



Accounting for a  
Sustainable Future™

# TELECOMMUNICATIONS

## Research Brief

Sustainable Industry Classification System™ (SICS™) #TC0301  
Research Briefing Prepared by the  
Sustainability Accounting Standards Board®

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# TELECOMMUNICATIONS

## Research Brief

SASB's Industry Brief provides evidence for the material sustainability issues in the industry. The brief opens with a summary of the industry, including relevant legislative and regulatory trends and sustainability risks and opportunities. Following this, evidence for each material sustainability issue (in the categories of Environment, Social Capital, Human Capital, Business Model and Innovation, and Leadership and Governance) is presented. SASB's Industry Brief can be used to understand the data underlying SASB Sustainability Accounting Standards. For accounting metrics and disclosure guidance, please see SASB's Sustainability Accounting Standards. For information about the legal basis for SASB and SASB's standards development process, please see the Conceptual Framework.

SASB identifies the minimum set of sustainability issues likely to be material for companies within a given industry. However, the final determination of materiality is the onus of the company.

### Related Documents

- [Technology & Communication Sustainability Accounting Standards](#)
- [Industry Working Group Participants](#)
- [SASB Conceptual Framework](#)
- [Example of Integrated Disclosure in Form 10-K](#)

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## MATERIAL SUSTAINABILITY ISSUES

### Environment

- Environmental Footprint of Operations

### Social Capital

- Data Privacy
- Data Security

### Business Model and Innovation

- Product End-of-Life Management

### Leadership and Governance

- Managing Systemic Risks from Technology Disruptions
- Competitive Behavior

## INTRODUCTION

The Telecommunications industry is the foundation of modern communications and information sharing. The growth of the Internet economy has strengthened the industry's position as a provider of key infrastructure, including telephone and broadband Internet service.

Telecommunications services have helped the public and private sector increase efficiencies and drive innovation through lower transaction costs and increased speed and variety of communication media. The growth in recent years of wireless and broadband communication has

driven an expansion in network spectrum and data transmission, leading to build-out of physical infrastructure, including wireless towers, data centers, and switching equipment. The Telecommunications industry faces several sustainability challenges and opportunities relating both to physical infrastructure, as well as transmission of user data. Management (or mismanagement) of material sustainability issues has the potential to affect companies' valuation through impacts on profits, assets, liabilities, and cost of capital.

Telecommunications companies reporting in their regulatory filings metrics on the material sustainability risks and opportunities that could affect value in the near- and long-term, would provide investors with a more holistic and comparable view of performance. This would include both positive and negative externalities, and the non-financial forms of capital that the industry relies on for value creation.

The sustainability issues that will drive competitiveness within the Telecommunications industry include:

- Managing the environmental footprint of companies' large and expanding network infrastructure and equipment;
- Ensuring the privacy of customer data through effective data use policies, and managing government relations or business strategy on issues related to data privacy;
- Managing the increasing risk of cyber-attacks, particularly for cloud-based services and business or government customers in sensitive sectors;

- Managing the end-of-life of telecommunications equipment and devices in a responsible manner;
- Managing risks to networks and operations that could potentially create systemic or social disruption; and
- Balancing the need to expand revenues in the face of increasing competition, with preventing engagement in anti-competitive practices.

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## INDUSTRY SUMMARY

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The Telecommunications (“Telecom”) industry consists mainly of telecom carriers, comprising two primary segments: wireless and wireline services. Wireless providers use wireless infrastructure, such as radio-based cellular networks, to provide a range of services including wireless telephony voice, data (including video, games, and music content), text messaging, Internet, and satellite communications services. Companies provide these services using wireless spectrum (the electromagnetic radio frequency bands used in wireless communication) obtained through licenses that are typically auctioned by government agencies.

Wireline telecom providers operate wired infrastructure to provide telephony services, video programming distribution, and Internet services. Wireline phone services include local

and long-distance voice communication, as well as voice over Internet protocol (VoIP) to residential and business customers. Some companies in the wireline segment also offer web hosting and data processing services.<sup>1</sup> Advances in broadband technology are enabling higher speeds for delivering information in both the wireline and wireless segments, driving the next generation of Internet-enabled services.<sup>1</sup>

Apart from telecom carriers, other industry players include local exchange carriers competing with telecom carrier incumbents, telecom resellers serving businesses and households, and network construction and leasing providers, serving telecom carriers. However, these constitute a negligible portion of overall industry revenues.<sup>11</sup>

The Telecom industry is a mature industry, with global revenues totaling around \$2 trillion according to the latest annual data.<sup>2</sup> The U.S. is the largest telecom market in the world, expected to grow by 3.7 percent per year between 2010 and 2015. However, emerging markets are experiencing higher growth rates.<sup>3</sup> For example, mobile cellular subscriptions in the Asia-Pacific region have increased exponentially in the past few years. Subscriptions are expected to have reached around 89 per 100 inhabitants by 2013 in this region, up from only 23 per 100 inhabitants in 2005.<sup>4</sup>

Major publicly-listed companies in the industry (see Appendix I) include AT&T and Verizon, which are domiciled in the U.S. and serve primarily U.S. customers. They also include

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<sup>1</sup> A list of representative companies appears in Appendix I. The activities described here are based on a mapping of the Sustainable Industry Classification System™ (SICSTM) to the Bloomberg Industry Classification Systems (BICS).

<sup>11</sup> Cable companies providing telecommunications services are excluded from the scope of the Telecommunications industry under SICSTM

companies domiciled abroad, serving their local markets. These include companies like NTT and China Mobile, serving the Japanese and Chinese markets respectively, and Telefonica, which is based in Spain but derives revenues largely from Latin America.<sup>5</sup>

Companies in the Telecom industry enjoy network effects, whereby the value of the service increases with the number of users. Together with significant investments required for the vast fixed line infrastructure in the Telecom industry, network effects create classic natural monopoly conditions. Even as regulations in several countries have attempted to increase competition in the industry over the years, incumbent enterprises (sometimes state-owned) continue to dominate in some markets.<sup>6,7</sup> In the U.S., the Telecom industry is currently dominated by two companies, AT&T and Verizon, which together accounted for around 73 percent of wireline revenue in 2012.<sup>8</sup> AT&T was a legally sanctioned and regulated monopoly until 1984, when it divested its wholly-owned Bell operating companies, which provided local exchange services, in an anti-trust lawsuit settlement.<sup>9</sup>

At the same time, larger players continue to enjoy economies of scale in the wireless segment, and have significant market share. Given the capabilities of the larger players, auctioning of valuable and limited spectrum can still create barriers to entry, particularly for larger spectrum blocks. AT&T and Verizon accounted for 55 percent of wireless revenue in North America in 2012. Sprint and T-Mobile, other players in the wireless segment, lost market share to AT&T and Verizon between 2008 and 2012.<sup>10</sup>

Some companies in the industry, in particular wireline service providers, are in direct competition with cable television (TV) providers.

In 2006 and 2007, both AT&T and Verizon launched pay-TV services; subscribers to both companies now account for almost 8 percent of all U.S. households with cable services.<sup>11</sup>

Sources of industry revenue include sale of mobile handsets and other wireless devices, pre-paid or post-paid wireless subscriptions, wireline subscriptions, sale of network capacity on a wholesale basis, and fee income from mobile roaming services.<sup>12</sup> Revenues are closely correlated with gross domestic product, while societal and consumer trends shape product and service offerings. In the U.S., retail consumers account for over 50 percent of spending on telecom. However, the business and government markets present growth opportunities for the industry.<sup>13</sup>

The wireless voice and data segments accounted for around 60 percent of industry revenues in North America in 2012, with the wireline segment accounting for the rest.<sup>14</sup> The wireline segment is experiencing a decline in revenues due to a steady reduction in demand for traditional voice services. Customers are substituting landline telephones with wireless devices. According to a 2011 study, 16 percent of Americans are receiving most of their calls on mobile devices despite having a landline phone.<sup>15</sup> Growth in wireline video and business services has offset some of the declines in voice services in the wireline segment.<sup>16</sup>

The wireless segment is driving industry growth, primarily through increasing data revenues. The wireless voice market is nearing saturation, but the use of Internet-connected mobile devices, such as smartphones and tablets, is soaring. Smartphone spending is expected to have a five-year Compound Annual Growth Rate (CAGR) of 18.4 percent and tablet spending of 30 percent through 2015.<sup>17</sup>

In addition, there is a trend towards machine-to-machine (M-to-M) wireless data communications, with companies looking to capitalize on the potential for an “Internet of things.” There are around 1.1 billion intelligent devices embedded with communication and software capabilities already in the market.<sup>18,19</sup> As a result of these trends, total wireless network traffic is expected to increase 30- to 70-fold over the next few years.<sup>20</sup> Telecom companies are also seeking to provide the infrastructure for an expanding cloud-computing market to expand their revenues.

