

Chapter 1

The Quest for Sustainability and Justice in a High-Tech World*

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Of the millions of words written over the past several decades about the electronics industry's incredible transformation of our world, far too few have addressed the downsides of this revolution. Many are surprised to learn that environmental degradation and occupational health hazards are as much a part of high-tech manufacturing as miniaturization and other such marvels. Although most consumers are eager to enjoy their latest computers, televisions, cellular phones, iPods, and electronic games, few relate the declining prices of these and other electronic technologies to the labor of Third World women, who are paid pennies a day. Fewer still realize that the amazingly powerful microprocessors and superminiaturized, high-capacity memory devices harm the workers who produce them and pollute the surrounding communities' air and water. Consumers who are inundated with well-financed marketing hyperbole rush out to buy the newest electronic gadgets and components, unaware that their old, obsolete goods add to the mountains of toxic electronic junk piling up around the world. They are likewise clueless about the fact that most electronics gadgets are assembled under working conditions as dangerous as those in the early industrial era in Europe and the United States.

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The reason for this widespread ignorance is that the health and ecological footprints of the global electronics industry remain largely hidden from most consumers' view. High-tech manufacturing has contaminated its workers as well as the air, land, and water of communities wherever these firms are located and wherever their wastes accumulate—from Silicon Valley (United States) to Silicon Glen (Scotland), from Silicon Island (Taiwan) to Silicon Paddy (China). Just as harmful are the endemic social inequalities and economic stratification that these firms promote. Although CEOs and upper management enjoy multimillion dollar salaries and "golden parachutes," many production workers live in large, densely packed dormitories and other substandard, crowded forms of housing, as they face wage stagnation and job insecurity. Not surprisingly, the production workers, who often labor under sweatshop conditions, are mostly women, immigrants, and people of color in the United States, Latin America, and Western Europe, as well as recently urbanized women in Asia. Similarly, the wage gap between men and women in the industry continues to loom large.

This book embodies the vision of many of the inspirational leaders around the world who are challenging the patterns of health, environmental, and social injustices that have arisen as a hidden aspect of the high-tech revolution. All of us share the perspective popularly attributed to anthropologist Margaret Mead, "Never doubt that a small group of thoughtful, committed people can change the world. Indeed, it is the only thing that ever has." Although we acknowledge the accomplishments of the high-tech revolution's pioneers—Gordon Moore, Bill Gates, Bill Hewlett and David Packard, Michael Dell, and many others—we also want to highlight and amplify the incredible accomplishments of the unsung heroines and heroes of this revolution's "other side," who have been fighting

to transform the electronics industry to better address the needs of its workers and affected communities around the world. Women like:

- Amanda Hawes, founder of the Santa Clara Center on Occupational Safety and Health and an attorney who, for more than thirty years, has been fighting to improve working conditions and advocating for chemically exposed electronics workers with cancer as well as the offspring of exposed workers born with severe birth defects;
- Lorraine Ross, a San Jose, California, housewife whose daughter's serious birth defects gave her the strength to mount a remarkable challenge to Fairchild Semiconductor Corporation's polluting practices in Silicon Valley, which led to the formation of the Silicon Valley Toxics Coalition;
- Dr. Orapan Metadilokkul, an occupational health physician in Thailand who confronted the Seagate Corporation when it was compromising its workers' health in the 1990s and who faced severe retaliation for her efforts; and
- Helen Clark, a Scottish semiconductor worker who gave her life fighting to provide a voice for poisoned workers at National Semiconductor's plant in Silicon Glen and who spurred the formation of PHASE Two in Scotland.

These and many other courageous individuals who have suffered the industry's "unintended consequences" have been among the key leaders responsible for the metamorphosis from discouragement to hope for a more sustainable future in Silicon Valley, as well as in many other high-tech centers around the world.

