. The financial effects, including around $68 million lost revenue and about $24 million related to remediation and restoration efforts, were manageable. However, in our view, it continues to be a negative overhang on new customer wins. With an increased focus on its health care business, following the sale of its imaging division and auto spin-off, we believe a repeat incident on a broader scale could pose greater harm to Nuance's business. Notwithstanding, we view such an occurrence as low-probability, as corrective measures and a greater emphasis to continuously enhance information security should ensure better protection against data-security risks. Nuance's exposure to environmental and governance factors are comparable to that of other software providers and not expected to affect our ratings in the near term. We assess Nuance's management and governance to be satisfactory because the board employs effective oversight of business strategy and adheres to corporate governance practices that promote long-term value for shareholders. Over the last 18 months, Nuance has implemented significant changes to its board composition, leadership, and related governance practices. The board now comprises nine members, expanded from seven, including two women and members from varying ethnic and professional backgrounds. Additionally, amendments to the company's bylaws now allow shareholders holding at least 20% of shares of Nuance common stock outstanding to call a special meeting of shareholders, which should better integrate shareholder feedback into the board's decision-making process.

Oracle Corp. (AA-/Negative/A-1+) — **Andrew Chang**

Social risk factors such as security and data breaches are ongoing risks for the software industry, but we believe Oracle's exposure is comparable to that of industry peers. However, as regulatory focus increases, and laws and regulations concerning the handling of personal information and data expand and become more complex, a breach could damage Oracle's brand and reputation, and expose it to legal claims and regulatory actions. To mitigate these risks, Oracle rigorously assesses and validates its software before release and provides training and certification programs to employees and customers. As for governance factors, we believe Oracle's key-person risk is significant because founder, chairman, and chief technology officer Larry Ellison owns 35.5% of the company. However, we believe Mr. Ellison's 40-year-plus track record of running a leading software company, as well as a credible succession plan (with Safra Catz serving as CEO), make this risk manageable. Our management and governance assessment of the company is strong as a result. Oracle's environmental risks are low, as is the case for the software industry overall.

Pitney Bowes Inc. (BB-/Stable) — **James W. Thomas**

Social risk factors such as security and data breaches are ongoing risks for the technology industry, but we believe Pitney has a modestly higher sensitivity to them following a 2019 ransomware attack. In October 2019, Pitney fell victim to the Ryuk virus, which disrupted client access to some of the firm's services, primarily in the highly profitable mail metering and presort services businesses. Although we expect the financial impact to be modest because of a combination of rapid remediation efforts, insurance coverage, and the lack of compromised data, we believe such events could impair the firm's customer reputation and growth prospects. Pitney's strategic focus on e-commerce enablement makes its reputation as a capable steward of sensitive data increasingly important to its financial success, in our view. Notwithstanding these concerns, we view such an occurrence as low-probability, as corrective measures and a greater emphasis to continuously enhance information security should ensure better protection against data-security risks. Pitney's exposure to environmental and governance factors is viewed as comparable to that of other software providers and not expected to affect our ratings in the near term. We assess Pitney's management and governance to be satisfactory based on our view that the board employs effective oversight of Pitney's business strategy and adheres to corporate governance practices that promote long-term value for shareholders.

SAP SE (A/Stable) — **Lukas Paul**

SAP's exposure to environmental and social risk factors is comparable to that of the broader technology software and services sector. Social risks mainly relate to customer privacy and data security, which could cause significant reputational harm and monetary damages to SAP if compromised. Many companies use SAP applications for mission-critical transactional data and, as a result, protection against risks such as cyberattacks and customer data leakage is vital. To mitigate these risks, SAP's internal security experts assess and validate software releases, and the company developed a global data protection and privacy policy and management system. In our view, SAP's enterprise-oriented products are less exposed to rapid changes in customer preferences than those of peers focused on consumer products, which usually have shorter life cycles and carry greater risk of obsolescence. SAP faces long-term environmental risks from GHG emissions, pollution, and waste, but they're not material rating drivers.

