

The **Secret Life** series

A PROJECT OF **INFORM**

CELL PHONES

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FAQ

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How many phones are in use in the US? How many are replaced? Collected?

As we state in our video, at the end of 2006 there were over 233 million cell phones in use. If we assume that a person keeps a phone for an average of 18 months, this would mean replacing over 150 million phones per year. The wireless industry does not compile data on the number of phones collected, but there is one estimate that over 10 million cell phones are collected every year through recycling programs. The wireless industry does keep a [daily count](#) of wireless subscribers – as of January 2008 it is well over 250 million!

Is using a cell phone longer better for the environment?

Absolutely. The average life of a cell phone in the U.S. is 18 months. We can greatly reduce cell phones' environmental impacts if we use our phones longer, and if we recycle them so they'll have a chance to be used by someone else. One study suggests that extending the service life of the phone from one to four years decreases the environmental impacts by about 40%.[\[1\]](#)

What are the benefits of recycling cell phones?

In general, refurbishing for reuse extends the life of the phone and this is better for the environment. Mainly, recycling conserves natural resources and reduces the huge environmental impacts from resource extraction. Recycling cell phones prevents toxic substances from getting into the soil, water and air when they're sent to landfills or incinerators. And recycling reduces the amount of waste that towns and cities have to handle. All of these things help people and the environment.

What is involved in recycling a cell phone?

Once they arrive at a collection facility, the phones are powered up to see if everything works. Some cosmetic work is done, personal data is removed and new software is often loaded on to prepare the phone for reuse. More than half of the phones received by recyclers can be refurbished and reused with minor repairs. Refurbished phones may be resold in the U.S. to smaller carriers or distributed as replacements for phones that break while under warranty. Refurbished phones may also be sold internationally. The phones that can't be reused are sent to smelters who reclaim the valuable materials they contain.

What about the batteries, chargers and accessories?

Batteries are separated from the handsets and sent to recyclers that recover the materials. Recyclers should also recover materials from batteries, chargers and accessories.

What happens with personal data on cell phones?

Recyclers will make sure the personal information on your phone is erased before it is resold. To be safe, you should erase everything personal before sending in your phone.

Will collected cell phones be dumped in a developing country?

A U.S.-based nonprofit, Basel Action Network (BAN), has documented the dumping of non-working computers, TVs and other electronic equipment in China and Nigeria, often under the guise of reuse. BAN also recognizes what we must do here in the U.S. to prevent these countries from becoming dumping grounds for our broken-down electronics. Find out more [here](#).

Are refurbished phones eventually recycled?

Refurbished phones either stay in the U.S. or are shipped abroad. Some recycling programs are being developed in developing countries, but much more needs to be done to help these countries create the infrastructure to safely manage these phones and other electronics at the end of their useful lives. Recycling programs are absolutely essential in all countries that receive these phones for reuse.

Are there any laws in the U.S. that address cell phone recycling?

There is no federal law, but laws are being implemented on the state and local levels. As of January 2008, only three states and one county have cell phone recycling laws: California, Maine, New York, and Westchester County, New York. For more information see INFORM's [fact sheet](#).

Is it illegal to throw out a cell phone?

Putting a cell phone in the trash is banned in California and Maine and in Westchester County, New York. To our knowledge, it is not banned in any other localities. INFORM has a [fact sheet](#) on cell phone recycling laws in the U.S. and Europe.

How can we recover more cell phones in the U.S.?

Each of us can help keep cell phones out of the trash. We can take our cell phones back to a store that accepts them, sell our old cell phones online or donate them. We can set up special collection events in our communities. We can ask state or local legislators to pass laws requiring that cell phones and other electronic equipment be recycled.

What is Extended Producer Responsibility?

Extended Producer Responsibility (EPR) is a policy that requires manufacturers to accept responsibility for managing products that have reached the end of their useful life. The EPR approach acts as an incentive for producers to design less wasteful, more recyclable products that contain fewer toxic constituents. The EPR approach also leads manufacturers to consider their products' full life cycle impacts and to incorporate costs for end-of-life product management into their products' price. For more information, see INFORM's [report](#).

SOURCES

[1] Mireille Faist Emmenegger, et al, "Life Cycle Assessment of the Mobile Communication System UMTS: Towards Eco-Efficient Systems," *International Journal of Life Cycle Assessment* 11, 4, (2006): 265–276.