This volume is the product of a movement that began at the grassroots level, with ordinary people facing injustice on their jobs and in their communities: women who were exposed to toxic chemicals in semiconductor plants and denied protection or compensation; people who were harassed and fired for trying to organize labor unions; female community residents who gave birth to children with serious birth defects after drinking water tainted with toxic solvents that had leaked from semiconductor plants; desperately poor, rural peasants forced to move into cities throughout Asia who are being poisoned by the tons of electronic waste (e-waste) dumped on their communities every day.

These stories have striking similarities, whether they occur in Silicon Valley, Asia, or Latin America, and whether the company is named IBM, Fairchild, National Semiconductor, Dell, RCA, Sony, Lenovo, or United Microelectronics Corporation. By linking workers, residents, toxic exposure survivors, labor activists, environmentalists, consumers, and academics in the North with those in the South, our goal is to inform and connect people in each phase of the electronics life cycle. From the extraction of raw materials; to the manufacture and testing of components; to the assembly of final products; to their shipping, marketing, and use; to their ultimate disassembly and disposal, we are following the products, documenting their impacts, and joining together to prevent and reverse the harm they have caused.

This book profiles workers, environmentalists, and their advocates across national borders who are highlighting injustices, as well as signs of hope, in both the private and the public sectors. This effort is not about attributing blame; rather, its aim is to *re-articulate responsibility and provide a vision of what a sustainable electronics industry*

can look like. Activists from Europe, Asia, and the United States, for example, have concluded that electronics producers must take greater responsibility for problems associated with the global export of e-waste. The Computer TakeBack Campaign (CTBC) in the United States and similar efforts elsewhere in the world are making significant progress in transforming the public debate in support of *extended producer responsibility* and product take-back (see Byster and Smith, "Electronics Production Life Cycle"; Raphael and Smith; Tojo; Wood and Schneider, this volume). Electronics products are being designed with increasingly short life spans—"Happy Meal" electronic games are disposed of with the rest of the trash, cell phones are discarded in a matter of months, computers become obsolete in a few short years. Consumers have the power and responsibility to stop such environmentally unsound practices. For instance, when confronted about their wasteful practices, Dell and Hewlett-Packard responded with innovations in product design and end-of-life disposal (see Raphael and Smith; Wood and Schneider, this volume). But although activists have succeeded in having a number of firms sign agreements and endorse principles of sustainability (see Appendices D and E), most electronics firms have yet to embrace sustainable product design, manufacturing, and disposal.

The contributors to this volume include many of the world's most articulate, passionate, and progressive visionaries, scholars, and advocates involved in documenting and challenging the global electronics industry's social and environmental impacts. From Asia, North America, and Europe, the authors are renowned for their contributions to the science and politics of labor rights and environmental and social justice and bring this perspective to the high-tech sector through this book. One irony is that, in order to

connect with each other and the rest of the world, activists have become some of the most dedicated and savvy consumers and users of the very technology tools developed by the industry that we challenge. Clearly, we are not antitechnology. Our goal is to find creative ways to successfully encourage the industry to live up to its promise and become a leading force for sustainability.

One critical challenge of contemporary democracy is to help ordinary people knowledgeably participate in governing complex technological systems and industries (cf. Habermas 1976; Feenberg 1991, 1999). This book aims to contribute to discussions and campaigns by concerned community members, electronics workers, health professionals, academics, labor leaders, environmental activists, and others who are developing alternative visions for the regulation and sustainable development of electronics design and manufacturing, assembly/disassembly, and waste disposal around the world. As editors and contributors, we are attempting to do something rather challenging: to bridge the divide between technical specialists and the broader population in analyzing and organizing citizen initiatives with respect to a critical global industry. Thus, this book aims not only to examine the electronics industry's global impacts on production workers and the environment but also to contribute to existing efforts by workers, advocates, and policymakers to ensure a greater commitment to sustainability in the global electronics sector.

Throughout this book, we address the fundamental questions that lie just beneath the surface of the electronics industry's public relations juggernaut:

- What are the industry's impacts on its own workers, surrounding communities, and natural environments around the world?