The wireline segment faces high fixed costs for equipment and network infrastructure and associated depreciation expenses. With expanding data volumes, the traditional Public Switched Telephone Network (PSTN) infrastructure faces constraints, and companies are looking to implement new technologies, such as fiber-to-the-premises. Wages are also a significant proportion of costs, with companies employing significant numbers of maintenance and repair personnel and customer service representatives. Companies also pay access charges to each other for network use, a significant proportion of these going to international carriers. Rent and utilities associated with housing and cooling network equipment are other significant cost items for this segment.<sup>21</sup>

On the other hand, for the wireless segment, cost of service and equipment expenses constitute a majority of costs. The former represents the expenses incurred to operate and access the wireless network, as well as roaming and long-distance costs. Wireless operators often buy mobile phone handsets from hardware

companies, representing their equipment expenses. They then sell these to subscribers at a subsidized rate in order to attract more users. Increases in such purchases are expected, as technological change and customer preference for the latest handsets render products obsolete more rapidly. Depreciation expenses, including spectrum licenses, are also significant. Some network infrastructure is becoming outdated, as second-generation (2G) and 3G services are replaced with 4G. Other significant costs for both wireless and wireline segments include marketing and customer acquisition costs.<sup>22</sup>

The wireless segment is more profitable for integrated players like AT&T.<sup>23</sup> Smaller, regional wireless carriers face lower margins compared to larger players, as they do not enjoy the same economies of scale.<sup>24</sup> The overall EBITDA<sup>III</sup> margin for both AT&T and Verizon was around 25 percent in fiscal year (FY) 2012. Foreign telecom companies like NTT, China Mobile, and Telefonica reported higher EBITDA margins.<sup>25</sup>

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## LEGISLATIVE AND REGULATORY TRENDS IN THE TELECOMMUNICATIONS INDUSTRY

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The Telecom industry has traditionally been subject to extensive regulations related to anti-trust, due to its highly concentrated nature and network effects creating natural monopoly conditions. Some key areas of regulatory focus in recent years that have the potential

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<sup>III</sup> Earnings Before Interest, Tax, Depreciation, and Amortization.

to impact value in the industry include network neutrality,<sup>iv</sup> spectrum auctioning rules, data privacy, and the regulation of VoIP. Some environmental laws, such as those related to electronic waste (e-waste), also affect Telecom companies. The following section provides a brief summary of key regulations and legislative efforts related to this industry.<sup>v</sup>

Regulations in different countries have focused on increasing competition in the Telecom industry, and de-regulating certain services. In the U.S., this was facilitated by the break-up in 1984 of the monopoly and competitive services of AT&T, until then a recognized and regulated monopoly service provider. However, the Telecommunications Act of 1996 represents the first major overhaul of the regulatory framework for the industry in the U.S. since the 1930's.

The Act's main goal was to ensure a level playing field and to foster competition between firms that use similar technologies to provide a well-defined type of service (e.g., voice).<sup>26</sup> As a consequence, the Act established separate regulatory regimes for telephone carriers, providers of cable television, and those providing broadband and information services. Additionally, the Act included provisions that sought to address the social issue of "universal service" in the context of technological advances and changing needs.<sup>27</sup> Despite increasing competition in the industry as a result of the Act, Telecom companies continue to be subject to close regulatory scrutiny related to anti-trust, due to continued high industry concentration and strong network effects.

Pricing continues to be regulated in the wireline segment, with state bodies establishing the maximum prices that can be charged for certain services. Furthermore, the Federal Communications Commission (FCC) regulates inter-state charges through a price-cap plan.<sup>28</sup> Companies in this segment therefore have an incentive to lower their cost structures.

Wireless carriers are affected by a licensing system for the electromagnetic spectrum necessary to provide wireless services, the allocation of which is regulated by the FCC.<sup>29</sup> Demands on spectrum in the U.S. are rapidly increasing. In 2012, the FCC introduced incentive auctions as a method to repurpose spectrum from broadcast television and radio, to meet the demand from mobile devices. Incentive auctions allow spectrum owners to sell frequency in an open bid market.<sup>30</sup>

With the expansion of Internet-based services in the economy, and growing volumes of data transmitted over Telecom networks serving as an important revenue source for the industry, emerging laws and regulations governing the Internet could have a significant impact on industry players. Several attempts by the FCC to introduce network neutrality rules have been supported by content and information service providers, while being a cause for concern for the Telecom industry. Telecom companies are seeking to recoup their significant investments in infrastructure from Internet media and services companies. According to Telecom industry players, such companies profit from using telecom networks, while increasing traffic and congestion problems on networks, without

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<sup>iv</sup> Network neutrality refers to the idea that network providers should be detached from what information is sent over their networks and should not discriminate among content or users.

<sup>v</sup> This section does not purport to contain a comprehensive review of all regulations related to this industry, but is intended to highlight some ways in which regulatory trends are impacting the industry.

paying extra charges for doing so. Internet media and services companies, on the other hand, are seeking laws that prevent Telecom companies from imposing extra charges for services requiring increased bandwidth, which they perceive as discriminatory.<sup>31</sup>

Rapid technological changes pose challenges for regulation, while creating regulatory uncertainty for Telecom companies. Some Telecom companies provide video services. Under the 1996 Telecommunications Act, Telecom companies that choose to provide programming on a common carrier basis over serving as a conventional cable operator will face less regulation, but will have to comply with FCC regulations requiring “open video systems.”<sup>32</sup> However, companies like AT&T face petitions filed at the FCC that allege that the manner in which the company provides “public, educational and governmental” (PEG) programming over their U-verse TV service conflicts with federal law, and certain services provided by the company should be considered traditional cable services subject to state and local cable regulation.<sup>33</sup>

VoIP, a growth area for the industry, continues to face uncertainty about whether it should be treated as an information service or a telecom service for the purposes of regulation. With a few exceptions, VoIP remains largely unregulated by the FCC. In 2012, California became the 25th state to prohibit its Public Utilities Commission from imposing new regulations on VoIP without authority from the state legislature.<sup>34</sup> As the debate over VoIP continues, potential

changes in this scenario could have significant implications for the industry and its consumers.<sup>35</sup>

Several laws related to data privacy, cyber security, and government access to user data affect the industry. The FCC regulates the collection of information by Telecom companies, such as the numbers called, time of call, as well as the particular service used. The FCC determines how companies can use such information, known as Customer Proprietary Network Information (CPNI), and their actions to protect it, including specific requirements for customers opting into or out of companies’ use of CPNI.<sup>36</sup>

In Europe, the European Commission has proposed new data privacy regulations to replace its existing Data Protection Directive. Under the revised rules, the European Union (E.U.) is introducing more stringent and harmonized rules regarding fines imposed on companies.<sup>37</sup>

Companies must strike a difficult balance between protection of customer privacy and requirements to share customer information with governments in the U.S. and other countries. In January 2014, the U.S. Department of Justice agreed to relax standards over company disclosures of certain types of government data requests. The decision came in response to changes to the government data collection policy in the wake of the 2013 exposure of government surveillance programs conducted by the National Security Agency (NSA) since 2007. Companies may still only report the number of government data requests in broad ranges and only after a six-month waiting period.<sup>38</sup>



In addition to data privacy regulations, companies are likely to be subject to emerging cybersecurity laws. Forty-six U.S. states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam have enacted legislation requiring companies to notify their customers when security breaches of personal information occur.<sup>39</sup> In order to bolster cybersecurity for the country's critical infrastructure, President Obama signed an Executive Order in February 2013 and issued Presidential Policy Directive 21. These direct the National Institute of Standards and Technology (NIST) to develop cybersecurity standards for critical national infrastructure and expand information sharing between government agencies and the private sector on cyber threats and malicious activity.<sup>40</sup> The NIST released its Preliminary Cybersecurity Framework in October 2013, which covers Telecom companies and is voluntary. It published the official framework in February 2014.<sup>41,42</sup>

The ability of Telecom companies to manage the challenges associated with emerging regulations – particularly those aimed at ensuring fair and competitive business practices and data protection – while expanding revenues and market share, could have material implications for their value.

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## SUSTAINABILITY-RELATED RISKS AND OPPORTUNITIES

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Industry drivers and recent regulations suggest that while traditional value drivers will continue to impact financial performance, intangible assets such as environmental and social capitals, company leadership and governance, and

the company's ability to innovate to address environmental and social issues are likely to contribute increasingly to financial and business value.

Broad industry trends discussed in the Industry Summary are also driving the importance of sustainability performance in the Telecom industry:

- **Growing data transmission:** Expanding data transmission over telecom networks, with trends such as growth in mobile communication, heightens concerns over data privacy and security breaches, even as Telecom companies seek to monetize such data.
- **Expanding telecommunications devices and infrastructure:** Exponential growth in data is creating the need for additional telecom infrastructure, including data centers, and raises concerns over the related environmental impacts of energy consumption. Related growth in handsets and communications devices, often provided by Telecom companies, and their rapid obsolescence are leading to concerns over environmental impacts at their end-of-life as they find their way to landfills, leading to regulatory action.
- **Reliance on common capital:** Companies in the wireless segment rely on access to the electromagnetic spectrum to expand their services and generate revenues. This reliance on common capital increases the importance of business practices that maintain companies' social license to operate.
- **Network effects and universal access:** While there is increasing competition in the Telecom industry, inherent network effects enjoyed by Telecom companies can create dominant market positions, posing anti-

trust risks, as discussed above. Dominant positions by a few players create concerns around consumer protection from discriminatory or monopolistic practices. Access to communications technology is now viewed as a basic and necessary good and can contribute to economic development and digital inclusion. As technology evolves, Telecom companies are under continued pressure to ensure that their dominant market position does not limit universal access to such services.