Reducing energy consumption and improving waste and water management are top priorities in SAP's environmental strategy. The company set a goal for achieving carbon neutrality by 2025, and cut carbon dioxide emissions 38% over 2014-2018 despite strong growth in the business. SAP also focuses on helping its customers run greener operations via its green cloud services and data centers (using 100% renewable electricity). Governance risks are low, in our view, because SAP's supervisory board composition is sufficiently independent and with diverse gender and nationality. SAP has achieved its goal of at least 25% women in management, and seeks to raise it to 30% by 2022.

Tencent Holdings Ltd. (A+/Stable) **Cliff Kurz**

The technology software and media sectors face significant social risks related to data security, content regulation, and social media activism. We view Tencent's management of user privacy, data security, and content regulation to be in line with the industry. Content regulation is a key risk for Tencent. The Chinese government has always exercised control over online content and games. This pressure intensified in 2018 and 2019 after the government tightened the online game approval process and explicitly limited hours of game play for young children. Ironically, we believe increased regulations will benefit larger internet companies such as Tencent. As the leading platform for online games, we believe Tencent is best-positioned to meet the government's increasing scrutiny given its large scale to absorb increasing regulatory costs and technical capabilities to meet regulator demands. Tencent was also proactive in implementing its Healthy Gameplay System to limit daily game play for younger audiences well before the government implemented similar regulations in 2019. On user privacy and data protection, Tencent takes active measures and has clear policies to comply with relevant regulations and laws in markets where it operates. Tencent has relatively good governance with a balanced representation of independent directors and executive and nonexecutive directors on the board.

Uber Technologies Inc. (B-/Stable) **Chris Frank**

Uber's credit quality is more exposed to social factors than global peers, given its disruptive business model, particularly its impact on the taxi industry and the status of its drivers as contractors. We believe this has provoked legal and regulatory challenges, some of which could result in meaningful cash outflows or adjustments to its business model. California's Assembly Bill 5 passed and took effect in January 2020, creating a test that companies must pass to classify workers as independent contractors rather than employees. Although the law is aimed at so-called gig-economy companies, Uber claims it can pass the test and will continue classifying its workers as contractors, which likely sets up a legal challenge under the new law. Uber, along with competitors Lyft, DoorDash, and Postmates, pledged to fund a ballot initiative to exempt themselves from the law. If Uber cannot pass the test, it would be a setback rather than an existential threat. We think ride-sharing players would raise prices as they did when New York City capped the number of such licenses and instituted minimum per-mile and per-minute rates for drivers, which will offset part but not all of the impact. We believe the change would hurt profitability, and increased prices could destroy some demand. But the trend toward increasing adoption of ride-sharing should overwhelm these factors over the long term and allow Uber to continue to expand quickly. Other jurisdictions could follow California's lead, lengthening Uber's path to profitability and positive cash flow. Similarly, the company has faced regulatory challenges in London, one its top five metro markets in 2018. London's transportation authority refused to grant Uber a new license after its old one expired in November 2019, because of safety and security concerns. Uber is appealing and can still operate. In addition, the company has a reserve for legal, regulatory, and non-income taxes of $1.6 billion as of Sept. 30, 2019. Still, we believe any potential legal settlements will not likely be large enough to affect our 'B-' rating. We think regulatory actions do not represent an existential threat to the company because it could adapt its business model. We view favorably the transition to CEO Dara Khosrowshahi and governance changes adopted as part of the SoftBank investment and IPO, including the elimination of super-voting shares and the termination of the voting agreement that granted control of board seats to certain parties. All board members are now elected by a proportional vote of all shareholders annually. We think Mr. Khosrowshahi had a good track record of managing growth at Expedia and that he has built an experienced executive team, including former Merrill Lynch & Co. and NYSE Euronext Inc. CFO Nelson Chai and former Associate Attorney General Tony West. In addition, many executives have relevant experience at market-leading technology firms. Uber has made constructive strategic moves under Mr. Khosrowshahi's watch, including the sale of its loss-making Uber Eats India operation to Zomato and the settlement of legal matters regarding autonomous vehicle trade secrets with Waymo LLC. Nevertheless, our assessment still incorporates the risk that management is too aggressive in loss-making investments such as Uber Eats, autonomous driving, and New Mobility. These could divert resources from shoring up the core ridesharing business and preclude it from reaching positive cash flow and EBITDA on the timeline we expect.