ENVIRONMENT

[In what ways do cell phones affect the environment?](#)

[Does a cell phone contribute to climate change?](#)

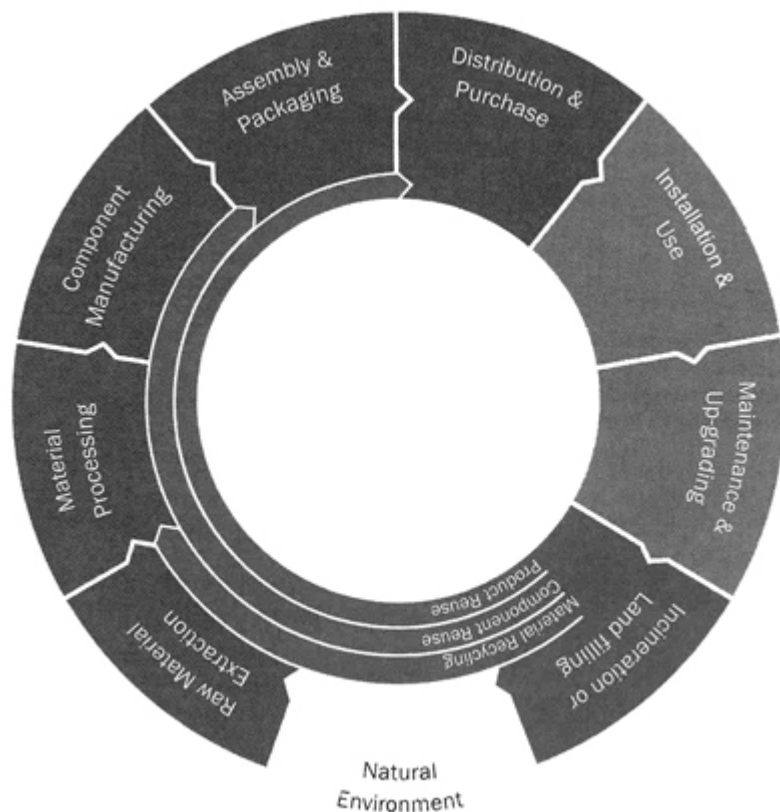
[What can we do to decrease the environmental impact of our cell phones?](#)

[What natural resources are extracted to make a cell phone?](#)

[What are the impacts of manufacturing a cell phone and how can they be reduced?](#)

In what ways do cell phones affect the environment?

In order to make a product like a cell phone, a series of things must take place. After the cell phone is made and used, we help determine its fate – either we toss in the trash or we recycle it. These phases are called the product's life cycle, and every phase has potential impacts on the environment. Raw materials must be extracted from the earth, then refined before they go to factories where components and phones are made – processes that deplete natural resources, use energy and create pollution. Most environmental impacts occur during this manufacturing phase^[1]. Transportation throughout the life cycle generates more negative impacts on the environment due to the burning of fossil fuels. During the phone's use phase, we charge it with electricity that comes mostly from fossil fuels, and the wireless infrastructure also requires electricity. When we replace our phone, we decide whether it is recycled or sent to a landfill or incinerator where toxic substances can get into the soil, water and air.



A product's life cycle [\[2\]](#)

Does a cell phone contribute to climate change?