- **Digital interconnectedness of the economy:** With enterprises, governments, and individual consumers increasingly depending on Telecom providers for mobile and broadband communication networks, the robustness of telecom infrastructure becomes important to avoid systemic or economy-wide disruptions.

As described above, the regulatory and legislative environment surrounding the Telecom industry emphasizes the importance of sustainability management and performance. Specifically, recent trends suggest a regulatory emphasis on customer protection and competitive markets, which will serve to align the interests of society with those of investors.

The following section provides a brief description of each sustainability issue that is likely to have material implications for the Telecom industry. Included in the description is evidence of materiality, as well as an explanation of how the issue could impact valuation. A table indicating the nature of the value impact and

evidence of interest from stakeholders appears in Appendix IIA. Appendix IIB expands on the channels of financial impacts of each sustainability issue, and the recommended disclosure framework appears in Appendix III.

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## ENVIRONMENT

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The environmental dimension of sustainability includes corporate impact on the environment, either through the use of non-renewable natural resources as inputs to the factors of production (e.g., water, minerals, ecosystems, and biodiversity) or through environmental externalities or other harmful releases in the environment, such as air and water pollution, waste disposal, and greenhouse gas (GHG) emissions.

Although the environmental footprint of the Telecom industry remains limited relative to other industries, the industry's energy use is increasing and becoming more material, as additional traffic drives the need for new network capacity and data facilities. Energy consumption translates into companies' indirect contribution to GHG emissions. This has potential implications for costs (as pricing of GHG emissions could be passed on to companies purchasing fossil fuel-based electricity), reputation and attractiveness to customers in the medium- to long-term (as public concerns drive a closer inspection by business customers of the environmental impacts of their supply chains).

# Environmental Footprint of Operations

A large part of the energy consumed by the industry is used to power critical network and data center infrastructure. Such infrastructure needs to be powered continuously; disruptions to energy supply can have a material impact on operations, depending on the magnitude and timing of the disruption.

Managing the environmental footprint of the significant telecom infrastructure used in this industry is important for managing costs, obtaining reliable supplies of energy, and lowering reputational risks. With increasing global focus on climate change, regulatory and customer actions place greater emphasis on resource conservation, and innovations in energy efficiency and renewable energy provide new avenues for energy management.

Telecom companies can pursue various strategies to achieve energy efficiency, including purchasing more efficient equipment, optimizing the locations for network equipment and data centers, managing energy “hotspots” in data centers, and implementing server virtualization, which can reduce the need to install more physical servers. In addition, long-term power purchase agreements with renewable energy providers or on-site generation based on fuel cells or other alternative energy sources can provide a hedge against volatile energy prices and be used to power telecom infrastructure in remote locations where the reach of the electric grid is limited.

With the growth in mobile device usage, new broadband technologies, and the emergence of M-to-M communications and cloud-computing, an increasing amount of data is being generated, transmitted over telecom networks, and stored with Telecom companies and others globally. Companies in the Telecom industry, therefore, may need to acquire more network capacity, equipment, and data centers, significantly increasing the materiality of energy consumption over time.

## Evidence

Although network equipment and data centers are becoming more energy-efficient, their overall energy consumption is increasing with the expansion in telecom infrastructure and data traffic. Information technology and telecom facilities in the U.S. consume about 120 million megawatt-hours (MWh) of electricity per year, which amounts to around three percent of electricity used in the country.<sup>43</sup>

Individual Telecom companies consume substantial amounts of energy, with an impact both on their operations and the environment. Powering AT&T’s vast wireline and cellular networks, including data centers, required around 14.6 million MWh of electricity in 2012. Energy consumption has increased significantly in the past few years, to power a dramatic rise in mobile data traffic on AT&T’s wireless network of more than 30,000 percent between 2007 and 2012.<sup>44</sup> Electricity use at other Telecom companies also largely goes to powering network equipment; for example, 88 percent of Sprint’s power is used for this purpose.<sup>45</sup>

Depending on the source of energy and the efficiency of its generation, electricity consumption by telecom network infrastructure can contribute significantly to environmental externalities, such as climate change, creating sustainability risks for the industry. Telecom networks had lifecycle GHG emissions of around 22 percent of the total footprint of the Technology and Communications sector in 2011. Furthermore, lifecycle GHG emissions from data centers and telecom networks are expected to increase more rapidly until 2020 than from other sources in the sector.<sup>46</sup>

Expenditures on energy can be significant in the industry. For wireline telecom carriers, for example, rent and utilities expenditures to house and power network equipment accounted for around 10 percent of revenues in 2012.<sup>47</sup>

While regulatory incentives related to GHG emissions mitigation have not been implemented consistently across the world or continuously over time, they are likely to increase costs of fossil fuel-based energy and make renewable energy options relatively more attractive in the medium- to long-term. In the U.S., average retail price of electricity for the commercial end-use sector has increased from 7.9 cents per kilowatt-hour (kWh) in 2001 to 10.3 cents per kWh in 2013.<sup>48</sup> The U.S. Energy Information Administration's (EIA's) long-term projections show that nominal electricity prices paid by the commercial end-use sector will increase to around 18 cents per kWh by 2040, in the agency's Reference case.<sup>49</sup> At the same time, as the impacts of climate change intensify, electricity grid disruptions are likely to increase, impacting network operations. Weather-related significant grid disturbances have been

steadily increasing in the U.S. from just over 20 incidents in 2003 to almost 140 incidents in 2011.<sup>50</sup>

Telecom companies have adopted various strategies to lower energy costs and improve efficiencies. Through measures aimed at lowering GHG emissions and energy use, Sprint reduced their operating costs by \$20 million between January and December 2008.<sup>51</sup> AT&T's efforts to reduce energy consumption saved the company over \$151 million from 2010 to 2012, through 14,300 energy efficiency projects. Electricity use per terabyte of data has fallen dramatically in the company's network, due in part to company efficiency initiatives, from 415 kWh per terabyte of network traffic to 281 kWh per terabyte.<sup>52</sup> Verizon's energy efficiency measures are also notable; the company increased data transmission on its network by 50 percent between 2009 and 2012, yet total electricity consumption rose only around two percent.<sup>53</sup>

Companies are also using renewable and alternative energy solutions to protect themselves against energy price fluctuations and unreliable electricity supply. Verizon launched a \$100 million solar and fuel-cell project to provide clean power to 19 of its facilities across the U.S., part of an ongoing effort to add renewable energy capacity to power company facilities.<sup>54</sup>

According to a 2012 Pike Research report, the Telecom industry will invest more than 61 percent of capital expenditures into sustainable infrastructure by 2016. The investments are motivated by efforts to improve energy efficiency due to rising energy prices, easier access to clean power, and GHG reduction.<sup>55</sup>

Disclosures by some companies in their 10-K filings indicate the materiality of energy management for this industry, especially with growth in data transmission. CenturyLink stated in its fiscal year (FY) 2012 Form 10-K that, "...pending proposals designed to reduce greenhouse emissions could substantially increase our energy costs. We may not always be able to pass on the increased costs of energy to our clients, which could harm our business." The company also cites inadequate electricity supply as a major risk.<sup>56</sup>

On its sustainability website, AT&T states that "Effective energy management has a direct impact on a company's bottom line, is an important environmental consideration, and is critical to the competitiveness of our business and the reliability of our service to customers."<sup>57</sup>

## Value Impact

Improving energy efficiency can reduce operating costs through lower utility bills, directly affecting profit margins. Such improvements may lead to both short-term cost savings through individual efficiency initiatives and a lower cost structure in the long-term through ongoing efficiency strategies that leverage technological and financial innovation. Energy efficiency solutions like virtualization are also likely to reduce the need for additional servers, potentially reducing capital expenditures and rent payments over the medium- and long-term.

Energy efficiency and the use of renewable energy can increase energy independence and mitigate operational risks related to energy availability and reliability, as well as price fluctuations,

with direct impact on a company's risk profile and cost of capital.

As energy is a key input to the strong predicted growth of mobile communications, with a need for increased data transmission and network capacity, the probability and magnitude of these impacts are likely to increase in the future.

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## SOCIAL CAPITAL

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Social capital relates to the perceived role of business in society, or the expectation of business contribution to society in return for its license to operate. It addresses the management of relationships with key outside stakeholders, such as customers, local communities, the public, and the government. It includes issues around access to products and services, affordability, responsible business practices in marketing, and customer privacy.