Ratings as of Feb. 11, 2020

ESG Risks In Hardware And Semiconductors

Table 2

Company/Rating/Comments **Analyst**

Apple Inc. (AA+/Stable/A-1+) **David Tsui**

Apple's exposure to environmental and social risk factors are comparable to those of the broader technology sector. Like most hardware providers, Apple faces a number of environmental risks from manufacturing its products, but we believe they are lower than those facing peers because of its strong commitment to maintaining policies to manage them. Apple outsources virtually all hardware manufacturing, but has significant influence over its supply chain's exposure to GHG emissions, waste, pollution, and disposal of electronic products. The vice president of environment, policy, and social initiatives reports to CEO Tim Cook, indicating decisions about environmental and social issues are reviewed at the company's highest levels. Labor issues also pose risks. Over the past decade, Foxconn, a key manufacturer of Apple's products, faced serious conflicts including unsafe working conditions, hiring underage workers, and violating employment laws. We believe Apple takes these allegations seriously and enforces a supplier code of conduct, reviewing partners for commitment to human rights and sound business practices. As protecting customer data became a major social issue in recent years, Apple made a consistent effort to name privacy as one of its core values. The company's position is supported by its dedication to

provide transparency on data collection via its applications and services, including Maps, Apple Pay, and Health, and how it is shared with external parties. We believe in the longer term this will continue to rise in importance as transactions and data storage continue to migrate to digital devices. We assess Apple's management and governance as strong based on its consistent good operating track record, effective strategic planning, and generally positive employee relations and corporate culture.

Broadcom (BBB-/Stable/A-3) — **James W. Thomas**

Broadcom's exposure to environmental social and governance risks is comparable to that of the broader technology sector. Broadcom has a fab-light operating model whereby it outsources most of its manufacturing to a third-party foundry, Taiwan Semiconductor Manufacturing Co. Ltd., and test and assembly facilities. Through these partners, Broadcom faces various environmental risks such as GHG emissions, hazardous materials, and waste, which could have a material impact on Broadcom's business if problems arise. We understand that Broadcom enforces its social and environmental code of conduct on its suppliers. We view its management and governance as satisfactory, reflecting management's experience, expertise, and ability to adjust business strategies.

Cisco Systems (AA-/Stable/A-1+) — **Andrew Chang**

We view social and environmental risks to be significant for Cisco, but also comparable to other hardware providers. The manufacturing of Cisco's hardware carries environmental risks such as GHG emissions, waste, and pollution from manufacturing and packaging. However, risk exposure is mostly indirect since the firm outsources virtually all manufacturing. We believe Cisco has a good track record of enforcing its supplier ethics policy, which influences how suppliers conduct business in labor safety and the environment. Like many industry peers, Cisco faces social risks including potential reputational damage or liability claims arising from cyberattacks or data security breaches of its customers' networks, but we believe the company has a good track record of managing them. We view its management and governance as strong, reflecting our overall positive view of its strategic planning, risk management processes, and consistency in achieving operational goals. CEO and chairman of the board Chuck Robbins has been with the company for over 20 years, the last five as CEO and two as chairman.

