

Taking Stock

Adding Sustainability Variables to Asian Sectoral Analysis

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Auto
Banking
Metals & Mining
Oil, Gas & Petrochemicals
Power
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Technology

TeeCee Technology

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Association for Sustainable & Responsible Investment in Asia



CONTENTS

INTRODUCTION.....	3
COUNTRY AND SECTOR DYNAMICS.....	4
What the sector looks like today.....	4
Cross-cutting issues.....	7
Long-term sector outlook.....	10
ENVIRONMENTAL CONSIDERATIONS GAINING IMPORTANCE.....	10
Regulation of toxic substances creates new risks.....	11
Product "takeback" is a new issue for consumer-facing tech firms.....	11
Cost reduction — mixed impacts on sustainability.....	12
Managing environmental impact of production remains important.....	14
THE IMPACT OF TRANSPARENCY, GOVERNANCE & CAPITAL MARKETS.....	14
Standards for transparency in Asia are low.....	14
Corporate governance standards are insufficient to mitigate risk.....	16
Capital markets subject to manipulation and inefficiency.....	16
INDUSTRIAL POLICY : THE ROLE OF ASIAN GOVERNMENTS.....	16
INTELLECTUAL PROPERTY RIGHTS : SUSTAINED GAINS FROM INNOVATION?...	17
Non-observance of intellectual property rights is common in Asia.....	18
IP investment is essential.....	19
Development of local standards is a risk IP promotion strategy.....	19
Foundation for strong R&D capabilities is being built.....	21
Frameworks to protect IPR are emerging throughout Asia.....	21
INVESTOR QUESTIONS FOR COMPANIES.....	24
RESOURCES.....	25

Sustainability

Sustainability is a systemic concept, relating to the continuity of economic, social, institutional and environmental aspects of development. In the terms of the 1987 Brundtland Report of the UN's World Commission on Environment and Development, sustainability is: "Meeting the needs of the present generation without compromising the ability of future generations to meet their needs." The key concept for investors is the need to address a range of environmental, social, and governance (ESG) factors which will inevitably shape long-term returns as markets respond to changing resource requirements and public priorities.

INTRODUCTION

The technology sector stands as one of the major success stories of Asian export-led economic development, and a large and diverse set of listed regional firms has captured a significant share of the global market for technology products. Over time, Asian firms have succeeded in moving up the technology food chain, such that they now dominate entire market segments, including contract manufacturing, memory production and chip packaging, and TFT-LCD manufacture. Analysts are sanguine regarding the outlook for continued cyclical growth in both new product categories and in domestic consumer markets, and existing firms and numerous new entrants continue to march up the value chain, moving into product design, software and services. The industry is dynamic and globally competitive, serving as an engine for growth, development and wealth creation in the region.

While many investors conceive of the tech sector as a paradise of private sector innovation and intense, efficient competition, we contend that it is important to recognize that regulatory frameworks and government activity relating to the environment, industrial policy and the functioning of capital markets and legal systems are all relevant to equity valuations. Asian technology firms have prospered in environments that have been low-cost and loosely regulated, yet that also have been protected, subsidized and benefiting from public goods such as education, infrastructural support and funded research and development. Loose enforcement of intellectual property rights has also contributed to the early competitive success of the sector. The sustainability of these practices, and the possible need to transition to new approaches, will have direct bearing on the competitiveness of firms and nations in the region, and will impact investment returns in both the short- and the long-run.

Asian technology firms have prospered in environments that have been low-cost and loosely regulated, yet also protected, subsidized and benefiting from generous provision of public goods

Asian technology equity research is dominated by a focus on technological innovation, growth trends, product cycles and competitive issues. This reflects the short-term, trading-oriented research calls common to the volatile, cyclical, momentum-driven world of tech stocks.

However, we see evidence that investors can benefit from incorporating aspects of sustainability analysis in their evaluation of Asian technology equities. In this report, we assess these issues in the context of Asia's most broadly held large- and mid-capitalization listed technology companies. We believe that the most important sustainability themes for investors in Asian technology companies will be:

- **Toxics and takeback** Increased regulation of toxic materials in many end markets, product recycling and "takeback" requirements, environmentally-friendly product design and tightening regulation of manufacturing waste and pollution streams will all likely impact the competitiveness of Asian technology manufacturers, and have the potential to influence valuations in both the short- and long-run

- **Transparency** Shortcomings in these areas have direct bearing on the sustainability of technology industry development, and investors should be mindful of how careful consideration of these issues can help investors to manage important categories of portfolio risk
- **Industrial policy** The technology sector has benefited greatly from government policies intended to support key export industries, and equity investors have arguably enjoyed significantly enhanced returns as a result. Investors should ponder the sustainability of various subsidies, tax breaks and market protections, and will recognize that policy changes, even those seemingly far removed from the tech sector, have the potential to impact the long-term trajectory of returns
- **Intellectual property rights** The development of legal frameworks to provide strong intellectual property (IP) protections will be vital as firms seek to innovate and expand margins, and that is likely the most significant long-term sustainability issue facing the Asian technology sector. Investors seeking stable returns should target firms investing in long-term R&D capability, and they should overweight national markets that encourage investment through strong IP protections

COUNTRY AND SECTOR DYNAMICS

What the sector looks like today

The listed universe of ex-Japan technology stocks is highly diverse, with some very large cap diversified players

Asian technology firms, producing both hardware and software products, as well as an emerging variety of information technology services, comprise approximately US\$350 billion of the US\$2.5 trillion Asia ex-Japan equity markets. The listed universe of ex-Japan technology stocks is highly diverse, with a limited group of very large-cap diversified players, dozens of large-cap manufacturing firms, a handful of large IT services and outsourcing firms and perhaps hundreds of mid-, small- and micro-cap names occupying a wide variety of niches in the global technology food chain.