As the economy continues to shift away from traditional wired voice services towards wireless and broadband, Telecom companies are facing new challenges relating to social capital. Management of issues related to social capital will enable companies to be well-positioned to deal with emerging regulations and concerns about the use and protection of customer data. Performance on the issues of data privacy and cybersecurity is likely to influence whether companies can attract and retain customers, and build brand value.

## Data Privacy

Through the services that they provide, Telecom companies have access to growing volumes of customer data. Companies are increasingly looking to monetize such data, which may include location, web browsing history, behavioral, and demographic information. They are beginning to sell such data for marketing purposes to third parties, such as billboard companies, malls, and software companies.<sup>58</sup> Some Telecom companies also use the data to provide online behavioral advertising to customers.

Companies in this industry must therefore carefully manage two separate and often conflicting priorities. On the one hand, these companies may find a valuable source of revenues in such data through sales to third parties and advertising, as revenues from voice services decline. On the other hand, Telecom companies having access to an expanding range of customer information is increasing privacy concerns. This is particularly relevant as third parties also gain access to such information, although it is generally provided to them at an aggregate level for groups of retail consumers.<sup>59</sup> These concerns have led to regulatory scrutiny from the FCC, and authorities in Europe and other jurisdictions, affecting Telecom companies in different countries (see Legislative and Regulatory Trends section).

These trends are increasing the importance to Telecom companies of adopting and communicating in a transparent manner policies on providing customer data to third parties, including the amount and type of data provided and the nature of its use (for example, for commercial purposes).

Collection of personal and content data is also a concern for invasion of privacy by governments, as accentuated by the recent national debate on the Foreign Surveillance Intelligence Act (FISA) and the role of the NSA in surveillance activities in the U.S. NSA surveillance of telecom networks, including Telecom companies' alleged sharing of customer data (such as location, number called, and time of the call), and associated reputational risks highlight the growing importance of protecting customer data.<sup>60</sup> When companies are required to track user information or share data with governments, transparency about their privacy practices and the degree to which they comply with government requests will enhance their reputation and lower the risk of legal actions or customer backlash against them.

### Evidence

Evolving laws on data privacy and protection in the U.S. and abroad pose regulatory risks for companies in the Telecom industry and demonstrate public concern about this issue. Investigations and enforcement actions by the FCC highlight industry practices leading to data privacy breaches and potential additional costs of ensuring regulatory compliance, although the amounts of some of the fines and settlements were small, relative to company revenues. In 2010, the FCC settled multiple investigations into self-reported lapses of AT&T's opt-out practices related to Customer Proprietary Network Information (CPNI). AT&T agreed to a voluntary contribution of \$200,000, and to adopt a two-year compliance plan, including monthly testing of its opt-out mechanisms.<sup>61</sup> In another case in 2010, Verizon agreed to pay \$90,000 in a consent decree related to CPNI opt-out practices, and to adopt a similar compliance plan including monthly validation testing.<sup>62</sup>

In its 10-K filing for 2012, MetroPCS warns of the regulatory risk stemming from the FCC, including restrictions on the use of CPNI: “The FCC has imposed substantial fines on certain wireless carriers for their failure to comply with the FCC’s CPNI rules and this continues to be an area of active regulatory oversight.”<sup>63</sup>

The FCC ruled in 2013 that protection of confidential data on user devices, such as whom users call, pricing and terms, and location coordinates is the obligation of wireless carriers. Previously, carriers were only responsible for data housed in their internal systems.<sup>64,65</sup> The Financial Times reported in August 2013 that Telecom companies were lobbying Congress to relax FCC control over communications industry data and instead grant the Federal Trade Commission greater reach within the industry. The FCC has the authority to limit the types of information that can be sold.<sup>66</sup>

Furthermore, a dynamic regulatory environment can increase penalties for data privacy violations. In October 2013, the E.U. introduced draft rules for fines of up to EUR 100 million (\$137 million) or five percent of annual global sales (whichever is greater) for data-protection violations under revisions to the E.U.’s privacy law. Previously, the maximum fine imposed on a company by privacy regulators was only EUR 150,000.<sup>67,68</sup>

The sale of user data for marketing or consumer-behavior analysis is a potential area of growth in the industry. In order to be able to capitalize on this growth opportunity, Telecom companies will need to ensure they adopt best practices in privacy protection, and are transparent about their privacy policies. Sale of user data was a \$5.5 billion industry in 2012,

and is expected to reach \$9.6 billion in 2016. Companies like Verizon and Sprint currently sell customer data such as user location and web surfing and application history to third-parties. Some of these companies allow customers to opt-in to data sharing agreements to protect user privacy.<sup>69</sup>

A 2009 survey by Carnegie Mellon University of users of location-based telecom and Internet services showed that in general, consumers consider the privacy risks of sharing their location data to outweigh the potential benefits.<sup>70</sup> Recognizing the importance of addressing specifically data use related to location-based services, AT&T expanded its privacy policy in November 2010 to include such information.<sup>71</sup> In Europe, Telefonica abandoned plans to sell aggregated location data in Germany after facing political backlash related to privacy concerns.<sup>72</sup>

Revelations of a broad surveillance program conducted by the U.S. government have raised concerns over user data privacy within corporations and the general public. Until recently, companies were not allowed to disclose certain types of data requests by the U.S. government. However, following the recent ruling by the U.S. Department of Justice allowing disclosures in broad ranges, companies like Verizon released information on the number of customer information requests from federal, state, and local law enforcement agencies in the U.S. Verizon received approximately 320,000 such requests in a year, among them between 1,000 and 1,999 National Security Letters. Beginning in 2014, Verizon will report the percentage of requests for which information was actually produced.<sup>73</sup>

## Value Impact

In order to generate profits, retain existing customers, and attract new ones, industry players rely on innovative new services that increasingly rely on the use of customer data, and leverage such data and user networks to sell targeted advertising or sell the data to third parties.

Therefore, breaches of data privacy policies or unclear communication to users regarding privacy policies and the use of data for advertising purposes are likely to affect company reputation and brand value, especially in the mobile consumer segments, with long-term impact on market share and revenue growth potential. In addition, companies relying on customer data for new products and services or those earning significant revenues from the sale of customer data may face limits on new product development and sources of revenue as a result of increasing privacy standards and regulations.

New and emerging data privacy regulations are likely to affect the operational expenses of companies through increased costs of compliance. Companies may face chronic Selling, General, and Administrative (SG&A) and extraordinary expenses for small but frequent incidents, while high impact, low probability data privacy incidents can generate substantial one-time costs to remediate and contingent liabilities, with an impact on companies' risk profile and cost of capital.

As customers and regulators begin to understand the privacy implications of the use of customer data in the mobile consumer segment, the probability and magnitude of these impacts are likely to increase in the future.

## Data Security

Companies in the Telecom industry and in other industries are facing increasing cybersecurity threats. Telecom companies need to ensure that policies and processes are in place to manage these risks and that they utilize hardware or software systems that enable them to tackle cybersecurity threats both to their own and their customers' operations. As hackers get more sophisticated, companies' security systems will also need to evolve.

Telecom companies are providers of critical infrastructure serving several sectors including financials, infrastructure, and government agencies, apart from retail customers. If sensitive data of such entities is exposed due to failings on the part of Telecom companies, there could be repercussions for the wider economy, and reputational risks for Telecom companies. The NIST's cybersecurity framework of February 2014, highlights the risks to the nation's security, economy, and public safety, as well as to companies' bottom lines through impacts on costs and revenues.<sup>74</sup>

### Evidence

A recent global study on the cost of cybercrime found that the cost, frequency, and time to resolve cyber-attacks had increased for four consecutive years. The study finds that the average annualized cost of cybercrime incurred per organization ranged from \$1.3 million to \$58 million. The average time to resolve a cyber-attack was 32 days, with an average cost to organizations of just over \$1 million during this period.<sup>75</sup>



The Telecom industry is particularly vulnerable to cybersecurity threats. According to the study, the communications industry was among the top five industry sectors in terms of average annualized costs incurred for four years to FY 2013.<sup>76</sup> Furthermore, according to Mandiant's 2013 Threat Report, six percent of all advanced cyber-attacks target the Telecom industry.<sup>77</sup> A 2011 study commissioned by the U.K. Cabinet Office concluded that the mobile telecom industry was "likely to be affected by cybercrime through industrial espionage, [intellectual property] theft and online fraud and theft of customer data."<sup>78</sup> An example of a data security breach at Telecom companies is the exposure of the email addresses of more than 114,000 iPad customers of AT&T in 2010, through an attack on the company's website.<sup>79</sup>

Verizon's 2013 data security report, a study of 621 data breaches and thousands more security incidents, found that cybercriminals are increasingly using phishing and social-based attacks to gain access to corporate networks and more sensitive information. Attackers used stolen user credentials in four out of five attacks, which helps mask their illegal activity as they enter networks through normal Internet traffic.<sup>80</sup>