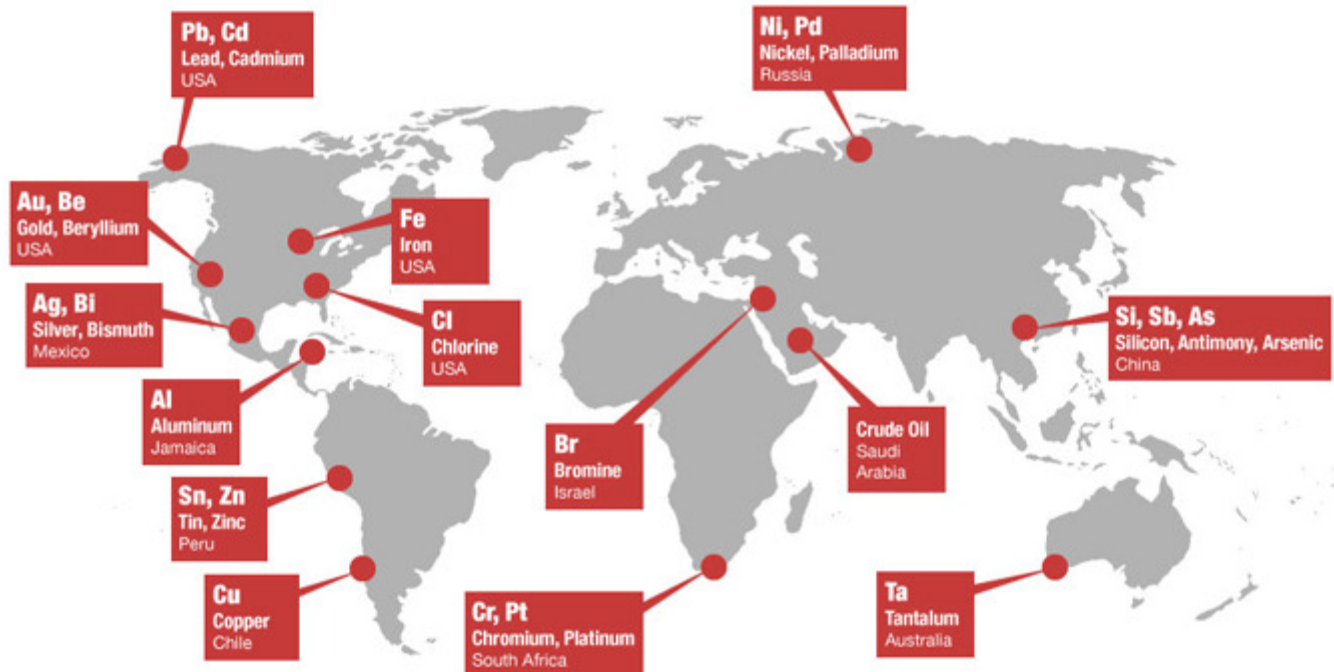
Cell phones do contribute to climate change, because fossil fuels usually provide the energy used to manufacture, transport and charge them. When burned to produce power, these fuels release carbon dioxide and other greenhouse gases into the atmosphere where they retain the heat of the sun instead of letting it reflect away from earth. More greenhouse gases means that the overall average temperature of the earth increases. These changes disrupt many aspects of the balance that created our planet's hospitable climate.

What can we do to decrease the environmental impact of our cell phones?

The best way we as consumers can minimize environmental impact is by getting a new cell phone only when it's really necessary. Better yet, get a refurbished one! Using a cell phone longer and/or buying a refurbished phone reduces the amount of natural resources that must be taken from the earth, saves energy and prevents pollution.

What natural resources are extracted to make a cell phone?

Extracting and processing materials for cell phones creates environmental and health problems all over the world. The chart shows some major areas impacted by material extraction.



What are the impacts of manufacturing a cell phone and how can they be reduced?

Transforming resources we extract from the earth (e.g., crude oil, copper, gold, palladium, silicon, etc.) into a product like a cell phone requires considerable amounts of energy and water, and generates large amounts of pollution and waste. A Swiss assessment has found that 40-50% of the environmental impacts over the life of a cell phone – including its production, use and disposal – occur during the single process of manufacturing printed wiring boards and integrated circuits.

The study suggested that extending the service life of the phone from one to four years decreases the environmental impacts by about 40%. [\[3\]](#) And remember this: recycling the metals in a cell phone requires significantly less resources than mining the earth for more! There is enough gold in 200 cell phones to make a gold wedding ring! [\[4\]](#) To find out more, check out Elizabeth Grossman's book, "[High Tech Trash: Digital Devices, Hidden Toxics, and Human Health](#)" or Greenpeace's report "[Cutting Edge Contamination: A Study of Environmental Pollution During the Manufacture of Electronic Products](#)".

SOURCES

[1] Mireille Faist Emmenegger, et al, "Life Cycle Assessment of the Mobile Communication System UMTS: Towards Eco-Efficient Systems," International Journal of Life Cycle Assessment 11, 4, (2006): 265 – 276.

[2] Philip White, Steve Belletire, and Louise St. Pierre, Okala: Learning Ecological Design, Phoenix, AZ: IDSA, February 2007, available at <http://www.idsa.org/whatsnew/sections/ecosection/okala.html>.