Figure 1 Larger Regional Listed Technology Companies

Market	Company	Market Cap* (US\$mm)	Market	Company	Market Cap* (US\$mm)
China	Lenovo	4,086	Taiwan	TSMC	47,034
	SMIC	2,477		Hon Hai	22,093
	Baidu.com	2,064		Foxconn Technology	11,345
	Sina Corporation	1,284		UMC	11,173
India	Infosys Tech	18,141	Media Tek	10,396	
	Tata Consultancy	18,075	Asustek	8,796	
	Wipro	14,477	AU Optronics	8,696	
	Satyam Comp Serv	5,271	Chi Mei Optoelectronics	7,551	
	HCL Technologies	3,831	High Tech Comp	6,694	
	i-flex Solutions	1,807	Acer	5,661	
Singapore	Venture Corporations	2,232	Quanta	4,545	
	Chartered Semi	1,961	Powerchip	3,674	
	STATS ChiPAC	1,341	Compal	3,168	
South Korea	Samsung Electronics	96,954			
	LG Philipps LCD	14,970			
	LG Electronics	12,379			
	Samsung SDI	5,301			
	Samsung EM	2,869			

* As at 30 December 2005, or last official day of trading

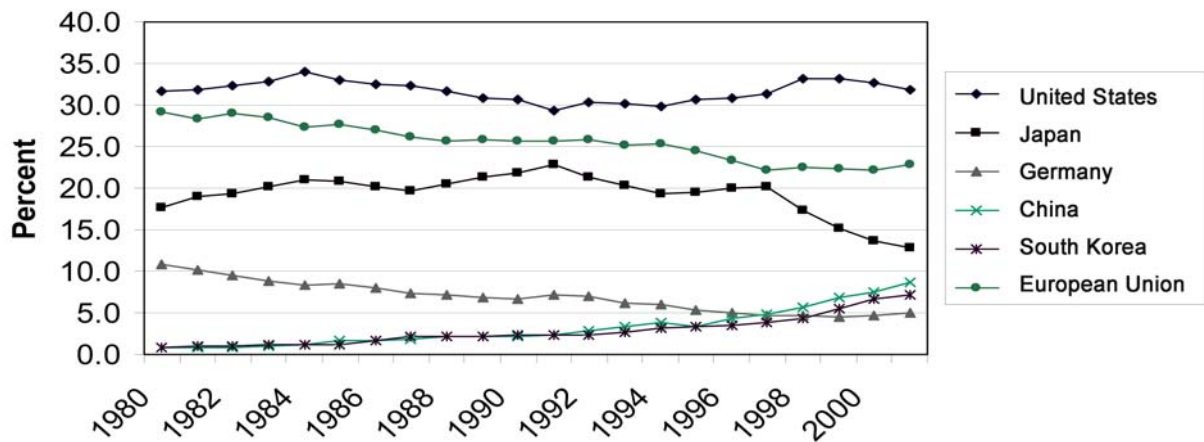
Source: Bloomberg, December 2005

While large capitalization names are headquartered in Korea, Taiwan, and to a lesser extent, India, the entire region participates in the industry, with semiconductor fabrication facilities, assembly operations, component manufacturers and services firms located in virtually every country. Different from many other industries in the region, direct government ownership or government control is fairly limited, as small private enterprises have rapidly grown into major firms, or as early government-owned interests were diluted to immateriality.

Korea

The Korean tech landscape is dominated by major chaebol-type firms such as LG and Samsung. These are broadly diversified across a large set of technology and consumer electronics segments, exhibit some vertical integration and have a relatively high level of brand recognition. Samsung, in particular, has emerged as a successful global brand and is the dominant player in a national industry that leads global production in both TFT-LCD and memory chips. Korea has an emerging dynamic tech economy that encompasses software developers, IT service providers and communications technologies driven by the highest broadband penetration rate of any major country in the region.

Figure 2 National Share of Global High-Tech Market, 1980-2001



Source: Global Insight

Taiwan

Taiwan is home to many of the world's most successful tech manufacturing operations, with particular concentration in semiconductor fabrication, LCD production and high-end contract manufacturing. Well known firms such as TSMC and Hon Hai have spawned a vast web of manufacturing and engineering firms that dominates the higher-value-added end of the Asian manufacturing spectrum and which supports an increasingly vibrant domestic R&D ecosystem.

China

China has emerged as the dominant national player at the low-end of the technology value chain, as major global firms have moved many low-value-added manufacturing operations offshore. More recently, both international firms and domestic players are increasingly building the ability of their Chinese operations to compete in higher-value-added areas. Domestic Chinese firms such as Ningbo Bird, TCL and Lenovo have risen to prominence serving emerging Chinese consumer markets.

India

India has a less-developed technology manufacturing base, but its large pool of highly educated, English-speaking labor has enabled the emergence of a set of internationally competitive IT services providers that is broad and deep, and poised for continued strong growth. The tech industry has grown at a 28% CAGR since 1998, and with revenues forecast to exceed US\$28B in 2005, it accounts for 4.1% of Indian GDP, up from 1.2% in 1998.

Malaysia, Thailand, Philippines

Localized regions with reliable infrastructure, attractive labor pools and generous government incentives have attracted significant technology investment.

Although these countries have supported few major domestic technology firms, they are dotted with the operations of major Japanese, Korean, Taiwanese and Western technology firms.

Cross-cutting issues

Rapid growth, difficult cyclicity, relentless pressure to reduce costs

While some technology product categories have matured in recent years, others are experiencing rapid growth. In virtually all categories, Asian nations, hosting both domestic and international players, have made dramatic gains in global share, and domestic manufacturers have fared disproportionately well as production has continued to migrate to the region from other geographies. Asian firms, enjoying lower operating costs, inexpensive capital and significant direct and indirect subsidies, have been able to capture huge portions of virtually all areas of the technology market, and the momentum continues to build, as network effects and supply chain proximity boost the concentration of activity in the region.

Asian firms have captured huge portions of virtually all areas of the technology market

Asia appears well positioned to capitalize on many of the major trends emerging on the hardware side of the technology equation. First, the next PC upgrade cycle, driven by the long-awaited Microsoft Longhorn/Vista release, will boost a PC components and assembly sector that, excluding microprocessors, has shifted almost entirely to Asia. Second, the explosive growth of the display sector and its extension into the television market, which is discussed in greater detail below, has been entirely dominated by Asian producers. Third, the mobile phone handset segment, including new 3G phones, is rapidly shifting manufacturing to Asia and a number of new Asian firms have emerged to serve domestic markets. Other drivers will likely include the next generation of game consoles, portable media players, networking equipment and others, all of which are dominated by Asian firms. Memory chip production, in both the more mature DRAM segment and the exploding non-volatile/flash segment, is an Asian stronghold.

Although growth is generally strong, virtually all of these segments are characterized by boom-bust cyclicity, constant margin pressure and intense competition. Firms that do not control key intellectual property or process technology are particularly exposed. However, even those that have made significant investments to support innovation are subject to the same overriding imperative: to reduce costs as rapidly as possible and by whatever means possible. In this environment, sustainable labor practices and environmental conduct are often casualties of perceived competitive necessity. For further discussion of the influence of labour issues, see the related Supply Chain report, section: Labour and Environmental Challenges Shape Supply Chain Risks.