There is investor interest in disclosures on the issue of cybersecurity. According to a survey of 405 investors, released in February 2013 by security firm HBGary Inc., more than 70 percent of investors are interested in reviewing company cybersecurity practices.<sup>vi</sup> The U.S. Securities and Exchange Commission (SEC) issued guidance in October 2011 asking all

companies to disclose any material information on cyber-attacks or risks. Furthermore, the SEC has asked companies in several sectors for more information than they provided in their initial 10-K filings.<sup>81</sup>

Leading Telecom companies recognize the material implications of this issue in their 10-K filings. While companies report having been subject to cyber-attacks, they do not consider these as having had a material impact on their operations. However, they recognize that future attacks could have material impacts, particularly as the frequency and sophistication of cyber-attacks increases. For example, Verizon reports in its Form 10-K for FY 2012 that cyber-attacks could result in significant expenses, such as incentives to retain customers and increased costs of cybersecurity measures, lost revenues, and reputational damage.<sup>82</sup> Companies like MetroPCS/T-Mobile report that President Obama's Executive Order on cybersecurity could require them to adopt additional cybersecurity measures.<sup>83</sup>

## Value Impact

Telecom companies manage an increasing volume of customer data, including personally identifiable information, as well as demographic, behavioral, and location data. Therefore, their ability to combat cyber-attacks is likely to affect company reputation and brand value, with a long-term impact on market share and revenue growth potential.

New and emerging data security standards and regulations are likely to affect the operating

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<sup>vi</sup> Note that the survey does not refer only to companies in this industry, but to all companies.

expenses of companies through increased costs of compliance. It may also require technology and system upgrades, resulting in additional research and development (R&D) and capital expenditures. Companies may face chronic SG&A expenses and extraordinary expenses for small but frequent incidents, while high impact, low probability data security incidents can generate substantial one-time costs to remediate and contingent liabilities, with an impact on companies' risk profile and cost of capital.

As customers and regulators begin to understand the security implications of the increasing volume of customer data managed by Telecom companies, the probability and magnitude of these impacts are likely to increase in the future.

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## BUSINESS MODEL AND INNOVATION

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This dimension of sustainability is concerned with the impact of environmental and social factors on innovation and business models. It addresses the integration of environmental and social factors in the value creation process of companies, including resource efficiency and other innovations in the production process, as well as product innovation and looking at efficiency and responsibility in the design, use-phase, and disposal of products.

The ability of Telecom companies to ensure innovation in business models and services in the face of changing competitive forces and regulatory drivers will be crucial to future success. Specifically, as retailers of hardware devices, such as mobile phones, Telecom firms have the opportunity to address concerns over product lifecycle.

## Product End-of-Life Management

Telecom companies in the U.S. work in partnership with phone manufacturers to bundle telecom services and communication devices, such as mobile phones, and therefore have a shared responsibility for end-of-life management of communication devices. Mobile phones continue to be a target for developing legislation related to electronic waste (e-waste). These devices are subject to rapid obsolescence due to technological change and customer preference for the latest handsets. They are typically replaced in two to five years, leading to a significant waste stream.<sup>84</sup> Devices that are not disposed of properly and end up in landfills have the potential to leach substances that are hazardous to both human health and the environment.

Telecom companies' relationship with customers provides an opportunity for effective management of product recycling, re-use, and disposal, with a potential for significant cost savings from recovered materials. Moreover, as vendors of third-party and branded communication devices developed by original equipment manufacturers, companies in this industry have an opportunity to work within their supply chain to encourage sustainable design that limits the use of harmful substances and incorporates reusable parts in products. This can help reduce long-term costs associated with disposal, and increase the value of recovered products. Companies may also derive value from re-using or recycling their vast amounts of network equipment and components at the end of life.

## Evidence

The use of communications devices is expanding rapidly due to technological advances, lower prices for devices, and consumer preferences. In 2013, global smartphone shipments reached one billion units in a single year for the first time.<sup>85</sup> Due to the rapid obsolescence of communications devices, particularly mobile phones, they represent an increasing proportion of e-waste going to landfills, driven in part by a low recycling rate. The Environmental Protection Agency (EPA) estimates that 152 million mobile devices (19,500 tons) were disposed of in 2010, with only 11 percent recycled, the lowest recycling rate among different types of e-waste.<sup>86</sup> This indicates potential for improvements in product end-of-life management.

Telecom companies face growing regulatory risks related to this issue. Twenty-five U.S. states have implemented e-waste recycling laws mandating that electronics retailers and manufacturers create a system for recycling, re-use, or proper disposal of electronic devices.<sup>87</sup> While many of these laws in their early days covered a limited scope of products, newer laws extend to mobile devices, as concerns around e-waste from communications devices increase. For example, the New York State Wireless Recycling Act requires companies providing mobile phones in the state to accept the devices for recycling.<sup>88</sup> Furthermore, several states have bans on e-waste in landfills, potentially affecting Telecom companies that have significant network equipment needing decommissioning or replacement.<sup>89</sup> In Europe, the Waste Electrical and Electronic Equipment (WEEE) Directive applies not only to manufacturers, but also to distributors of mobile phones and accessories, thus affecting Telecom

companies with sales of such devices in the region. The Directive requires companies to finance the collection, treatment, recycling, or proper disposal of e-waste.<sup>90</sup>

Penalties or costs, due to such laws, together with potential revenues generated from refurbishing and re-selling products, are increasingly providing incentives for Telecom companies to manage end-of-life impacts. Some Telecom companies are proactively managing the issue, and enjoy cost savings as a result of their recycling and re-use programs.

For example, Sprint has established a goal to re-use or recycle 90 percent of the devices it sells by the year 2017, as well as re-use or recycle all network and IT e-waste by 2017.<sup>91</sup> The company reported a 44.5 percent collection rate for phones in 2012,<sup>92</sup> and indicates that more than 90 percent of the devices it collects are re-used.<sup>93</sup> The company's device collection programs have helped it to avoid more than \$1 billion in costs over the years, as collected handsets can be remanufactured and used instead of new devices to support the company's service and repair operations, insurance programs, and sales to price-conscious customers.<sup>94</sup> Sprint also established an environmental scorecard for suppliers that addresses issues such as recyclability. The company plans to have 70 percent of all devices launched annually in compliance with the scorecard.<sup>95</sup>

AT&T utilizes its relationship with customers to raise awareness and promote the uptake of cell phones that are designed with environmentally-focused principles. To achieve this, AT&T launched an Eco-rating system, in cooperation with original equipment manufacturer device suppliers in July 2012, which provides a score

for sustainability attributes of AT&T-branded devices and accessories.<sup>96</sup> Vodafone, the global U.K.-based Telecom firm, has established phone recycling programs in 17 of the markets where it operates, and states that such programs have a significant commercial benefit for the company.<sup>97</sup>

## Value Impact

Telecom companies act as the retailers for a majority of hardware products used in connection with telecom services, mainly wireless, and therefore have a shared responsibility with hardware manufacturers in the collection and management of these products at the end of their useful life. Performance on this issue can affect company reputation and brand value, with long-term impact on market share and revenue growth potential. It can also affect Telecom companies' relationships with hardware manufacturers who seek to improve the end-of-life management of their product, and their ability to bring the most competitive bundle of products and services to their customers, with long-term impact on market share and revenue growth potential.

End-of-life management standards from hardware manufacturers or regulators can also result in increased operating expenses, with impact on profits. However, refurbishing and re-using collected devices could ultimately result in net cost savings for Telecom companies.

As social and regulatory concerns over e-waste continue to increase, the magnitude and probability of these impacts are likely to increase in the future.

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## LEADERSHIP AND GOVERNANCE

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As applied to sustainability, governance involves the management of issues that are inherent to the business model or common practice in the industry and that are in potential conflict with the interests of broader stakeholder groups (government, community, customers, and employees) and therefore create a potential liability, or worse, a limitation or removal of license to operate. This includes issues such as risk management, safety management, supply chain and resource management, conflict of interest, anti-competitive behavior, and corruption and bribery.

In the context of the Telecom industry, governance issues manifest themselves in the form of companies' competitive business practices, and business disruptions that may have systemic impacts, particularly as the industry serves as critical infrastructure for the economy.

## Managing Systemic Risks from Technology Disruptions

Telecom companies own or operate critical infrastructure that forms the basis of modern communications and business processes. Systemic or economy-wide disruption may be created if the network infrastructure of Telecom companies is unreliable and prone to business

continuity risks, or if Telecom companies are not prepared to handle major emergencies. Apart from the Data Privacy and Security issues discussed above, disruptions can occur in the form of network downtime due to technical errors, impacts of extreme weather events, natural disasters, or electric grid disruptions.

As the frequency of extreme weather events associated with climate change continues to increase, Telecom companies will face physical threats to network infrastructure. Long-term climatic changes could also affect network equipment. This could result in frequent or significant service disruptions, outages, and the need to upgrade or repair damaged or compromised equipment.