[3] Mireille Faist Emmenegger, et al, "Life Cycle Assessment of the Mobile Communication System UMTS: Towards Eco-Efficient Systems," International Journal of Life Cycle Assessment 11, 4, (2006): 265–276.

[4] Assuming an average gold content of 25 mg per phone (70 g phone without batteries) - Source: Christian Hagelüken, Personal communication, Umicore Precious Metal Refining, Hoboken, Belgium, August 1, 2007. - 200 phones can produce enough gold for a 5 g wedding ring made of pure gold.

HEALTH

[Do cell phones contain hazardous substances and can they harm us?](#)

[Is cell phone use dangerous to human health?](#)

[Is it safe to use a cell phone during pregnancy?](#)

[Should I let my child use a cell phone?](#)

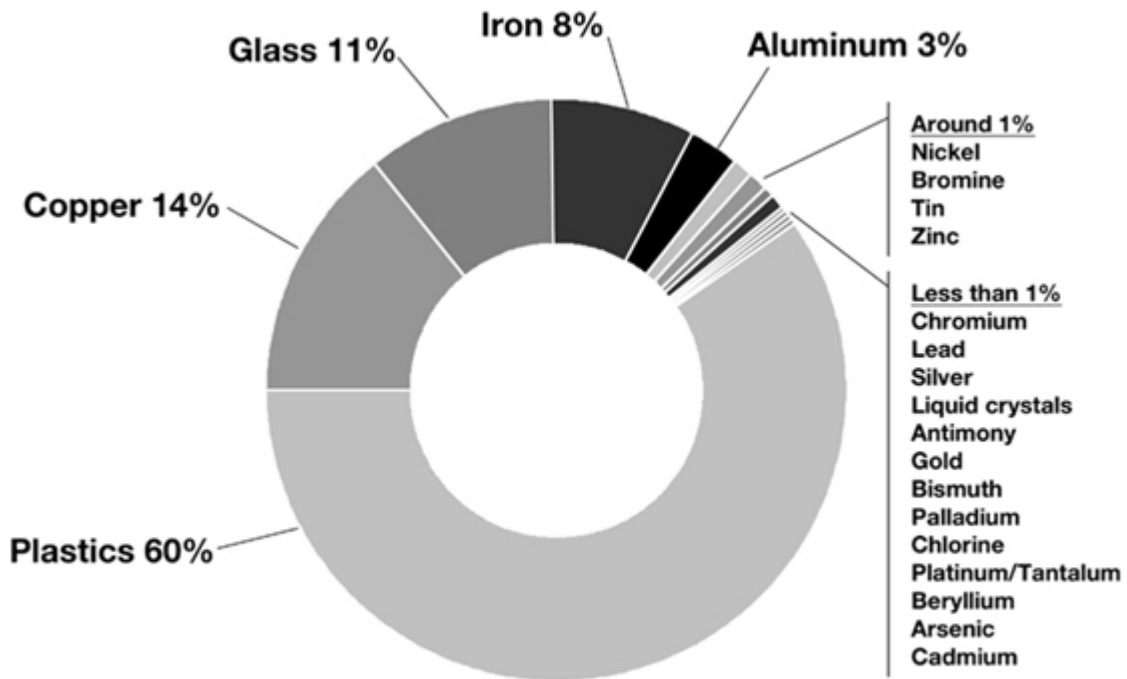
[How does irresponsible recycling of electronics harm human health?](#)

Do cell phones contain hazardous substances and can they harm us?

A number of the materials in cell phones can be hazardous to the environment and to human health at sufficiently high concentration levels, but they are not known to be harmful when encased within an intact phone. However, some materials can pose a danger at the end of a phone's life, if the phone is improperly disposed of in a landfill or incinerator. Five of the potentially hazardous materials have been [demonstrated](#) to leach out of the phones under landfill conditions, where they could contaminate both the soil and groundwater. These are lead, antimony, copper, nickel and chromium. These metals have been linked to a variety of health problems, including cancer, birth defects and developmental problems in children, and damage to the nervous, reproductive and immune systems.

In newer cell phones, the rechargeable batteries used are almost entirely lithium-ion and lithium-polymer based. These batteries are generally stable during normal use, but when they are crushed or if there is an external short circuit, hazardous reactions may occur. Due to the risks associated with improper disposal in landfills and incinerators, it is important to recycle the batteries along with the phones – including older nickel cadmium and nickel metal hydride batteries.