- **The display market illustrates tech manufacturing dynamics**

The market for display devices is illustrative of many of the trends that play out repeatedly in various segments of the technology manufacturing sector. TFT-LCD displays are one of the largest emerging categories of technology hardware products, and revenue growth has been explosive,

driven by demand for notebook PCs, flat-panel displays, mobile phones, and more recently, flat panel televisions. According to DisplaySearch, a market research firm, the TFT-LCD segment grew 45% in 2004 to US\$48.5 billion, up from \$33.5 billion in 2003. Including digital light processing (DLP) and other Asian-dominated display segments such as plasma, industry revenues totaled \$62.2 billion in 2004.

Figure 3 TFT-LCD Statistical Snapshot

Supplier	Q2:05 Market Share (%)	Y/Y Unit Growth (%)	National Market Share (%)		
			Q2:04	Q2:05	
LG Philips LCD	23.4	98	Japan	11.5	9.5
Samsung	20.2	52	Korea	45.2	44.6
AU options	13.9	68	Taiwan	43.0	45.0
Chi Mei Opto.	11.3	89	China	0.2	1.1
Sharp	6.6	52			
Others	24.7	51			
Total	100.0	66			

By Application		
Category	Y/Y Unit Growth (%)	Y/Y ASP Decline
Notebook PC Panels	30	40
LCD Monitors	45	40
LCD TV	84	25

Source: DisplaySearch, Nikkei, Electronics Asia

Immense capital spending has driven capacity up to a point that threatens to swamp demand

A virtuous cycle of innovation, rising demand and falling costs has driven growth, yet immense capital spending of roughly \$35 billion over the past two years has driven capacity up to a point that threatens to swamp demand, savaging average selling prices and margins. DisplaySearch estimates that enough capacity will be in place by the end of 2005 to produce 100M LCD televisions, and nearly 150M by the end of 2006; this rapid run-up of supply will require unusually strong demand growth, or further price erosion may ensue. All the major players are expecting to gain share, yet many industry observers expect oversupply to result and for a shakeout to come in due course. Nevertheless, at the time of this writing, TFT-LCD players continued to announce significant additional 7G capacity expansions.

As TFT-LCD products become further commoditized and cost pressures become more intense, manufacturing and investment will likely migrate to low-cost locations. DisplaySearch figures already show Japan losing share despite the presence of early leaders such as Sharp and Hitachi, Korea just holding on despite massive investment, and Taiwan making significant gains. China also has the potential to gain rapidly, depending in part on the performance of TCL, a major Chinese TV producer, as it enters the market in partnership with Thomson.

Whether in memory chips, hard disk drives, or technologies yet to be developed, this boom-bust dynamic will likely persist, as will the progressive migration to low-cost manufacturing centers. In this environment, the ability to innovate, to protect intellectual property, and, to a lesser extent, to build a recognizable consumer brand, will likely be among the best ways to build an enduring strong competitive position, and to escape the bruising competition inherent to the commodity end of technology markets.

The ability to innovate and to protect intellectual property will be crucial to a strong competitive position

- **Software & services**

Markets for software and services are gaining greater prominence in Asia, though still small in comparison to manufacturing. Enthusiasm for consumer-oriented opportunities has driven the emergence of a number of gaming and internet firms, as investor interest in nascent Chinese firms such as Baidu, Shanda, Sina, Ctrip and others demonstrates. Despite much hoopla and its US\$2.5B market capitalization, Baidu reported just \$8.4 million in revenues in the June quarter, suggesting that while growth expectations are enormous, the current market is in a very early stage of development. Consumer oriented software and services markets are more mature in Korea and Taiwan, driven by higher incomes and high broadband penetration rates, yet few global scale firms have emerged.

The situation is quite different in commercial software and services, and the success of a group of Indian firms has received a tremendous amount of attention in recent years, heralding the emergence of a group of Asian firms with an opportunity to enjoy growth that is less cyclical and less prone to margin erosion. Tata, Infosys and Wipro, able to service global clients in the age of seamless internet communications, are capitalizing on a large labor pool of technically competent, English speaking workers in a domestic environment that provides legal protections for intellectual property and increasingly, a friendly, post-permit Raj regulatory environment.

Limited disclosure Investors in the Asian technology sector face significant challenges in assessing the sustainability risks associated with individual technology firms. Disclosure from large multinational technology firms is generally good, as firms have responded to CSR pressure with extensive sustainability reporting. Inclusion in sustainability indexes such as the FTSE4Good and the Dow Jones Sustainability Index (DJSI) has played a role in encouraging the stronger disclosure standards provided by a wide variety of firms, including such Japanese technology firms as NEC, Hitachi and Sharp. However, tech firms in the remainder of Asia have not generally met the same disclosure standards common to their Japanese competitors.

Consumer-facing firms have generally sought to bolster their reputations as non-polluting, socially responsible firms whose products provide ample social benefits. At Asian firms, however, sustainability reporting is either limited or non-existent. Although many firms presumably comply to some extent with the requirements of purchasers which are seeking to ensure sustainable practices within their supply chains, direct disclosure to investors is limited, and is therefore difficult to incorporate into the investment process.

Long-term sector outlook

The outlook for the sector looks good for continued increases in global market share

The technology sector in Asia will likely continue to develop at a rapid pace, and despite the inevitable turbulence of boom and bust cycles, the outlook is good for continued increases in global market share. At the low end of manufacturing markets, low costs, subsidies and favorable government policy will likely continue to be key factors. High cost manufacturing destinations such as Korea and Taiwan will increasingly experience the "hollowing out" phenomenon that has already progressed to a far greater extent in Japan. China will likely be the principal beneficiary of this trend, particularly if government policies, lending practices and labor costs remain largely unchanged. India may also emerge as an attractive destination for manufacturing, although current rapid growth is starting from a small base — India's 2002 total tech hardware production of \$3.6B was dwarfed by that year's \$20.8B tech output of Shenzhen alone. The continued prosperity of Korea and Taiwan and the success of the higher-value-added elements of the industry elsewhere will depend to an increasing extent upon the success with which firms are able to defend investments in research and development through intellectual property protections. Korea has made strong progress in this regard, Taiwan has lagged, and China has thus far recused itself from serious consideration of the issue.

Software and IT services will likely continue to be dominated by India which will capture the lion's share of growth. Indian firms have already demonstrated global competitiveness and will likely continue to take share from large western firms such as EDS, IBM, and other consultancies. Strong intellectual property protections and legal systems position India and Singapore well in this regard. Other countries that find the right combination of educated workforce, legal protection for IP and incentives, will likely do well. A key challenge for much of Asia in the coming decade will be to nurture innovation and to enable the development of global technology firms which will be able to escape the treadmill of relentless price competition in commoditized markets.