As Telecom companies expand their network infrastructure and adopt new technologies, they need to ensure the reliability and resilience of such systems so as not to disrupt key services. Significant growth in data volumes and increasing complexities of network management could pose risks for service continuity and quality. Companies could protect shareholder value with practices to minimize the probability and magnitude of systemic impacts and by actively investing in improving the reliability, resilience, and quality of their infrastructure and services.

## Evidence

Given the systemic importance of telecom networks, the FCC has recently taken several steps to ensure their resilience in the U.S., posing regulatory risks for Telecom companies. These include proposed rules for wireless service

providers “to publicly disclose the percentage of cell sites within their networks that are operational during and immediately after disasters.” The FCC hopes this public disclosure will incentivize competition to improve network reliability. The FCC is also working to improve the reliability of networks used to originate emergency calls. As a majority of such calls are now placed on wireless networks, these are the focus of attention. However, the FCC also proposed rules to ensure that wireline providers routing emergency calls implement best practices in network design, operations, and maintenance. Furthermore, a public-private federal advisory committee to the FCC has been asked to recommend best practices for cooperation among network providers during emergencies, including sharing infrastructure and back-up power assets.<sup>98</sup>

According to the FCC, recent events have exposed weaknesses in the infrastructure of some telecom providers. For example, at its peak, Hurricane Sandy is said to have disabled about 25 percent of cell sites in the affected area, and more than 50 percent in the counties that were most impacted. Some wireless providers are said to have fared better than others.<sup>99</sup> Server failures have also been responsible for service disruptions for VoIP services. Around 31 percent of residential wireline emergency calls are made using VoIP services. In May 2010, a server failure caused a service outage lasting several hours for AT&T’s U-Verse interconnected VoIP service, in the company’s entire 22-state local phone service area, serving around 1.15 million customers.<sup>100</sup> Furthermore, the FCC’s National Broadband Plan (NBP)

highlighted that inadequate back-up power and communications backhaul redundancy were key contributors to congestion or failure of commercial wireless data networks, particularly during large-scale natural and man-made disasters.<sup>101</sup>

Regarding the need for new technology and systems to maintain high standards of reliability, the FCC states, "As the communications infrastructure migrates from older technologies to broadband technology, critical communications services will be carried over a communications network infrastructure that may or may not be built to the high carrier grade standards of legacy wireline systems. This potential for differences in service reliability could be a major source of concern for critical sectors, such as energy and public safety, and for consumers in general."<sup>102</sup>

The above discussion highlights the potential for systemic impacts affecting individuals and the economy, as well as exposes risks that Telecom companies face in relation to the resilience of their network infrastructure. Major network disruptions are already impacting value in the Telecom industry. For example, in 2012, Verizon reported a fourth-quarter loss of \$4.22 billion, or \$1.48 per share. Damage caused by Hurricane Sandy contributed to the loss, costing the company seven cents per share.<sup>103</sup> Although a majority of these costs were associated with the company's wireline business, the storm also exposed weaknesses in its wireless infrastructure.<sup>104</sup>

In response to Hurricane Sandy, the City of New York produced a plan to bolster the city's

infrastructure and protect communities from the impacts of climate change. Telecom infrastructure was specifically addressed in the plan, and faces challenges such as risks from flooding by oceanic storm surges and extreme heat waves, which damage electronic equipment.<sup>105</sup>

A 2010 report commissioned by the U.K. Department for Environment, Food, and Rural Affairs looked at adaptations of the information and communications technology industry to impacts from climate change. Broad, long-term climatic changes, such as higher temperature, precipitation, and wind variation can affect infrastructure on a large scale. They can, for example, accelerate damage to equipment, which raises maintenance and replacement costs, and affect the reliability of networks. Extreme weather events such as hurricanes tend to severely impact telecom infrastructure on a local geographic scale. According to the report, there is little evidence that major Telecom providers are currently prepared to respond to significant events.<sup>106</sup>

Leading Telecom companies generally provide disclosures in their 10-K filings highlighting the risks associated with technology and network disruptions. Level 3 Communications outlines in its Form 10-K for FY 2012 the financial exposure from such disruptions, for example, saying "...we often provide our customers with committed service levels. If we are unable to meet these service level commitments, we may be obligated to provide service credits or other compensation to our customers. Because we offer emergency notification services [...], any significant interruption or degradation in those services could create legal and financial

exposure.”<sup>107</sup> NII Holdings reports in its Form 10-K for FY 2012 the potential impact of new regulatory initiatives in this area, saying, “In some of our markets, more stringent network performance standards and reporting obligations have been adopted in order to ensure quality of service during unforeseen disturbances, and we may be required to make significant investments in our existing networks in order to comply with these recently adopted network performance standards.”<sup>108</sup>

### Value Impact

Technology disruptions can lead to reputation and brand damage, with long-term impact on market share and revenue. They can also lead to significant extraordinary expenses and contingent liabilities related to contractual liability or claims for damages. In addition, technology and system upgrades may be necessary to address the causes of disruptions, resulting in additional R&D expenses and capital expenditures.

As telecom services are becoming essential for many personal and business activities, disruptions can have a systemic impact that could endanger a company’s license to operate and affect its risk profile and cost of capital. Given the increasingly systemic impact of technology disruptions on society, and the adoption of new technologies and additional infrastructure by Telecom companies, the probability and magnitude of value impact on Telecom companies are likely to increase in the future.

## Competitive Behavior

The Telecom industry provides the classic example of a network industry, where most of the services provided exhibit strong network effects, in which the value of the service rises with the number of people using it. These positive feedback effects are due to demand-side economies of scale and can lead to a market “tipping” towards a single company or standard. A larger subscriber base allows companies to offer lower prices and gain higher margins due to the scale economies. This, in turn, allows carriers to invest in upgrading infrastructure to deliver better services. However, this could come at the expense of competition in the industry, as new entrants find it difficult to build their subscriber base. Large-scale infrastructure requirements for both wireless and wireline telecom also create barriers to entry, contributing further to natural monopolies.<sup>109</sup>

Despite efforts in different countries to promote competition in telecom markets – such as breaking up incumbent players that are natural monopolies to limit their market share and de-regulating the competitive portions of the market – often telecom markets continue to be dominated by a few large players. In the U.S., while Telecom companies face competition from cable companies and the level of competition is healthier in the wireless segment, industry concentration is still fairly high. The two leading companies, AT&T and Verizon, together accounted for around 73 percent of wireline revenue and 55 percent of wireless revenue in the Telecom industry in North America in 2012 (see Industry Summary).

High industry concentration in different countries has been the result of merger and acquisition (M&A) activity, in order to acquire more subscribers and spectrum licenses. For example, in May 2013, T-Mobile USA, up until then the fourth-ranked carrier in the U.S., acquired Metro PCS. In Europe, Telefonica is currently bidding for KPN's mobile subsidiary in Germany.<sup>110</sup> Other reasons for continued high rates of industry concentration include large capital requirements, first-to-market advantages held by incumbent players, different regulatory approvals needed to operate in different states, spectrum scarcity, and the ability of large integrated players to offer bundled services, which add to their economies of scale.<sup>111</sup>

The highly concentrated nature of the industry has led to concern on the part of consumer advocates over issues such as pricing, contracts, device locking, and network neutrality. "Net neutrality" concerns arise due to the network effects enjoyed by dominant players. Control over telecom networks can provide Telecom companies with unfair advantage over competitors in the delivery of Internet and other content over the network. Telecom companies are under increasing pressure to ensure net neutrality, where all data on the Internet is treated equally, in terms of performance and access. There are also concerns over charging higher fees for other companies to access the networks of dominant players and concentration of ownership of the electromagnetic spectrum.<sup>112</sup> Spectrum has become a valuable commodity for the Telecom industry, and companies are aggressively trying to acquire spectrum, beyond auctions. While this is critical to companies' growth, it has important implications for the level of competition in the industry.

Telecom companies therefore face heightened regulatory risks from anti-trust regulation and regulatory changes aimed at fostering competition and universal service, as technology advances. These have the potential to impact market share and profitability, particularly for dominant players.

The concept of universal service, originating in the context of natural monopolies, is a central tenet of the Telecommunications Act of 1996, and it is evolving as technology evolves. The Act and subsequent actions by the FCC emphasize access to new communications technology such as high-speed Internet for all consumers at just, reasonable, and affordable rates. Universal service principles within the Act are specifically focused on rural and insular areas and low-income consumers. The FCC uses contributions from Telecom carriers including wireline, wireless, and VoIP providers, based on their end-user revenues, to implement the provisions of the 1996 Act.<sup>113</sup>

Given the continued focus of regulations on facilitating competition, in order to protect shareholder value, Telecom companies must balance the need to expand market share and generate revenues in an increasingly competitive market with the need to ensure that they do not engage in unfair practices to restrict competition by utilizing their network advantages. In addition, companies that are able to develop unique products and pricing structures and ensure high quality of service for rural and insular areas, will be able to expand their subscriber base while maintaining their license to operate.