- What role has inequality by race/ethnicity, class, gender, and geography played in the industry's evolution?
- How can the global electronics industry be transformed into more sustainable systems of production, use, and disposal?
- Can high-tech development sustain comprehensive and equitable growth, or will it continue to result in growing economic polarization?

The Political Context

This volume has strong roots in the political activism and policy interventions initiated over the last several decades by the Santa Clara Center for Occupational Safety and Health (SCCOSH), the Silicon Valley Toxics Coalition (SVTC), the Campaign for Responsible Technology (CRT), and the International Campaign for Responsible Technology (ICRT), all based in San Jose, California. Formed in 1976, SCCOSH was the first nongovernmental organization (NGO) in the world to research, document, and call attention to the occupational health impacts of the many toxic chemicals used in electronics manufacturing. It developed the baseline information on high-tech hazards that has informed the work of many other NGOs over the years (see Hawes and Pellow, this volume). When reports began appearing in local news media about toxic chemicals leaking out of electronics workplaces and into the groundwater in Santa Clara Valley, SCCOSH spun off SVTC to open up a new environmental front. Since 1982, SVTC has focused on the ecological and community health impacts of the electronics boom.

For several decades, SCCOSH and SVTC have served as the environmental conscience of the electronics industry. Both organizations have been responsible for significant changes in how the industry is regulated by government, as well as for

important environmental and occupational health transformations within the industry. In response to the rapid expansion of electronics manufacturing outside of Silicon Valley, in 1992 they initiated the U.S.-based CRT to unite diverse organizations and communities; to promote broader participation in the design and development of sustainable technologies; to strengthen locally based organizing by sharing experiences, information, resources, and strategies; and to provide a larger context for advocacy groups dealing with technology-related concerns. The CRT tracked the global expansion of electronics manufacturing and built a network of grassroots organizations and individuals. Participants were united by the recognition that their diverse, but related problems—all associated with the rapid development of electronics manufacturing—could be overcome only by extending democracy into the technological decision-making process.

In several states (California, Texas, Arizona, New Mexico, Oregon, and Massachusetts) and locations around the world (Scotland, Japan, Malaysia, Taiwan, the Philippines, and Mexico) where electronics development was booming, the CRT built relationships with community, environmental justice, environmental, and labor organizations. In its collaboration with the Southwest Network for Environmental and Economic Justice (SNEEJ), CRT formed the Electronics Industry Good Neighbor Campaign to organize good neighbor agreements designed to protect environmental, occupational, and public health. This network succeeded in changing relationships between electronics firms and impacted local communities. In other cases, this work impacted environmental regulation of the industry by government. In still other cases, the work led to industry improvements, such as when the CRT prevailed on the U.S.

Congress to direct SEMATECH, the semiconductor research consortium, to develop more environmentally sustainable technologies.

In 1997, CRT's vision took a dramatic leap forward at the European Work Hazards Conference in the Netherlands, when participants concluded that responsible technology had become a *global* issue and needed to be tackled as such. The participants recognized that developing and sharing knowledge across borders that linked occupational and environmental health with workers' rights was a critical, unmet need, and they resolved to establish the International Campaign for Responsible Technology (ICRT) to "ensure that the high-tech industry and governments become accountable to their host communities and people, and that the industry use the best practices to improve health and safety and reduce environmental impacts" (see Byster and Smith, "From Grassroots to Global," this volume).

Origins of This Volume

In November 2002, ICRT organized the "Global Symposium on Strategies for a Sustainable High-Tech Industry," its first international gathering. The symposium provided an exciting venue for leading activists and academics from around the world to share their diverse, yet similar efforts in addressing the many challenges of high-tech development. Participants from more than a dozen countries developed creative strategies for addressing the myriad problems associated with electronics manufacturing, assembly, disassembly, and disposal. During the meeting, delegates visited the Semiconductor Industry Association's headquarters to present their stories and concerns about occupational and environmental health to the head of the chip industry trade

association. At the conclusion of the symposium, participants adopted the following mission statement:

We are an international solidarity network that promotes corporate and government accountability in the global electronics industry. We are united by our concern for the lifecycle impacts of this industry on health, the environment and workers' rights.