The rise of large domestic consumer markets, particularly in China and India, will likely drive a wide variety of changes in the industry. Large consumer-facing firms will face challenges of brand building, and although consumer awareness of sustainability issues will likely remain low, firms that cultivate a reputation for sustainable corporate practices may benefit as increasingly affluent consumers consider the impacts of their product choices.

ENVIRONMENTAL CONSIDERATIONS GAINING IMPORTANCE

Technology firms have generally benefited from a sustainability "halo effect," since IT-enabled gains in productivity and resource-use efficiency have made immense contributions to increasing the long-term sustainability of economic activity globally. However, the industry's legacy of producing toxin-laden products in an environmentally damaging, resource-intensive manner continues to come under scrutiny. Investors assessing sustainability issues

should familiarize themselves with the environmental issues facing the technology industry, as Asian governments and increasingly affluent Asian consumers may grow progressively more aware of, and perhaps intolerant of, certain forms of social costs associated with rapidly becoming the technology workshop of the world.

Regulation of toxic substances creates new risks

Although Asian governments are unlikely to be at the vanguard in promoting consumer protection regulation, Asian firms will face new, but manageable risks in ensuring that their products and sourced components are in compliance with such regulations in other parts of the world. In 2003, the European Union passed the Restriction on Hazardous Substances Directive (RoHS) mandating that a wide range of products meet strict new guidelines regarding toxic material content. Effective from July 1, 2006, the use of lead, cadmium, mercury, hexavalent chromium and PBB and PBDE flame-retardants will be heavily restricted, if not in fact effectively banned.

Sony learned a difficult lesson early, when 1.3 million PlayStation game consoles were seized in 2001 by Dutch authorities for illegal cadmium loadings in electric cabling, causing financial losses from lost sales and rework estimated to have totaled US\$93 million. Sony ran afoul of local Dutch regulations, but with the formal implementation of RoHS next year, similar rules will govern markets across the entire EU.

Given the strong link between toxics management and tougher standards for market access, it should not be surprising that the vast majority of technology manufacturers have now taken steps to ensure compliance with various local and RoHS requirements in their products and in all sourced components. There remains room for concern, however, because the absence of similar regulations in large Asian markets, most notably in China, creates the possibility that toxin-bearing components made through older and cheaper processes will remain common in products intended for regional use and could find their way into other parts of the electronics supply chain. As investors look at sourcing and supply chain practices for technology manufacturers in Asia, they should be aware of the financial and reputational risk involved with possible violation of RoHS requirements.

Regulations governing toxic content in technology products raise the stakes in supply chain management

Product "takeback" is a new issue for consumer-facing tech firms

Passed in conjunction with the RoHS Directive, the EU's Waste Electrical and Electronic Equipment (WEEE) Directive sets collection, recycling and recovery targets for all types of electrical goods sold within the European Union. The WEEE addresses the problem of "e-waste", which has received increasing attention in recent years from a variety of NGOs and advocacy groups. The

Silicon Valley Toxics Coalition has reported extensively on the issue of electronics recycling in the US, while Greenpeace has researched the high levels of local contamination near recycling workshops in China and India where valuable materials are smelted out of some of the nearly 50 million tons of electronic equipment disposed of annually.

While the problem of e-waste will likely not impose significant new direct costs on Asian tech firms, there may be indirect fallout from not proactively addressing the problem. While leading developed market, consumer-facing brands such as Sony, Philips and Hewlett Packard have undertaken extensive efforts to "green" their products through their entire lifecycle, many emerging Asian brands such as BenQ and even some maturing ones such as LG Electronics appear to be at a much earlier stage of awareness of the importance these issues may hold as consumers seek to differentiate between the numerous brands available in the channel. Also, see the Supply Chain report, section: The Influence of ESG Regulatory Hurdles on Export Market Access.

Cost reduction — mixed impacts on sustainability

Cost containment does not always result in an improved sustainability profile

The constant imperative to reduce costs and improve product performance generally serves to reduce the impact of new products on a per-unit basis. Next generation products typically weigh less due to reduced materials use, require less power due to lower lifetime carbon impact, and are produced in factories that relentlessly cut costs wherever possible, often through increasing control of processes which, by improving yields, reduce waste. Investors should bear in mind, however, that cost containment does not always result in an improved sustainability profile, and the substitution of inexpensive labor for expensive capital, while reducing overall costs, can frequently increase waste, reduce quality and increase worker exposure to toxins. While resulting liabilities may appear low at this time, many firms may in fact be in the process of creating long-term liabilities with a high level of materiality.

Figure 4 Low Cost Batteries — Sustainability Tradeoffs

BYD Company Limited (HK: 1211) is a successful Shenzhen-based battery producer. Founded in 1995, the company has rapidly captured market share from manufacturers in Japan and elsewhere, and is now the largest maker of nickel-cadmium (NiCd) batteries in the world, and the second largest producer of lithium ion batteries. BYD employs 36,000 workers, mostly young women, at its campus in Shenzhen, China.

BYD's original listing prospectus cites a "unique production process" which "takes advantage of the abundant human resources in the PRC and adopts a labour intensive production process...adopting manual labour for procedures requiring less accurate techniques." BYD has undercut the precise, highly-automated, capital-intensive production processes common in Japanese battery factories, and its competitive advantage rests almost exclusively on cheap labor.

BYD presents two sustainability challenges. First, although no problems have surfaced publicly, many BYD employees, working in minimal protective gear, now manually assemble Ni-Cd batteries and risk exposure to metallic cadmium, which can be absorbed through the skin and lungs, causing a host of long-term health problems. Second, the firm's low 1% R&D spending rate exposes its relative lack of investment in technology; in the meantime, it has likely made use of IP developed by Japanese firms, and one lawsuit brought by Sanyo was settled early in 2005. Over the long run, employee health problems from extended exposure to cadmium could pose a risk to BYD, although in the current Chinese legal environment it is unlikely that this risk would prove material. Additionally, low levels of R&D investment threaten to undermine future battery innovation on a global scale if high-cost producers are unable to maintain R&D investment in the face of price competition from BYD. BYD is a good example of tech sector-driven economic development in the Chinese Pearl River Delta region, yet the nature of its success poses difficult tradeoffs for sustainability-oriented investors.

Sources: BYD Website, NE Asia Online, BYD Prospectus

Poor process control and a focus on short-term cost reduction can result in spectacular failures. This was recently seen with Abit Computer, a listed Taiwanese PC motherboard manufacturer, which has been linked to a US\$442M write-off by Dell Computer for costs associated with replacing and servicing defective motherboards in its OptiPlex line of PCs. In what has been described as a cost reduction effort, Abit engineers used capacitors which proved unsuitable in the product, leading to electrolyte leaks and product failure. While such incidents are rare and may serve as wake-up calls for others in the industry, they underscore the risk for investors when inadequate process control and competitive pressure lead to major errors, whether they be in product quality, environmental compliance, or other areas of the business.