Average composition of cell phones (batteries excluded*)



* Percentages based on a 1 kg (2.2 lb) sample; Composition contains average values of smelter and producer chemical analysis - average production year estimated to be around 2001 (+/- 1 year)

What's in a cell phone handset?[1]

Is cell phone use dangerous to human health?

A March 2007 [study](#) showed a small but significant increase in certain benign and malignant brain tumors for long-term users of cell phones, especially on the side of the head where the person typically held his or her phone. The studies involved subjects that had greater than (or equal to) ten years of cell phone use. According to the authors, earlier studies covered insufficiently long periods of time to determine long-term carcinogenic risk from exposure to radiation emitted during the use of cell phones. The researchers involved have made a number of [suggestions](#) to minimize risk. They suggest using hands-free equipment and making only short calls on cell phones. And, while radiation emitted by most phones has decreased as the technology has improved, they recommend selecting phones that emit less radiation by [checking](#) the Specific Absorption Rate (SAR) of the phones we buy; low radiation models score 0.6 and below.

Is it safe to use a cell phone during pregnancy?

A recent study published by the journal [Epidemiology](#) finds a correlation between the amount of mothers' cell phone use during pregnancy and behavioral problems in their children at age 7.[2] Because this study is the first to suggest such a link, and may have omitted other factors that would explain its findings, its authors are cautious about drawing conclusions and recommend further research with different groups of mothers

and children. However, they note the importance of the public health implications, if their findings are replicated in other research.

Should I let my child use a cell phone?

The [exposure risks](#) are likely to be greater for children because their skulls are thinner and their brains and nervous system are still developing. Thus, researchers recommend that parents be especially cautious about children's cell phone use. Some even suggest that children should not be given cell phones at all.

How does irresponsible recycling of electronics harm human health?

Discarded electronics are ending up in developing countries where little to no infrastructure exists to safely and efficiently recover the valuable materials or manage the electronic scrap without harm to human and environmental health. Certain flame-retardants found in electronics, which are used to reduce the risk of fire, and polyvinyl chloride- (PVC) containing materials pose risks to human health. Crude recovery practices that include acid leaching and open burning create toxic emissions from the flame-retardants and PVC-containing materials.

A recent study of soil samples taken in a village in southeast China, where dismantling and recovery operations have been ongoing for the last decade, showed high concentration of toxins such as polybrominated diphenyl ethers (PBDEs) and polychlorinated dibenzo- p-dioxins and dibenzofurans (PCDD/Fs). PBDEs are contained in some flame-retardants used in electronics and other products, and have been found to persist in many places in the environment, most shockingly showing up in human breast milk. PCDD/Fs are emitted from the burning of PVC-containing materials and are known to be highly toxic.^[3] The EU's Restriction of Hazardous Substances (RoHS) Directive, which entered into force July 1, 2006, bans Penta-BDE and Octa-BDE, two of the flame-retardants used in electronics.

SOURCES

[1] Jaco Huisman, "QWERTY and Eco-Efficiency Analysis on Cellular Phone Treatment in Sweden: The Eco-Efficiency of the Direct Smelter Route Versus Mandatory Disassembly of Printed Circuit Boards," Delft, Netherlands: Delft University of Technology, 2004.

[2] [The Independent](#) 5/18/08

H. A. Divan, L. Kheifets, C. Obel, & J. Olsen (July 2008). Prenatal and Postnatal Exposure to Cell Phone Use and Behavioral Problems in Children. *Epidemiology*, 19, 1 – 7. [Available for subscribers only on the journal website.](#)

[3] Anna Leung, et al, "Spatial Distribution of Polybrominated Diphenyl Ethers and

Polychlorinated Dibenzo-p-dioxins and Dibenzofurans in Soil and Combusted Residue at Guiyu, an Electronic Waste Recycling Site in Southeast China,” *Environmental Science & Technology* 41, 8, (2007): 2730-2737.

PUBLIC POLICY

[Are there any laws in the U.S. that address cell phone recycling?](#)

[What provisions make an effective cell phone recycling law?](#)

[What can our federal government do to stop the dumping in the developing world?](#)

[Are there European laws that address cell phone and rechargeable battery recycling?](#)

Are there any laws in the U.S. that address cell phone recycling?