## Evidence

The industry faces ongoing legislative and regulatory actions aimed at ensuring competition, which could limit the market share and growth potential of some larger players.

M&A activity by dominant market players has come under regulatory scrutiny. This has resulted in companies abandoning plans to consolidate, affecting their share prices. For example, the U.S. Department of Justice sued to block AT&T's \$39 billion takeover of T-Mobile. AT&T acknowledged that it was unlikely to overcome significant opposition when it ended its bid in December 2011.<sup>114</sup> In late 2013, Sprint, the third-largest U.S. carrier, announced that it was considering a merger with T-Mobile in order to better compete with Verizon and AT&T. The companies' share prices rose on the news. However, reports that the FCC and U.S. Department of Justice would not support the deal led to the companies' share prices declining in the ensuing weeks. Sprint shares declined 27 percent since late December 2013, following a peak of \$10.79 on expectations of the merger.<sup>115</sup>

In 2009, the FCC began an investigation to probe the level of competition in the wireless sector following concerns over the vertical relationships between upstream and downstream market players such as AT&T and Apple. Such inquiries could portend future regulations limiting practices such as the exclusive relationship between AT&T services and iPhone sales.<sup>116</sup>

Efforts to enhance industry competition and consumer protection were also illustrated in March 2013 when the Obama Administration and the FCC indicated that Congress should act to allow wireless customers to 'unlock'

their mobile devices once they have fulfilled an initial contract. This would provide customers with the opportunity to use devices purchased through one carrier on another network, thereby reversing the 2012 ruling by the Copyright Office of the Library of Congress that made it illegal for consumers to unlock their cellphones.<sup>117</sup> In February 2014, the U.S. House of Representatives approved a bill allowing individual mobile phone customers to unlock devices, while preventing bulk unlocking of phones for resale purposes.<sup>118</sup>

Cost and limited availability of spectrum can be considerable barriers to entry for wireless telecom providers. Companies spent more than \$19 billion in a 2008 auction of 700 MHz spectrum. AT&T and Verizon both obtained major portions of the spectrum.<sup>119</sup> In April 2013, the Justice Department indicated that it would support limits on the amount of spectrum a single wireless company could hold. Intended to promote competition, related action could prevent both AT&T and Verizon from bidding on certain airwaves during auctions.<sup>120</sup> The FCC's Chairman recently indicated that the two companies' participation in a mid-2015 spectrum auction for highly sought-after lower-frequency 600 MHz spectrum may be limited. It is estimated that AT&T and Verizon already own 75 percent of lower spectrum frequencies.<sup>121</sup> While the FCC already enforces rules preventing spectrum aggregation, these limits are applied on a case-by-case basis, usually in the context of company M&A activity.<sup>122</sup>

The FCC is also continuing to focus on ensuring universal service. For example, high inter-carrier fees for calls routed by long-distance and wireless providers to local phone companies have led to poor call quality in rural areas.

In response, the FCC implemented new rules to strengthen reasonable and non-discriminatory service to rural areas.<sup>123</sup> In April 2012, the FCC requested comments on a proposal to tax broadband Internet service. Similar to fees currently attached to both landline and cellular telephone bills, the revenue would be used to support universal access, by contributing to the newly created Connect America Fund, which aims to subsidize the construction of high-speed Internet networks to the 19 million Americans who currently lack access.<sup>124</sup>

The changing dynamics of technology and communications markets, in particular the rapid expansion of the Internet, pose further challenges to the industry in terms of competitive behavior. Telecom companies maintain costly infrastructure to enable communications services and make continuous improvement to enable access to an increasing number of products and services over telecom networks, including Internet and mobile media. Consequently, some Telecom companies are seeking ways to share the cost of maintaining the infrastructure with Internet content providers, who use telecom networks to deliver their services.<sup>125</sup>

At the same time, Telecom companies could face regulations to ensure net neutrality, restricting their ability to recover costs and potentially limiting market share. In 2010, the FCC approved the Open Internet Order, a set of regulations that incorporates significant elements of net neutrality. The Order requires that wireline broadband providers, and to a lesser extent, wireless providers, follow specific rules regarding transparency, blocking, and unrea-

sonable discrimination. Wireline and wireless broadband providers must disclose network management practices, performance characteristics, and terms and conditions of service. Furthermore, fixed broadband providers are prohibited from blocking lawful content or discriminating in transmitting lawful network traffic. While the D.C. Circuit Court of Appeals struck down the existing net neutrality rules in January 2014, the FCC announced in February 2014 that it will develop a new net neutrality framework, the agency's third attempt to regulate Internet access by Internet service providers.<sup>126,127</sup>

## Value Impact

Telecom companies can face extraordinary expenses and contingent liabilities from adverse legal or regulatory rulings related to anti-trust. Rulings related to anti-trust and M&A activity may also affect a company's market share and pricing power if its dominant position in key markets is challenged, with significant impact on revenue. Strong reliance on market dominance can also be a source of risk if companies are vulnerable to legal challenges, increasing their risk profile and cost of capital.

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## SASB INDUSTRY WATCH LIST

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The following section provides a brief description of sustainability issues that did not meet SASB's materiality threshold at present, but could present a material issue in the future.

## Delivering Sustainability Solutions for Customers

As companies in the industry face competition in wireline services from cable providers, and look to expand their wireless and data services to increase revenues, sustainability-related communications solutions for customers could become important drivers of long-term value creation.

Business and retail customers of Telecom companies face growing environmental and social challenges, including those related to energy and environmental resource management, sustainable supply chains, and the quality and affordability of healthcare, financial services, and education, depending on the customers being served. By developing new technologies such as M-to-M communication, leveraging their networks, and creating innovative services and business models, Telecom companies could enable customers to address their sustainability concerns, while driving increasing data use on wireless networks. This has the potential to enhance shareholder value, by increasing revenue through new market opportunities and improved market share, although the materiality of financial impact on Telecom companies is unclear as yet.

Telecom companies are increasingly engaging in smart grid technology, building management tools, and M-to-M technology to improve energy efficiency. In addition, leading global Telecom firms, particularly wireless providers, are also innovating to tackle social challenges

in diverse areas such as agriculture, healthcare, education, and finance, reaching more consumers and increasing usage of their services.

The Global e-Sustainability Initiative SMARTer 2020 report concluded that the information, communication, and technology sector (including Telecom companies) could enable a 22 percent reduction in GHG emissions in the U.S. by the year 2020, compared to current projections.<sup>128</sup> Examples of how Telecom companies are starting to live up to their transformational change potential are already available. AT&T, for example, is helping to modernize the electric grid in the U.S. by enabling two-way connectivity for 13 million smart meters as of 2011.<sup>129</sup> Vodafone helped a waste management organization in the Netherlands monitor its garbage bins remotely through M-to-M technology; the outcome was an 18 percent reduction in the organization's annual carbon footprint and operating savings of EUR 92,000.<sup>130</sup>

In terms of social innovations, Telecom companies are offering services to individuals and businesses to improve social outcomes, as well as developing new business models for bottom-of-pyramid markets. In healthcare, for example, Deutsche Telekom (the parent company of T-Mobile) and a medical equipment company teamed up to assist patients with home diagnostics for chronic illnesses. The technology collects and transfers patient data so that health providers can monitor a patient's online health diary. Vodafone has established partnerships with local NGOs in several countries to

improve agricultural productivity and provide access to insurance services to local producers. Farmers in Turkey, for example, can sign up for SMS alerts that provide weather forecasts, crop prices, and tailored information based on crop types and location. It is estimated that the program improved farmers' productivity by around EUR 100 million between 2011 and 2012.<sup>131</sup>

## **Mobile Phone Radiation**

The human and environmental health impacts of radiation from mobile phone devices and network infrastructure continues to be the focus of significant debate and scientific inquiry. In March 2013, the FCC announced that it was seeking comment from other agencies and health experts on its standards relating to electromagnetic fields from cell phones.<sup>132</sup> The agency last reviewed those standards in 1996. The outcome of this review and ongoing scientific studies has the potential to present significant costs for the industry in the form of capital expenditures relating to existing infrastructure and future litigation.

## APPENDIX I: Five Representative Companies | Telecommunications<sup>vii</sup>

COMPANY NAME (TICKER SYMBOL)
AT&T, Inc. (T)
Verizon Communications, Inc. (VZ)
Nippon Telegraph & Telephone, Inc. ADR (NTT)
China Mobile, Ltd. ADR (CHL)
Telefonica S.A. ADR (TEF)

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<sup>vii</sup> This list includes five companies representative of the Telecommunications industry and its activities. This includes only companies for which the Telecommunications industry is the primary industry, companies that are U.S.-listed but are not primarily traded Over-the-Counter, and where at least 20 percent of revenue is generated by activities in this industry, according to the latest information available on Bloomberg Professional Services. Retrieved on 23 January 2014.