Poor process control and a focus on short-term cost reduction can result in spectacular failures

Managing environmental impact of production remains important

The environmental impact of technology manufacturing is not inconsequential, and investors should seek to verify that portfolio companies are not needlessly incurring long-term liabilities, and that they are actively minimizing costs through efficient use of power, water and other inputs. A modern, high-end semiconductor lab can use as much water as a city of 100,000 and tens of megawatts of electricity, and thus can have a significant impact on its local environment.

In the US, much has been made of the environmental contamination caused by such major firms as IBM, Fairchild Semiconductor, Intel and others during the early stages of the technology manufacturing boom from the 1950s through the 1980s. Groundwater plumes of leaked toxic chemicals, soil contamination and other toxic releases have resulted in 29 US EPA Superfund sites in Santa Clara County (heart of Silicon Valley) alone. Employee lawsuits over exposure to toxic chemicals, particularly organic solvents thought to be responsible for "cancer clusters", persist as liabilities for many major technology firms. Although most contemporary manufacturing processes have been developed to limit the potential for creating environmental liabilities in highly-regulated, litigious settings such as the US, Asian investors should keep in mind that firms continually run the risk of creating material long-term liabilities.

OEMs will have little difficulty dropping virtually any supplier in order to clean up their supply chains, exposing firms and their investors to declines in revenue

Perhaps the most obvious and immediately material risk for technology manufacturers is the possibility of losing major OEM customers. The products of most Asian technology firms have limited differentiation and are often fungible and easily replaced by other vendors. In an environment in which local and international activists are increasingly likely to publicize incidents of contamination or worker exposure to toxics, OEMs will have little difficulty dropping virtually any supplier in order to clean up their supply chains, exposing firms and their investors to potentially catastrophic declines in revenue. Also see the Supply Chain report, section: Cross-cutting issues.

THE IMPACT OF TRANSPARENCY, GOVERNANCE & CAPITAL MARKETS

Standards for transparency in Asia are low

Financial disclosure inadequate

Standards of disclosure in the technology sector are not considered to be out of line with other industries in the region, and listed firms generally comply with accounting rules and disclosure standards promulgated by regional exchanges and governments. However, Asian tech sector disclosure is weak relative to standards in developed markets, and even US-listed Asian firms can be surprisingly opaque. Particularly troubling in the tech sector is the accounting treatment of, and disclosure requirements for, joint ventures, which are

increasingly common as firms link up to share technology, pool resources for immense capital spending projects, and to penetrate markets around the region. IAS 31 has tightened up disclosure requirements as of this year, yet both equity accounting and proportionate consolidation leave gaps in the level of information available to investors about both control and financial results in specific joint ventures. As many firms report an increasing percentage of net income from joint ventures, particularly among Taiwanese tech conglomerates, investors should demand greater disclosure to gain better insight into the sustainability of the reported financial performance of firms.

Figure 5 Limited Transparency in the Chinese Technology Sector

Huawei [a maker of telecom equipment] is ostensibly privately-owned, although many of its shares are owned by the local state telecoms authorities to which it has sold equipment. It enjoys a US\$10bn low-interest credit line from the China Development Bank, whose mission is to make concessional loans in support of state policy goals. Huawei's ties to China's military have long been the subject of speculation. For the most part, Huawei seems to act independently. Yet, so much about the firm's parentage is obscure that one can never be entirely sure.

Source: "Chinese Bids Reveal Complexity of State Ownership", Financial Times, August 8, 2005

In October of 2004, an industry initiative called the Electronics Industry Code of Conduct (EICC) established guidelines for participating firms in key areas of sustainability. The EICC seeks to govern conduct in three categories of firms: original equipment manufacturers (OEMs), original design manufacturers (ODMs), and electronic manufacturing services (EMS) providers. The EICC sets specific and detailed goals on practice and disclosure in five key areas: labor, health & safety, environment, management systems and ethics. Founding members include IBM, Dell, Hewlett-Packard, Flextronics, Celestica, Jabil, Sanmina SCI and Solectron. Additional firms, including Cisco, Sony, Microsoft, Intel and others, have subsequently adopted the EICC. EICC compliance is emerging as a focus for sustainability reporting at most member firms which publish comprehensive annual sustainability reports.

Sustainability disclosure limited in most instances

At this time, no Asian firms have adopted the EICC (and even in Japan, only Sony appears to have adopted the EICC), and sustainability disclosure is virtually non-existent. Samsung published a 2004 "Green Management Report" which details a wide variety of practices contributing to reduced emissions and pollution, product recycling, safety & health practices and community engagement, but this sort of report does not exist at other large-cap Asian (ex-Japan) technology firms. Even TSMC, a prominent Asian component of the Dow Jones Sustainability Index, provides remarkably little information to investors regarding practices of interest to most sustainability-oriented investors. In the absence of disclosure regarding sustainability metrics, Asian tech investors lack the disclosure tools crucial to assessing the materiality and potential impact on returns of these sustainability-related issues.

No Asian firms have adopted the EICC and sustainability disclosure is virtually non-existent

Corporate governance standards are insufficient to mitigate risk

The technology sector is particularly prone to JV abuse

Problems related to inadequate corporate governance standards in Asia have been extensively documented, and the technology sector is also prone to abuse. Investors will look for independent boards and simple capital structures with sufficient protections for minority shareholders. Joint venture (JV) structures are also subject to governance risk since reduced transparency and transfer of control can limit the extent to which investors can monitor the behavior of management. The technology sector is particularly prone to JV abuse, both due to the frequency with which firms create JVs to pursue new product opportunities, and due to the scale of the value transfer when firms pledge key IP and process technologies to non-wholly-owned entities.

Capital markets subject to manipulation and inefficiency

The pronounced volatility of technology stocks enhances the opportunity for abuse from insider trading and share manipulation. Although such abuse can be rationalized as a "victimless crime", selective disclosure passes losses on to the investing public which undermine the health of capital markets in the region. Conversations with analysts, investors and company officers reveal a market culture with a short-term focus and a strong appetite for rumor and hot stock tips that extends from the boardroom to the assembly line, creating a situation where investors are often caught in a zero-sum game. Sustainability-oriented investors can benefit through the recognition of the importance of regulation aimed at curbing such abuses and will need to stay alert to market-level changes in enforcement of securities laws as Asian governments continue their march toward higher standards.