CommScope Holding Co. Inc. (B/Stable) — **James W. Thomas**

CommScope's exposure to environmental and social risk factors is comparable to industry peers'. It faces social risks such as workplace safety and child labor at its manufacturing operations and supply chain in various emerging markets including Mexico, China, and India. CommScope's program to mitigate safety risks reduced injury rates over the past 10 years to below U.S. Occupational Safety and Health Administration benchmarks. It also has a program to manage child labor risks by conducting reviews, assessments, and audits of its own operations and those of its suppliers deemed to be high risk. We think the company's management of these risks adequately mitigates the potential for legal liabilities, costly regulatory actions, and reputational damage. It seeks to address waste management and GHG emissions through product lifecycle management and manufacturing design processes. The company reduced harmful chemicals in its products and waste produced by manufacturing. It also minimized packaging, seeks out recyclable materials in any remaining packaging, and maximizes reuse, refurbishment, or recycling for its products at the end-of-life stage. CommScope also manages its manufacturing processes to reduce energy consumption and GHG emissions, which already dropped 10% and are targeted for 25% below 2016 levels by the end of 2020. We think this puts the company in a good position to handle potential emissions regulations or taxation.

Dell Technologies Inc. (BB+/Stable) — **Andrew Chang**

Dell's exposure to environmental and social risk factors is comparable to that of the broader technology sector. However, we believe Dell is less favorably positioned on governance risk factors. We assess Dell's management and governance as fair because it's exposed to key-man risk with founder and CEO Michael Dell, who has controlling ownership of the company and voting power. There are seven members of the board of directors: Mr. Dell, two from Silver Lake Partners, and four independent members. The combination of concentrated voting power and a small board with a low mix of independent directors could provide outsize influence to Dell's executive leadership and more specifically Mr. Dell, and limit minority shareholders' ability to affect change, in our view. Like most technology companies, Dell faces long-term environmental risks from GHG emissions, waste and pollution from product manufacturing, and environmental degradation from sourcing minerals used in its electronic equipment. The earthquake and tsunami in Japan and severe flooding in Thailand in 2011 damaged infrastructure and factories that disrupted Dell's supply chain for various components used in its products. Since then, Dell has diversified its global supply chain and manufacturing footprint to minimize harm from natural disasters. Dell is also a member of the Responsible Business Alliance, which sets the industry standard around corporate social responsibility in global supply chains. Furthermore, privacy and data security breaches could pose significant reputational and monetary damages to Dell as its enterprise customers increasingly emphasize the security technology infrastructure.

Ericsson (Telefonaktiebolaget L.M.) (BB+/Positive/A-3) — **Lukas Paul**

Ericsson's exposure to environmental and social factors is broadly similar to the wider technology hardware and semiconductor sector. Regarding governance risks, in December 2019, Ericsson reached a settlement with the U.S. Securities and Exchange Commission (SEC) and Department of Justice over noncompliance with the U.S. Foreign Corrupt Practices Act in some of Ericsson's countries of operations. As part of the settlement, Ericsson paid a total of $1.06 billion (SEK10.1 billion) in fines, profit disgorgements, and interest, and agreed to appoint an external compliance monitor for three years. Since 2016, Ericsson has taken measures to strengthen compliance and internal controls, including increased staffing of compliance and related functions, enhanced capabilities for detecting irregular transactions, and improved monitoring of business counterparties. As a result, we consider this an isolated and nonrecurring incident that does not jeopardize Ericsson's credit quality. However, credit metrics could weaken if Ericsson faces similar actions and penalties in other jurisdictions. The controversy over Ericsson's Chinese competitor, Huawei, highlights social risks that telecom equipment vendors face in guaranteeing their products adhere to the highest data protection and privacy standards while navigating national

security interests and governments' surveillance requirements. Environmental risks are not a key factor in the credit rating at this point, but could gain weight over time because the continued densification of networks and the roll-out of 5G are likely to increase power consumption. This will require Ericsson, like its peers, to continue developing state-of-the-art power management technology.

Hangzhou Hikvision Digital Technology Co. Ltd. (A-/Stable) — **Cher Chen**

Hikvision's credit profile is more impaired by social risk factors than companies in the broader technology hardware and semiconductor sector. Specifically, Hikvision is subject to risks of data security and issues related to mass surveillance. As internet protocol video surveillance increases in prevalence, cybersecurity is an increasing concern to prevent unauthorized surveillance of businesses and individuals. In May 2017, Hikvision faced potential security vulnerabilities with some of its internet protocol video cameras as highlighted by the Industrial Control Systems Cyber Emergency Response Team (ICS-CERT). We believe the company has since fixed outstanding vulnerabilities with its video cameras and is increasingly focused on cybersecurity issues. For example, the company recently obtained an international certification for its smart home cloud platform security.