There is no federal law, but laws are being implemented on the state and local levels. As of January 2008, only three states and one county have cell phone recycling laws: California, Maine, New York, and Westchester County, New York. INFORM has a [fact sheet](#) on cell phone recycling laws in the U.S. and Europe.

What provisions make an effective cell phone recycling law?

- Ban on disposal of cell phones in the ordinary waste stream, due to hazardous materials contained in these products, with penalties for violations;
- No-cost consumer returns to encourage greater participation;
- Retailer or producer take-back of products that have been or are being sold;
- Set performance standards and targets for collection and recycling;
- Reporting requirements for collection amounts;
- Consumer education about new laws and take-back programs from retailers or manufacturers required;
- Sales ban and other penalties for retailers or producers that do not comply with the law;
- Use of best available techniques to protect worker health and the environment, encourage participation in treatment operations with certified environmental management systems; and,
- Design improvements encouraged to phase out the use of hazardous materials and to enhance the reuse and recycling of products.

What can our federal government do to stop the dumping in the developing world?

The U.S. Congress can ratify the Basel Convention and the Basel Ban Amendment to end the dumping. The Basel Convention is a global environmental treaty adopted in response to concerns about escalating shipments of hazardous wastes from developed to developing countries. The Basel Ban Amendment goes further, which prohibits hazardous waste exports from the most industrialized countries that are part of the

Organization of Economic Cooperation and Development (OECD) to all non-OECD countries. The Basel Convention aims to reduce the generation of hazardous wastes and to minimize their shipment to the developing world. A primary goal is the “environmentally sound management” of hazardous wastes to protect human health and the environment. The Convention contains lists of wastes that are hazardous and establishes controls on their shipment. Among the wastes defined as hazardous are circuit boards containing lead-based solder used in most cell phones.

Are there European laws that address discarded cell phones and rechargeable batteries?

Yes. The Waste Electrical and Electronic Equipment (WEEE) Directive entered into force on February 13, 2003, requiring EU member states to develop individual legislation based on its terms by August 13, 2004. The Directive includes cell phones as part of the electronic equipment that it covers. Cell phone manufacturers must finance collection and recycling of discarded cell phones. Related to the [WEEE Directive, the Restriction on Hazardous Substances \(RoHS\) Directive](#), in effect as of July 1, 2006, sets maximum concentration values by weight of each homogeneous material for lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers contained in the listed electrical and electronic equipment. The EU Battery Directive entered into force on September 26, 2006, and member states must transpose this Directive into national law by September 26, 2008. Battery manufacturers and makers of equipment that include batteries must finance collection and recycling of discarded batteries.

RESOURCES

INFORM Reports

[Wireless Waste - The Challenge of Cell Phone and Battery Recycling](#)
by Aarthi Rayapura (2005)

[Calling All Cell Phones: Collection, Reuse and Recycling Programs in the US](#)
by Eric Most (2003)

[Waste in the Wireless World: The Challenge of Cell Phones](#)
by Bette K. Fishbein (2002)

INFORM Fact Sheets

[Benefits of recycling electronics in the US](#)
[Cell phone and battery recycling laws in Europe and the US](#)

Websites

[Basel Action Network](#)
[Basel Convention](#)
[Clean Production Action](#)
[Clean Water Action](#)
[Cradle-to-Cradle](#)
[Earthworks](#)
[Electronics TakeBack Coalition](#)
[Greenpeace](#)
[Life-Cycle Assessment](#)
[Natural Capitalism](#)
[Product Policy Institute](#)
[Silicon Valley Toxics Coalition](#)
[Story of Stuff](#)
[Texas Campaign for the Environment](#)
[Washington Citizens for Resource Conservation](#)

Books

Challenging the Chip: Labor Rights and Environmental Justice in the Global Electronics Industry
Edited by Ted Smith, David Naguib Pellow and David A. Sonnenfeld, (2006)

Cradle to Cradle: Remaking the Way We Make Things
by William McDonough and Michael Braungart, (2002)

Stuff: The Secret Life of Everyday Things
by John C. Ryan and Alan Thein Durning, (1997)

High Tech Trash: Digital Devices, Hidden Toxics, and Human Health
by Elizabeth Grossman, (2006)

Natural Capitalism: Creating The Next Industrial Revolution
by Paul Hawken, Amory Lovins, and L. Hunter Lovins. (1999)