INDUSTRIAL POLICY: THE ROLE OF ASIAN GOVERNMENTS

To varying extents across much of Asia, technology firms have been the beneficiaries of deliberate, long-term, government-led industrial policies. Mercantilist trade practices, targeted subsidies, tax abatements and holidays, and other techniques have been marshaled to support the growth of the technology sector to a greater extent than in virtually any other industrial sector. Careful government policy, perhaps as much as Asia's feted tech entrepreneurs, should be credited with success in capturing global market share. Bank lending has financed a much greater portion of the capital expansion of the technology sector than in other parts of the world, partly due to less mature capital markets, but also due to government intervention in the allocation of capital. Numerous government-sponsored technology parks, such as Hsinchu in Taiwan or Suzhou in China, have frequently provided tech firms with cheap land, reliable and subsidized utilities, extensive tax breaks, waivers on a variety

of regulations and other subsidies that have promoted the rapid expansion and competitiveness of clusters of activity in the technology sector. Other government policies, ranging from fixed exchange rate regimes to intellectual property enforcement policies that benefit domestic producers, have also played important roles in shaping the modern Asian tech sector. Investors considering the long-term prospects of the industry should consider whether or not current industrial policies can be sustained in the long-run and whether or not change may come due to underlying economics, WTO rules interpretation and implementation, or shifting levels of popular political support for certain practices.

Policies promulgated to promote the development of the technology industry are unlikely to change rapidly anywhere in the region, but sustainability-oriented investors will likely have greater awareness that such policies come with considerable price tags attached. As the industry matures and populations grow more affluent, taxpayers may grow less willing to provide generous support to technology firms. Support for direct subsidies and giveaways may falter, or such practices may be curtailed in the face of WTO regulations. In economies where direct bank lending constitutes a large portion of the funding for technology-related capacity expansion, the ability of politically influenced lenders to efficiently allocate capital is uncertain. Frequent predictions of dire consequences for the banking sector in China and elsewhere have generally come to naught in recent years; however the risk is a real one, and could prove particularly acute if a technology downturn coincides with recession in any of the Asian economies. During the Asian Financial Crisis, the Korean public shouldered a significant portion of the bad debt incurred at overextended chaebols, and Hynix, a restructured Hyundai spin-off, re-emerged as a global technology competitor thanks, effectively, to a large public bailout. The willingness, or for that matter, the ability of governments to provide such support should be a concern for investors.

INTELLECTUAL PROPERTY RIGHTS: SUSTAINED GAINS FROM INNOVATION?

The issue of intellectual property rights (IPR) has emerged as a source of considerable controversy within Asia and a source of conflict with trading partners. The developing economies of the region maintain a reputation for misappropriation of designs, processes and technologies which would enjoy significant protection under copyright or patent law in most developed nations. Burgeoning regional trade surpluses with the United States and other nations have elevated the significance of the problem and have prompted calls for new protections for, and stricter enforcement of, IPR—which is an important basis for developed-country comparative advantage. While a loose approach to IPR has contributed significantly to economic development in the region, helping to grow manufacturing capacity and to provide affordable goods to consumers, the continuance of existing IPR policies could pose a growing threat to future economic development in the region. Beyond the overt and immediate danger of new restrictions on trade, a lack of intellectual property protection will have a pernicious and chilling effect in the long-term on domestic innovation, as

Increased protections for intellectual property will be critical to the sustained long-term development of Asian economies

incentives for investment in R&D are eroded by an inability to effectively monetize intellectual property. We believe that increased protections for intellectual property will be critical to the sustained development of higher-value-added economic activity in developing Asia, and that without reform, Asian firms will face increased resistance in international markets. Investors will increasingly recognize the importance of this issue and will seek to invest in firms building long-term R&D capability, and to overweight national markets that encourage investment through strong IP protections.

Non-observance of intellectual property rights is common in Asia

Software piracy is a well-documented area of intellectual property theft, and countries with three of the top five national piracy rates are in Asia

Most casual observers of Asia will be familiar with street-level sales of counterfeit DVDs and handbags, but the problem runs deep with some analysts estimating that counterfeit goods, including auto parts, electronics and pharmaceuticals, constitute as much as one third of industrial output in China. In the technology sector, software piracy is a well-documented area of intellectual property theft, and countries with three of the top five national piracy rates are in Asia: Vietnam, China and Indonesia. Even in India, where a significant domestic software industry has emerged, high piracy rates undermine a sector which already exports product worth more than three times the value of the domestic market. The chilling effect that the prevalence of piracy has on domestic software production is evident in the lack of major domestic packaged software firms throughout much of the region.

Figure 6 Software Piracy in Asia

	2004 Piracy Rate (%)	Est. Annual Industry Losses (US\$m)
China	90	3,655
Hong Kong	52	116
India	74	519
Indonesia	87	183
Malaysia	61	134
Philippines	71	69
Singapore	42	96
South Korea	46	506
Taiwan	43	161
Thailand	79	183
Vietnam	92	55
United States	21	6,645
Japan	28	1,787
France	45	2,928
United Kingdom	27	1,963

Source: Business Software Alliance, IDC, 2005

In technology hardware markets, the intellectual property situation is murkier. Firms participating in export markets or in the supply chains of major international firms must comply with end-market IP regulations or risk loss of contracts and lawsuits — frequently brought in jurisdictions which take an unfavorable view on patent infringement. Output for domestic markets, however, is another matter and cheap, generic products, liberated from the costly burden of royalties, are widely available. Large consumer hardware brands, increasingly dominant in wealthier Asian markets such as Korea and Taiwan, are generally in compliance with IP rules for their finished products, but much remains unclear about IP usage in manufacturing process technology. Virtually all commentators on intellectual property rights in China agree that violation is common and flagrant, enforcement is minimal and that near-term prospects for significant improvement are dim.

IP investment is essential

IP investment is essential for defensible margins and long term global competitiveness. Innovation and development of intellectual property will enable Asian firms to establish enduring competitive advantage in global markets and to get off a treadmill of ferocious competition based on lowest cost manufacturing. Firms will not be able to leap to technological leadership overnight and a long-term commitment will be necessary to nurture national R&D capability. Firms will need to make long-term investments and nations will need to invest in education and adopt well-designed measures to protect IP and encourage innovation. As governments begin to address this area, investors will need to differentiate between various corporate and national strategies and to assess where the most effective investments in IP are being made.

Firms will need to make long-term investments to protect IP and encourage innovation

Development of local standards is a risk IP promotion strategy

One controversial method of encouraging domestic development of intellectual property is to establish unique standards which empower domestic firms while shutting out foreign competition. Korea has pursued domestic standards in the past, and China is now the principal user of this tactic. The establishment of a local standard, for which local firms will frequently hold key patents, enables firms to dominate a domestic marketplace; but it can also reduce the ability of firms to compete in international markets where other standards prevail.