Hewlett Packard Enterprise Co. (BBB/Stable/A-2) — **David Tsui**

HPE's exposure to environmental and social risk factors is comparable to those of the broader technology sector. HPE, similar to many technology solutions providers, faces long-term environmental risks such as GHG emissions, waste and pollution from product manufacturing, and environmental degradation from sourcing minerals used in electronic equipment. We believe HPE places significant emphasis on mitigating its long-term environmental risk exposures. For example, in 2018, HPE lowered its operational GHG emissions 37% from 2016 by reducing its real estate footprint and increasing the proportion of renewable electricity purchased to 37% in 2018, up from 27% in 2017. While we believe HPE focuses on mitigating social risks such as privacy and data security, we recognize that breaches could pose significant reputational and monetary damage to HPE as its enterprise customers increasingly emphasize the security technology infrastructure. We assess HPE's management and governance as satisfactory, reflecting our positive view of its strategic planning process, standards for operational performance, and management's expertise and experience.

Hon Hai Precision Industry Co. Ltd. (A-/Stable) — **Cliff Kurz**

Hon Hai faces significant social risks mainly because of its enormous operating scale and labor force, which exceeds 800,000, mostly manning assembly lines in China. This presents challenges balancing employees' welfare against a competitive cost structure. Any mismanagement in labor relationships could lead to materially negative perception by the public, regulators, and customers. Hon Hai strengthened its workforce management system after labor disputes associated with low wages and poor working conditions, and the resultant damage to its market reputation, during 2010-2012. In addition, the company increased reliance on automation to improve working conditions and minimize the potential impact of labor shortage and rising wages. Hon Hai is exposed to environmental risks typical of the technology hardware sector with significant energy, water, and chemical consumption during its manufacturing process. We assess Hon Hai's management and governance as satisfactory, reflecting its good track record and ability to adjust and control the execution of its strategies, higher-than-industry-average performance standards, and the management team's strong expertise. Hon Hai's board is likely to become more diverse and effective after founder Terry Gou retired as executive chairman in July 2019, although he remains a nonexecutive director. The company's board of directors has eight members, of which three are independent.

HP Inc. (BBB/Stable/A-2) — **Tuan Duong**

We believe HP's exposure to environmental and social factors is in line with the broader technology hardware industry. HP faces environmental risks such as GHG emissions stemming from resources consumed in the product manufacturing process and disposal of old equipment. We view HP's management and governance as satisfactory, reflecting its strategic planning, standards for operational excellence, and management's expertise and experience. In August 2019, HP announced a CEO transition, naming longtime HP printer segment executive Enrique Lores. We think this should help the company execute its longer-term printer segment strategy over the next few years to address increasingly competitive market conditions and ongoing printer industry difficulties.

Infineon Technologies AG (BBB/Watch Neg) — **Lukas Paul**

Environmental and social factors are broadly similar to those in the wider technology hardware and semiconductor sector. We think Infineon's exposure to environmental risks is in line with peers despite its large share of in-house manufacturing (about 75%). Environmental risks, including water use and contamination, waste, and GHG emissions, could result in regulatory penalties or reputational damage, leading to customers turning to other suppliers. However, these risks are mitigated by Infineon's strong track record of ESG risk management and steps taken to reduce energy consumption and GHG emissions. Though it is not legally required to do so, Infineon voluntarily complies with the SEC's requirements regarding access to minerals. We assess Infineon's risk exposure to governance factors to be low. Management's demonstrated governance commitment further supports our confidence in Infineon's environmental risk mitigation.