One of the major activities emphasized during the symposium was the need for research and publications on such topics as environmental protection, labor rights, and globalization. Participants also committed to further develop strategies for organizing and empowering workers and communities and to identify opportunities for approaching regulatory institutions. At the same time, participants recognized the need to continue efforts that would compel firms to reduce their toxic impacts and promote sustainable solutions. This book is a direct outgrowth of those gatherings and discussions.

Geographical and Sectoral Scope

This volume has two geographical frames of reference. The first is in the vicinity of San Jose, California, otherwise known as “Silicon Valley,” where the U.S. electronics industry has its roots (see Pellow and Matthews, this volume) and continues to have a very important presence. There is a thirty-year history of community and worker dialog and struggle with the electronics industry in the Silicon Valley. The story only *begins* there, however, as the region has been viewed as *the* model for electronics and “clean” economic development throughout the world. Unfortunately, this misconception persists, as the Silicon Valley “miracle” has been exported or mimicked in Europe, Asia, and the Americas, with serious social and environmental consequences.

Though “the Silicon Valley story” has been widely told, important new chapters still are being written. The environmental consequences of electronics manufacturing in Silicon Valley are making more headlines today than ever before. Numerous campaigns have focused on electronic waste, the toxic poisoning of workers, and other issues (see the unprecedented series of articles by *New York Times* columnist, Bob Herbert [2003a, 2003b, 2003c, 2003d]; as well as related coverage in the *San Francisco Chronicle*, *Washington Post*, *San Jose Mercury News*, and the *Guardian* [UK], and on many Internet sites). The court battles between IBM and its former employees over the impact of toxics on their health, and the dramatic confrontations and negotiations between environmentalists and high-tech industries (e.g., Dell, and most recently, Apple) over electronic waste disposal, are just two of the many stories that have appeared regularly in the news.

Global citizen action focused on the electronics industry has strong links with Silicon Valley, as well. The lessons and possibilities for community governance, environmental health, and social justice after companies moved to “greener pastures” in other nations are inextricably linked. For example, when electronics firms, toxics, and waste moved to lower cost areas of the world, workers and activists were able to mobilize more effectively there because they had learned from Silicon Valley’s tragedies, as well as the U.S. activists’ successes in their efforts to expose these problems. NGO efforts to publicize the inequities of globalization brought the struggles of workers and residents from around the world to electronics consumers in North America and Europe. Likewise, socially responsible investment firms’ emerging focus on inequality and governance brought many of these issues into the boardrooms of global electronics companies.

The volume's second geographical frame of reference encompasses parts of the world increasingly integrated into global networks of electronics production, consumption, and disposal, with their own rich and important histories of engagement with the industry (cf. Castells 1996, 2000). Recent international conferences and informational tours in China, Thailand, Japan, Taiwan, Mexico, Sweden, the Netherlands, Scotland, and elsewhere have brought this “global village” much closer together, convening activists from Asia, Europe, and their counterparts in the United States.

It is critical for civic actors everywhere that these geographically dispersed and disparate experiences are documented, made more visible, and are well analyzed. Likewise, leading advocates and analysts must do more to come together with progressive leaders within the industry. Together, they can improve the sustainability not only of the industry, the communities where the factories are located, and the workers who provide their labor, but also of the planet itself.