## APPENDIX IIA: Evidence for Material Sustainability Issues

	EVIDENCE OF INTEREST				EVIDENCE OF FINANCIAL IMPACT				FORWARD-LOOKING IMPACT		
	HM (1-100)	IWGs		EI	Revenue / Cost	Asset/ Liabilities	Cost of Capital	EFI	Probability/ Magnitude	Exter- nalities	FLI
		%	Priority								
Environmental footprint of operations	80	84	2	High	•		•	Medium	•	•	Yes
Data privacy	70	100	1t	High	•	•	•	High	•	•	Yes
Data security	N/A	100	1t	High	•	•	•	High	•	•	Yes
Product end-of-life management	55	84	4	Medium	•	•		Low	•	•	Yes
Managing systemic risks from technology disruptions	35	79	5	Medium	•	•	•	Medium	•	•	Yes
Competitive behavior	75	89	3	High	•	•	•	Medium			No

**HM:** Heat Map, a score out of 100 indicating the relative importance of the issue among SASB's initial list of 43 generic sustainability issues. The score is based on the frequency of relevant keywords in documents (i.e., 10-Ks, shareholder resolutions, legal news, news articles, and corporate sustainability reports) that are available on the Bloomberg terminal for the industry's publicly listed companies.

**IWGs:** SASB Industry Working Groups

**%:** The percentage of IWG participants that found the issue to be material. (-) denotes that the issue was added after the IWG was convened.

**Priority:** Average ranking of the issue in terms of importance. One denotes the most material issue. N/A denotes that the issue was added after the IWG was convened.

**EI:** Evidence of Interest, a subjective assessment based on quantitative and qualitative findings.

**EFI:** Evidence of Financial Impact, a subjective assessment based on quantitative and qualitative findings.

**FLI:** Forward Looking Impact, a subjective assessment on the presence of a material forward-looking impact.

## APPENDIX IIB: Evidence of Financial Impact for Material Sustainability Issues

	REVENUE & EXPENSES						ASSETS & LIABILITIES				RISK PROFILE	
	Revenue		Operating Expenses		Non-operating Expenses		Assets		Liabilities		Cost of Capital	Industry Divestment Risk
	Market Share	Pricing Power	COGS	R&D	CapEx	Extra-ordinary Expenses	Tangible Assets	Intangible Assets	Contingent Liabilities & Provisions	Pension & Other Liabilities		
Environmental footprint of operations	•		•		•						•	
Data privacy	•		•			•		•	•		•	
Data security	•		•	•	•	•		•	•		•	
Product end-of-life management	•		•					•				
Managing systemic risks from technology disruptions	•			•	•	•		•	•		•	
Competitive behavior	•	•				•			•		•	

■ HIGH IMPACT      ■ MEDIUM IMPACT

## APPENDIX III: Sustainability Accounting Metrics | Telecommunications

TOPIC	ACCOUNTING METRIC	CATEGORY	UNIT OF MEASURE	CODE
<b>Environmental Footprint of Operations</b>	Total energy consumed, percentage grid electricity, percentage renewable energy; amount of energy consumed by (a) cellular and (b) fixed networks	Quantitative	Gigajoules, Percentage (%)	TC0301-01
<b>Data Privacy</b>	Discussion of policies and practices relating to collection, usage, and retention of customer information and personally identifiable information	Discussion and Analysis	n/a	TC0301-02
	Percentage of users whose customer information is collected for secondary purpose, percentage who have opted-in	Quantitative	Percentage (%)	TC0301-03
	Amount of legal and regulatory fines and settlements associated with customer privacy <sup>viii</sup>	Quantitative	U.S. dollars (\$)	TC0301-04
	Number of government or law enforcement requests for customer information, percentage resulting in disclosure	Quantitative	Number, percentage (%)	TC0301-05
<b>Data Security</b>	Number of data security breaches and percentage involving customers' personally identifiable information <sup>x</sup>	Quantitative	Number, percentage (%)	TC0301-06
	Discussion of management approach to identifying and addressing data security risks	Discussion and Analysis	n/a	TC0301-07
<b>Product End-of-Life Management</b>	Materials recovered through take back programs, percentage of recovered materials that are (a) reused, (b) recycled, and (c) landfilled	Quantitative	Weight (tons), percentage by weight	TC0301-08
<b>Managing Systemic Risks from Technology Disruptions</b>	Average interruption frequency and average interruption duration <sup>x</sup>	Quantitative	Disruptions per customer, Hours per customer	TC0301-09
	Description of systems to provide unimpeded service during service interruptions	Discussion and Analysis	n/a	TC0301-10
<b>Competitive Behavior</b>	Amount of legal and regulatory fines and settlements associated with anti-competitive practices <sup>xi</sup>	Quantitative	U.S. dollars (\$)	TC0301-11

<sup>viii</sup> Note to **TC0301-04** – Disclosure shall include a description of fines and settlements and corrective actions implemented in response to events.

<sup>x</sup> Note to **TC0301-06** – Disclosure shall include a description of corrective actions implemented in response to data security incidents or threats.

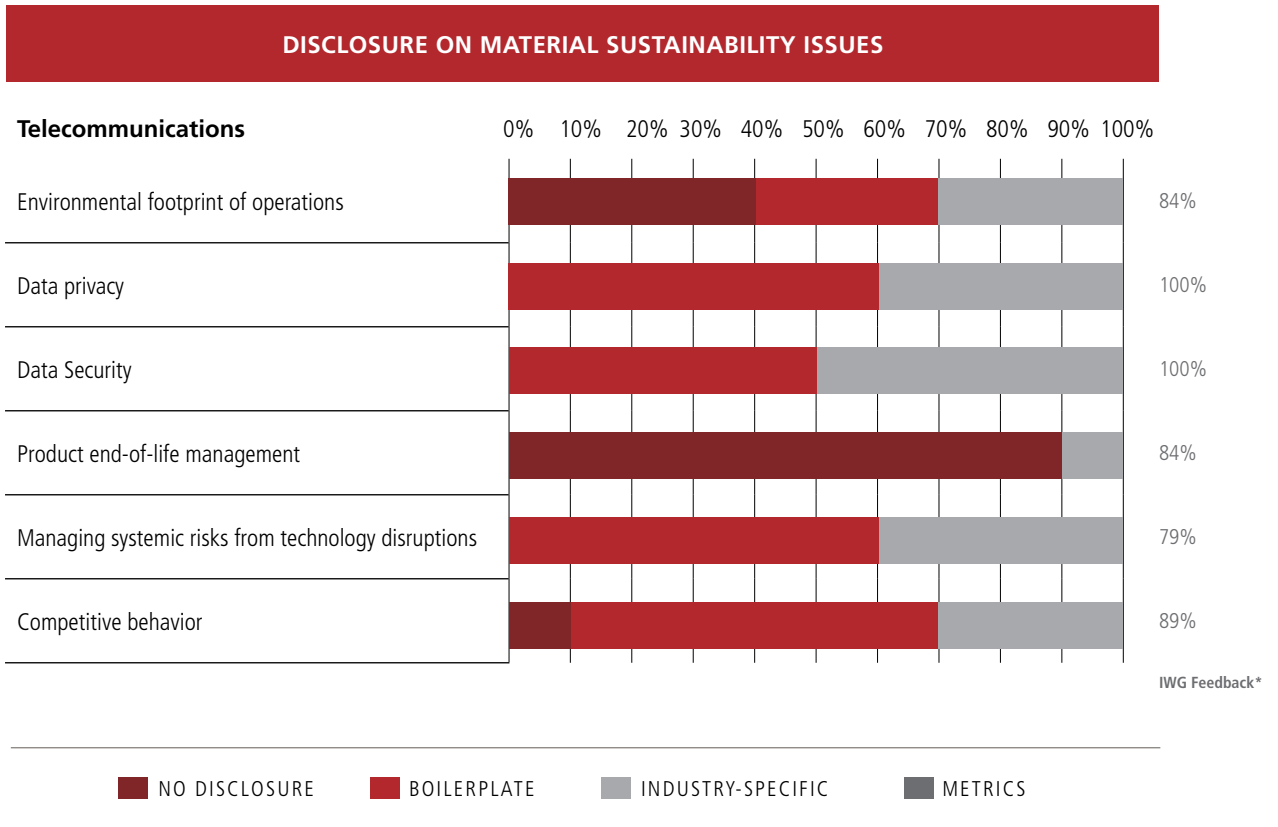
<sup>x</sup> Note to **TC0301-09** – Disclosure shall include a description of each significant performance issue or service disruption and any corrective actions taken to prevent future disruptions

<sup>xi</sup> Note to **TC0301-11** – Disclosure shall include a description of fines and settlements and corrective actions implemented in response to events.



## APPENDIX IV: Analysis of 10-K Disclosures | Telecommunications

The following graph demonstrates an aggregate assessment of how the top ten U.S. domiciled companies, by revenue, in the Telecommunications industry are currently reporting on material sustainability issues in the Form 10-K.



\*Percentage of IWG participants that agreed issue was material

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