Intel Corp. (A+/Stable/A-1) — **Andrew Chang**

Social and environmental risks are relevant for Intel, but we believe they are comparable to those of other semiconductor providers and don't expect them to affect our rating in the near term. Intel manufactures most of its products in-house, which exposes it to various environmental risks including water contamination, energy use, and GHG emissions. But we believe Intel has properly addressed these risks through strong recycling and conservation efforts. We also believe Intel upholds similar standards for its suppliers by conducting supplier audits throughout the year. Like most of the sector, Intel is exposed to social risks, including the health and safety of its workforce and compliance with human rights and labor standards. Our management and governance assessment of the company is strong, reflecting our overall positive view of the company's strategic planning and risk management processes. Intel promoted CFO Bob Swan to CEO in January 2019. While he lacks a technical background, we believe he has a good track record of meeting operational and financial targets.

LG Electronics (BBB/Stable) — **JunHong**

Park

We view LG's exposure to environmental and social risk factors as in line with the broader technology industry. Like all consumer electronics manufacturers, worker safety is a key social risk, and it continues to take measures to improve its safety record and reduce its lost-time injuries frequency rate. LG's manufacturing processes also expose it to environmental risks such as waste and pollution. However, the company is committed to constantly improving its manufacturing and packaging process, building more energy-efficient products, and reducing electronic waste. LG is also working toward mitigating its impact on the environment by introducing green businesses such as making components for electric vehicles. We view its management and governance to be satisfactory, mainly reflecting our positive view of its strategic planning process and operational effectiveness. Four of LG's seven board members are from outside.

Micron Technology Inc. (BBB-/Stable)

Andrew Chang

Micron's exposure to ESG risk factors is comparable to that of the broader technology sector. Micron has 13 manufacturing sites in the U.S., Japan, Singapore, Malaysia, Taiwan, and China, and its manufacturing operation is subject to various environmental risks concerning GHG emissions, climate change, hazardous materials, and waste. Environmental risks could result in regulatory penalties or reputational damage, leading customers to turn to other suppliers. However, Micron's exposure to these risks is mitigated by its strong track record of environmental risk management and steps taken to reduce energy consumption and GHG emissions. We also believe the company's established framework to ensure high standards for labor, health, and safety at these facilities help minimize its social risk exposure. We view Micron's management and governance as satisfactory, reflecting the management team's experience, expertise, and ability to adjust its ESG risk management strategies when needed. Micron has an independent board of directors with no known conflicts of interest. Established under the oversight of its governance and sustainability committee, Micron also has a separate and cross-functional sustainability council comprising senior leaders across all functions of the business. This council forms sustainability policies and measures including environment, people, and supply chain management, and periodically evaluates their effectiveness and impact on the business short- and long-term.

NEC Corp. (BBB-/Stable/A-3)

Taishi Yamazaki

We view NEC's social and environmental related exposure as similar to industry peers' in the broader technology sector. We believe NEC, like many other information and communications technology company, faces challenges securing and managing talented employees with advanced skillsets. Additionally, the company's business is potentially exposed to risks such as personal or classified information leaks and cyberattacks. However, we believe NEC will manage these risks appropriately by strengthening its in-house training and human resources. Governance risks are neutral to our credit analysis of NEC because of adequate board effectiveness and public disclosure. The company faces compliance risks related to antimonopoly laws because it conducts many transactions with the public sector. Because of past violations, NEC was suspended from bidding on public sector contracts, but the effect on earnings was limited. We think the compliance system is now stronger.

Nokia Corp. (BB+/Stable/A-3)

Lukas Paul

Environmental and social factors affecting Nokia are broadly similar to those in the wider technology hardware and semiconductor sector. The controversy over Chinese competitor Huawei highlights social risks that telecom equipment vendors face in guaranteeing their products adhere to the highest data protection and privacy standards while navigating national security interests and governments' surveillance requirements. As disclosed in its SEC Form 20-F for 2018, Nokia is scrutinizing certain transactions in the former Alcatel-Lucent business it acquired in 2016 and that violated anticorruption laws in the past. However, the company expects any possible financial impact to be limited. Environmental risks are not a decisive factor in the credit rating at this point, but could gain focus over time because the continued densification of networks and the roll-out of 5G are likely to increase power consumption. This will require Nokia, like its peers, to continue developing state-of-the-art power-management technology.