Contributors to this volume write about multiple sectors within the global electronics industry, including semiconductors (Lüthje; LaDou; Watterson; Hawes and Pellow; McCourt; Yoshida); electronic components (Foran and Sonnenfeld; Partida; Tojo); office equipment (Yoshida); personal computers (Lüthje; Wood and Schneider); consumer electronics (Ferus-Comelo; Leong and Pandita; Pandita; Garcia and Simpson; Chang, Chiu, and Tu; Ku; Tojo); and electronic waste (Puckett; Agarwal and Wankhade). As electronics manufacturing covers a vast array of production processes (see Lüthje, this volume, for a further discussion of the structure of the global electronics industry), this is not all inclusive. Taken together, however, the industry sectors addressed in this book represent the many challenges and opportunities that workers, communities, firms, and

governments around the world face when dealing with the social and environmental impacts of a dynamic, important, and powerful industry.

Organization of This Volume

Although an understanding of geographical and sectoral characteristics is important for mapping the electronics industry's development and growth, we organized this book around three broad, integrative themes: the globalization of electronics manufacturing, labor rights and environmental justice, and product end-of-life-cycle issues (i.e., e-waste and extended producer responsibility).

Global Electronics

As a major driver of corporate-led globalization, the high-tech industry has rapidly diversified its operations from Silicon Valley to all corners of the world, motivated by the drive to find lower costs, a docile and capable workforce, and reduced regulation. Throughout this book, we explore the globalization of the electronics supply chain (from components to subassembly, to final assembly and testing, etc.) and product life cycle (from manufacturing, to sales and marketing, to consumption, to obsolescence and waste recycling/disposal/processing). This book takes a holistic, sectoral approach, which conveys the electronics industry's overall footprint, rather than any one particular point in the supply chain or product life cycle.

The volume begins with the historical and global questions most important to the study of the industry. It then considers the social and environmental impacts of production and assembly practices, and concludes with an examination of the problem of electronic waste and end-of-life policy dilemmas affecting all nations. The supply-chain and life-cycle approaches demonstrate electronics' effect on both human beings and the

natural environment from production to consumption, through disposal. Some call this a "cradle to grave" approach, whereas others refer to it as a "cradle to cradle" approach. Several chapters in Part I take a global view of key dynamics in the sector, including its structural characteristics and health impacts, and the important role of women and migrant workers. Other chapters in Part I present a bird's-eye view of working and environmental conditions and practices of electronics manufacturing in China, India, Thailand, and Central and Eastern Europe.

Labor Rights and Environmental Justice

People of color, immigrants, and women often work in the most dangerous and lowest-paying jobs in this industry around the globe (Pellow and Park 2002; see also Ong 1987; Asia Monitor Resource Center [AMRC] 1998). Their level of employee power and union representation is universally very low, and many industry leaders continue to insist that electronics remain virtually union free in order to thrive (Eisenscher 1993; Robinson and McIlwee 1989).

Part II of this book presents the stories of workers and environmentalists confronting dangerous work hazards, antiunion hostility, and environmental health perils in the United States, Mexico, Scotland, Taiwan, and elsewhere. These chapters make it clear that workers are struggling to document and overcome the health problems they face, building international unions, and collaborating with environmentalists to bring about local and global policy changes. Although the most vulnerable populations are on the front lines of environmental and economic injustice, and daily threats continue as a result of poor occupational health and labor conditions, nearly all workers in the industry are subjected to these problems. Although electronics manufacturing workers,

assemblers and "dissemblers"¹ face hazards and injustice, engineers, chemists, technicians, and other highly paid, white-collar workers also are routinely exposed to toxic chemicals on the job and have no union representation. It is significant that the first workers to bring the issue of workplace cancer to IBM management were chemists in San Jose whose voices were ignored. Part II concludes with an essay on the future of international labor organizing in electronics.