There are several recent examples of this practice. The Chinese government is currently pushing the TD-SCDMA wireless standard for 3G networks in an effort to circumvent WCDMA and CDMA2000 standards, as well as a domestic "EVD" standard, distinct from global DVD standards. Another example came in 2003 when the Chinese government declared that all wireless LAN chipsets would need to use the Chinese-developed WAPI security protocol. This would have forced foreign firms to license the Chinese standard, tilting the playing field toward domestic producers since foreign producers would lose the scale economies gained by shipping the same products in numerous international

markets. The WAPI requirement was dropped only in the face of forceful lobbying by the US government.

The advantage bestowed by leadership in a domestic standard-based market is a mixed blessing for firms, which may enjoy enhanced profits at the expense of global competitiveness. If these profits enable rapid capital accumulation and investments in long-term R&D, then globally competitive national champion firms may yet emerge, though a positive outcome is by no means certain. The only certainty is that the approach will yield considerable economic deadweight losses for the host nation in the process. This risk is apparent in efforts by the Chinese government to promote, through public-sector procurement policies, Linux-based open source software products. Although cost savings may result from forsaking Windows-based software for products supported by Chinese firms such as Red Flag Linux, there is a substantial risk, as with Linux-based products in other markets, that lack of functionality, applications and support may leave users stranded, potentially facing high costs in an underfinanced standard. In a market where software piracy is unchecked, users may be inclined to choose "free" Windows applications over "free" Red Flag Linux applications, leaving domestic developers to wither in the absence of meaningful IP protection.

Figure 7 Government Intervention and a Domestic Standard Play Havoc with 3G Adoption in China

As 3G wireless networks roll out around the world, progress in China is stalled as the industry awaits the outcome of a standards debate. Chinese mobile carriers expected to receive 3G licenses in 2005, but observers now expect that licenses may not be issued until late 2006 or later. Expectations for a capital spending boom have been reined in from north of US\$30 billion to as little as US\$10 billion over the next three years, and even that has been cast into doubt. While 2G mobile uptake continues rapidly (China now has 330mn mobile subscribers, yet only a 26% penetration rate), the market for high-end handsets and advanced services is in limbo.

Underlying the 3G delay is a standards battle as the Chinese Academy of Telecommunications Technology (CATT) backs the homegrown TD-SCDMA standard over the WCDMA and CDMA2000 standards prevalent in the rest of the world. Although framed as a debate over the best technology, the dispute is clearly driven by business considerations. The Asian Wall Street Journal estimates that Chinese firms would face royalties of up to 25% if they adopt foreign 3G standards, versus 2G royalties closer to the 8% level, and that these costs could eliminate much of the competitive advantage that Chinese firms have enjoyed in recent years; royalty payments to Qualcomm and other western firms could exceed \$7.5 billion over the next five years by some estimates. Another rather banal consideration is that CATT is a majority shareholder in Datang Mobile, which would, along with Huawei and ZTE Corporation, benefit greatly from TD-SCDMA adoption.

If China goes ahead with TD-WCDMA, then domestic firms will doubtless capture market share from Western vendors and enjoy increased short-term profitability. Those profits may, in turn, fund R&D which could better enable Chinese firms to compete globally, although the effectiveness of this mercantilist strategy remains to be seen.

Sources: "China Eases up on 3G", Asian Wall Street Journal, June 30, 2005; "China's IP Standoff", Asian Wall Street Journal, July 5, 2005; "Facing the China Challenge", Boston Consulting Group, June 2004

Foundation for strong R&D capabilities is being built

Despite the current dominance of developed market IP, Asian technology firms are well positioned to build world-class research and development capabilities. Globalized R&D operations will enable Asian firms to set up research centers in developed countries while capitalizing on returning expatriates and strong domestic educational systems.

Figure 8 Annual Engineering Degrees Awarded by Country, Science and Engineering Articles by Geography

Number of Degrees Awarded		Science and Engineering Articles by Geography			
Country	(Bachelor level degrees only, figures in year 2000)	Country	1988	2001	% Change
China	291,563	United States	177,700	200,900	13
EU-15	179,929	Western Europe	143,900	229,200	59
Japan	104,478	Asia	51,800	113,600	119
Russia	82,409	China	4,600	21,000	354
India	59,536	India	8,900	11,100	25
United States	56,508				
South Korea	26,587				
Taiwan					
Mexico	24,184				
Poland	21,618				

Source: US National Science Foundation, 2002

Nevertheless, the current R&D situation is somewhat difficult to ascertain since many listed Asian firms do not break out research and development expense as a separate P&L item in published financial disclosures. Greater disclosure in this regard will enable investors to assess this critical sustainability metric.

Frameworks to protect IPR are emerging throughout Asia

The outlook for intellectual property protection is improving, but much remains to be done to create a fertile environment for innovation. While external pressure, perhaps driven by the US or the WTO, will occasionally bear fruit, the battle for IPR enforcement will ultimately be a domestic political battle waged by various interest groups. When enough stakeholder groups realize that their long-term interests are best served by robust IP protection, the tide may begin to turn against IP abusers, and robust and impartial protective mechanisms may eventually emerge.

One argument against patent enforcement is that the system is unjust, forcing consumers to overpay for products. Tao Xinliang, the dean of the School of Intellectual Property at Shanghai University, was quoted in *The New York Times* saying that "we must make sure that prices are reasonable, that the whole family of mankind can enjoy the fruits of production...things should operate in such a way as to make rich people richer and poor people richer too, as opposed to making rich people richer and poor people poorer." This viewpoint, while perhaps morally justifiable, seemingly disregards the negative impact on innovation. A similar argument has been marshaled in India against high pricing for patented western medicines since many could not afford patented medicines, but the momentum shifted critically in recent years. In March of this year, the Indian parliament passed new intellectual property protections with the enthusiastic support of the domestic pharmaceutical industry, which now supports policy that enables the protection of its own intellectual property. Indian drug companies, which filed for more than 800 international patents last year alone, now expect a torrent of foreign direct investment to support innovation; and software makers are similarly optimistic.

Only 18% of all Chinese patent applications since 1985 have been from international applicants

In China, halting steps forward are being made, although the general lack of impartial legal systems and robust enforcement undermines progress. Many IP-related laws were passed prior to WTO accession in 2001, but administrative and enforcement mechanisms remain inadequate. The State Intellectual Property Office, charged with administering patents, is viewed as under-funded and understaffed, and currently faces a three-year backlog of unread patent applications. A hodgepodge of agencies with overlapping jurisdiction has also led to many foreign firms abandoning efforts to protect IP in China, and only 18% of all Chinese patent applications since 1985 have been from international applicants. Since Chinese patent applications account for less than one percent of the total filed in Europe and the US, the imbalance suggests that foreign firms do not consider a China filing worthwhile. The Chinese Venture Capital Association will likely continue to clamor for more meaningful IP protections, but the momentum has yet to shift.