Panasonic Corp. (A-/Negative/A-2)

Kei Ishikawa

The major consumer electronics company's social and environmental related exposure is similar to industry peers' in the broader technology sector. Panasonic is exposed to social risks such as product safety and labor-intensive manufacturing processes, which can affect profitability and competitiveness. With its supply chain and sales network spread around the world, Panasonic is also exposed to environmental risks, and natural disasters that affect earnings. The impact of these events, however, has always been temporary and absorbed by the company's decentralized supply chains and diversified business portfolio. We believe it likely maintains contingency plans for unexpected disasters to ensure business continuity. We view Panasonic's management and governance as satisfactory, reflecting its experience, expertise, and ability to adjust business strategies when necessary. Independent directors make up one-third of Panasonic's board, with no known conflicts of interest.

Qualcomm Inc. (A-/Stable/A-2)

Andrew Chang

We believe Qualcomm has higher sensitivity to governance risks, specifically legal risk, than global peers. In 2019, Qualcomm resolved its two-year dispute with Apple, agreeing to dismiss all litigation. The settlement includes overdue payments from Apple and new license and chipset supply agreements. While this is clearly a positive development, other legal risks remain, such as the ongoing U.S. Federal Trade Commission lawsuit that alleges Qualcomm engaged in anticompetitive behavior, and an ongoing license dispute with Huawei, one of its most important customers. We believe over the longer term, customers may continue to challenge Qualcomm's licensing terms. The company was also investigated by regulators in several countries or regions it conducts business in, including the U.S., EU, China, Korea, and Taiwan, with fines reaching $1.2 billion. It incurred $319 million in litigation expenses in fiscal 2019, down from fiscal 2018. We expect further challenges to Qualcomm's business practices, creating uncertainty around its cash flow. In all, we believe Qualcomm's management has sufficient experience adjusting to changing business environments, including legal and regulatory challenges. Qualcomm's CFO departed for a competing firm in 2019, but CEO Steven Mollenkopf has been in his role since 2014. The board of

directors has changed significantly in recent years and now comprises 11 independent directors out of 12 members. Qualcomm's environmental and social risks are considered modest, and in our view comparable to those of the broader technology sector.

Samsung Electronics Co. Ltd. (AA-/Stable/A-1+) — **JunHong Park**

We view Samsung's exposure to social and environmental risk factors as similar to the broader technology sector. Product quality remains a key social risk. Battery incidents with its Galaxy Note 7 smartphone in 2016, subsequent recall, and discontinuation resulted in litigation, substantial brand damage, and lost earnings in the smartphone division. However, Samsung withstood this because of its significant net cash holdings and solid overall operating cash flows, a repeat of such severe quality issues could be detrimental to our rating. The company has taken measures to avoid these issues and strengthened safety checks and quality control measures. Because of the nature of its manufacturing business, Samsung is exposed to waste and pollution issues. However, the company is committed to constantly improving its manufacturing and packaging process, building more energy efficient products, and reducing electronic waste. Our management and governance assessment is strong, reflecting our positive view of its strategic planning and execution, and management's considerable expertise and experience in the technology industry.

Semiconductor Manufacturing International Corp. (BBB-/Stable) — **Hins Li**

We believe environmental and social risk factors are not key rating drivers for SMIC. Nevertheless, the company faces environmental risks from GHG emissions, water supply, and disposing of toxic materials. We believe SMIC has good awareness of these risks and tries to contain them, for example, by installing pollution control equipment for waste treatment and water recycling. It also follows applicable environmental standards. SMIC is exposed to social risks such as rapidly changing consumer preferences and safety concerns. We believe the company is well-positioned to cope with varying consumer preferences because of its diversified product and service portfolio. It may also face business challenges if it fails to attract and retain highly qualified engineering talent. SMIC has good awareness and measures to manage production safety, which is also vital to performance. Legal risks associated with intellectual property (IP) are considered a significant governance factor for SMIC. It was embroiled in two IP litigations with TSMC in 2002 and 2006. The respective cases cost SMIC as much as $175 million and $200 million, in addition to shares and warrants granted to TSMC, which we view as immaterial to the company's financial profile. We believe SMIC's awareness and management of IP protection have substantially improved, with a dedicated team of engineers managing integrated circuit design libraries and IP.