Electronic Waste and Extended Producer Responsibility

Environmentalists working to reign in the international trade in hazardous wastes since the 1980s (Greenpeace, Basel Action Network) recently identified the next generation of this problem: the trade in electronic waste. E-waste is typically traded or dumped from North to South, but as nations like India and China increasingly modernize, their own industries and consumers are contributing to the problems as well. Contributors to this section are important leaders of the global movement to expose and monitor e-waste exporters and reform the practices of firms and governments that allow it. Extended producer responsibility (EPR)—extending companies' traditional responsibility to include products' impacts throughout their life cycles, including end-of-life responsibility—has become the broad, unifying goal, and activists around the world are succeeding in their efforts to institutionalize these policies in legislation and company practices. Part III of this volume reveals the power of local and international grassroots movements to shape corporate practices, government legislation, and transnational agreements. The stories told are global in scope, but focus especially on Japan, India, China, Europe, and the United States. The section concludes with an inspiring account of the successful U.S. campaign to compel the country's number one computer retailer, Dell

Computer, to accept greater responsibility for taking back and safely disposing of its obsolete products.

Additional Resources

Following the main sections of the book, several significant historical documents are appended for readers' reference and use. These include the text of the "Environmental Justice Principles" from the First National People of Color Leadership Summit in Washington, DC, in 1991; the SVTC's and CRT's "Silicon Principles of Socially and Environmentally Responsible Electronics Manufacturing" from 1996; sample shareholder resolutions; the "Computer Take-Back Campaign Statement of Principles" from 2004; and the "Electronics Recycler's Pledge of True Stewardship" from 2003, respectively. Final pages of the volume include a list of acronyms used throughout the book; a complete, integrated bibliography to facilitate research on the global electronics industry; and a directory of key organizations around the world engaged in ongoing advocacy related to the industry.

The global electronics industry is ever evolving and changing, as are the advocates working for its greater sustainability. Thus, having up-to-date online information is an important part of staying informed, making effective policies, and achieving greater sustainable practices in the global electronics industry. For links to updated and supplemental information for this book, please see this volume's Web page on our publisher's Web site (www.temple.edu/tempress) as well as Web sites of the organizations listed in the "Resources" section at the end of this volume.

Vision for the Future

Electronics industry leaders have produced enormous technical innovations over the years, but have not kept sufficient pace with the socially and environmentally oriented advances that are available to them. Changes in the industry too often have come about only after tragedies, negative media exposure, the publication of research documenting systematic environmental and labor abuses, or considerable pressure from activists and government agencies (cf. Mazurek 1999, Pellow and Park 2002). Electronics industry leaders and employees have essential roles to play in incorporating more socially and environmentally oriented technology designs and industrial practices in operations around the world. There are signs this is happening, as high-tech employees empower themselves to work for change from within and as physicians, attorneys, community activists, and policymakers apply pressure from without. There is a great abundance of creative genius and brainpower within the electronics industry. Although a few industry leaders have stepped forward, many more need to dedicate their creativity and energy toward creating a sane and sustainable production, consumption, and waste management system.

All of the contributors to this book believe it is imperative that scholars, activists, practitioners, workers, industry leaders, and policymakers explore the consequences—both negative and positive—of the continuing electronics boom and the related high-technology revolution. It is critical that we better understand the relationship between the economic globalization and the globalization of social and environmental ills. Finally, after documenting these concerns and relationships, we also must develop strategies to regulate, harness, and document the power of electronics and the global economy for the

greater good of humanity and the natural world. There are many examples of how this industry can provide important leadership on the issues of concern—such as resource conservation, energy efficiency, and phasing out toxic and ozone depleting chemicals.

Our view is that the future of sustainability, environmental justice, and labor rights cannot lie solely in the hands of either the social movements or the captains of industry and representatives of the state. All citizens and stakeholders must help determine the future of this industry, its employees, and the environment of impacted communities around the world. We are united in the vision expressed at a gathering of the Trans-Atlantic Network for Clean Production in Soesterberg, Netherlands, May 1999:

Electronics Sustainability Commitment

Each new generation of technical improvements in electronic products should include parallel and proportional improvements in environmental, health and safety, as well as social justice attributes.

Note

¹ Dissemblers are workers who break down electronic equipment and components for salvageable materials.