Ironically, it is the US legal system that is one of the most important arbiters of Asian IP disputes as Asian firms are increasingly suing each other's American subsidiaries for patent infringement. TSMC extracted a US\$175 million settlement from SMIC when it added claims in US courts to a complaint that had been languishing in a Taiwanese court. Settlements of this magnitude highlight the potential materiality of IP infringement suits and help support the view that this particular sustainability issue has the potential to impact equity valuations.

Figure 9 Asian Firms Slug It Out in US Courts

When IP protections in Asia have proven insufficient, Asian firms have turned to courts in the United States to defend their intellectual property. Taiwan Semiconductor Manufacturing Corporation (TSMC, based in Taiwan), the world's largest provider of semiconductor foundry services, sued Semiconductor Manufacturing International Corporation (SMIC, based in Shanghai) for patent infringement, in Taiwan in January 2002, but when this case failed to proceed expeditiously, they filed new claims in the US Federal District Court in December 2003. Although these charges were initially dismissed, TSMC re-filed an expanded set of claims in California State Superior Court in April 2004 as well as in the US Federal District Court, and additionally filed a complaint with the US International Trade Commission. Since both firms had significant sales and operations in the US, and were both publicly listed on US exchanges, the jurisdiction of the courts was clear. In January 2005, SMIC agreed to a US\$175mn settlement with TSMC requiring cash payout over a six year period. The settlement costs amount to nearly 3% of revenues, and almost a quarter of SMIC's reported net F2004 profits.

In another case, Hitachi Global Storage Technologies sued Chinese hard disk drive manufacturer GS MagicStor in December 2004 for infringement of patents related to the design and manufacture of Hitachi's 1" HDDs. GS MagicStor had begun to supply drives for Apple Computer's popular i-Pod, and Hitachi filed suit in the US Federal District Court for the Northern District of California after determining that its patents had been infringed. Hitachi had significant operations in the US, considering that in 2003 it had purchased IBM's California-based HDD business, but GS MagicStor had only a sales subsidiary. Nevertheless, the court appears to have jurisdiction in the matter, and the case is proceeding.

Source: SMIC SEC Form 20-F 12/31/04; Hitachi GST website, PC World Magazine, ZDNet

INVESTOR QUESTIONS FOR COMPANIES

Compliance and standards

- What systems does your firm have in place to ensure that all components meet RoHS requirements?
- What steps are you taking to monitor all the links in your supply chain for compliance, and how sure are you that your firm is not exposed to risk of fines or, more significantly, product impoundment and recall?
- Are you familiar with the Electronics Industry Code of Conduct (EICC)? What impact do you think that adoption of such a code would have on your business?
- In consumer-facing parts of your business, how do you intend to approach product takeback requirements? In the absence of government takeback regulations, do you view takeback as a competitive differentiator in consumer markets?

Internal management policies

- What internal disciplinary policies are in place to prevent environmental and safety violations?

Disclosure

- What is the timeframe on which you expect to begin to disclose key sustainability data, such as environmental citations, carbon emissions, and other?

Strategic management

- How do you determine where to locate new manufacturing facilities? What sort of tax abatements and other government support are you able to receive from various jurisdictions?
- How do you approach the issue of intellectual property? In what countries do you file for patents?
- What are your views regarding the current level of legal protection for your intellectual property? Do you believe that stricter enforcement would help your business?

RESOURCES

Company websites

- Abit Computer www.abit.com.tw
- Acer Inc. www.acer.com
- Asutec www.asus.com
- AU Optronics www.auo.com
- BenQ www.benq.com
- BYD Company Limited www.byd.com.cn
- Chartered Semiconductor Manufacturing www.charteredsemi.com
- Chi Mei Optoelectronics www.cmo.com.tw/cmo/english
- Compal Electronics www.compal.com
- Foxconn www.foxconn.com
- HCL Technologies www.hcltech.com
- I-Flex Solutions www.iflexsolutions.com
- Infosys www.infosys.com
- Lenovo www.lenovo.com/us/en
- LG Electronics www.lge.com
- LG Philips LCD www.lgphilips-lcd.com
- Philips Electronics www.philips.com
- Powerchip www.psc.com.tw
- Samsung Electronics www.samsung.com
- Samsung SDI www.samsungsdi.co.kr
- Satyam Computer Services www.satyam.com
- Taiwan Semiconductor Manufacturing Co. www.tsmc.com
- Tata Consultancy Services www.tata.com/tcs
- United Microelectronics Corporation www.umc.com
- Wipro Technologies www.wipro.com

Examples of sustainability reporting

- Hewlett Packard www.hp.com/hpinfo/globalcitizenship
- IBM www.ibm.com/ibm/environment
- Intel www.intel.com/intel/finance/gcr04/intel_gcr_2004.pdf
- Microsoft www.microsoft.com/mscorp/citizenship
- Philips Electronics www.philips.com/about/sustainability
- Samsung www.samsung.com/AboutSAMSUNG/ELECTRONICSGLOBAL/SocialCommitment
- Sony www.sony.net/SonyInfo/Environment
- UMC www.umc.com/English/about/images/environment_report_eng_1.pdf

Useful web-based resources

- Business Software Alliance www.bsa.org
- Electronics Industry Code of Conduct www.hp.com/hpinfo/globalcitizenship/environment/pdf/supcode.pdf
- Electronic News www.reed-electronics.com/electronicnews
- European Recycling Platform www.erp-recycling.org
- Intellectual Property Department, Government of the Hong Kong SAR www.ipd.gov.hk
- International Data Corporation (IDC) www.idc.com
- International Finance Corporation www.ifc.org/sustainability
- National Association of Software and Services Companies (India) www.nasscom.org
- Semiconductor Equipment & Materials Int'l www.semi.org
- Semiconductor Industry Association www.sia-online.org/home.cfm
- Silicon Valley Toxics Coalition www.svtc.org
- Technology Policy & Assessment Center, Georgia Institute of Technology tpac.gatech.edu
- State Intellectual Property Office of the PRC www.sipo.gov.cn/sipo_English/default.htm
- US EPA PFC Reduction/Climate Partnership for the Semiconductor Industry www.epa.gov/highgwp/semiconductor-pfc/overview.html
- U.S. National Science Foundation www.nsf.gov

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