Sony Corp. (A-/Stable/A-2) — **Kei Ishikawa**

Sony's social and environmental related exposure is similar to that of the broader technology sector. Sony has controlled environmental risks, but as one of the top global consumer electronics makers, its supply chain spreads all over the world, and climate change can have some impact on earnings. For instance, in 2011 Sony postponed its digital single-lens camera amid significant flooding in Thailand. We believe Sony will continue to diversify its global supply chain and manufacturing footprint, manage backup plans for continuing operations during disasters, and hedge risks using insurance to minimize these risks. We view the company's management and governance as satisfactory, reflecting management's experience, expertise, and ability to adjust its business strategies when needed. Governance factors are neutral for the rating on Sony. We believe Sony's measures for protecting itself from cyberattacks have improved. It incurred ¥4.9 billion in costs primarily for investigation and remediation activities, though not direct losses from the cyberattack on the U.S. movie business in 2014.

Taiwan Semiconductor Manufacturing Co. Ltd. (AA-/Stable) — **Cliff Kurz**

Environmental and social risks do not drive the ratings on TSMC, and we believe the company is in a better position than peers to minimize these risks. TSMC faces environmental risks due to the high energy and water consumption in the manufacturing process, as well as unstable power and water supplies and business interruptions related to natural disasters such as earthquakes since most of its production facilities are in Taiwan. Failure to attract and sustain sufficient human capital in Taiwan, where the population is aging and highly qualified engineering talent is becoming scarce, could impair TSMC's business. However, its strong capabilities and commitment to minimizing the environmental impact of its operations are evidenced by its industry-leading metrics on energy consumption, water recycling, and other emissions that show persistent improvement. The company's strong business reputation and importance to Taiwan's economy also alleviate the potential risk of insufficient power and water supplies because the government will likely prioritize the company. TSMC has three fabrication facilities in major locations, built with high safety standards against major natural hazards, minimizing their potential impact. We view TSMC's management and governance as strong, with clear short- and long-term goals for business and technology development, and a good record of executing these strategies.

Western Digital Corp. (BB+/Negative) — **Chris Frank**

Western Digital's exposure to ESG risk factors is comparable to that of the broader technology sector. Western Digital's manufacturing operations are subject to environmental risks concerning GHG emissions, climate change, hazardous materials, and waste. We believe the company is more exposed to these risks than hardware and semiconductor companies that solely focus on design and marketing activities because of its in-house manufacturing capabilities. However, the exposure is still comparable to that of the broader technology sector. The company conducts periodic audits to assess its compliance with applicable environmental laws and regulations, and requires that manufacturing facilities meet minimum energy, water, and waste conservation targets in addition to location-specific targets. We view the company's management and governance as satisfactory, reflecting management's experience, expertise, and ability to adjust its business strategies when needed.

Xerox Corp. (BB+/Negative) — **Tuan Duong**

We believe Xerox's ESG risks are in line with those of sector peers in the hardware industry. Xerox faces environmental risks in its manufacturing operations, which are exposed to GHG emissions, energy management, hazardous materials and waste, air and water pollutants, and materials

recycling. In terms of social risks, Xerox's core printer and copier products face secular changes related to fewer printed pages as most workplaces shift to digitized content and documentation. We believe consumer focus on waste management and reduction will limit printed pages. We believe both factors will hurt Xerox's revenues, in addition to intensifying competition and mature market conditions. We incorporated these factors into our analysis of Xerox's competitive position.

Ratings as of Feb. 11, 2020

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