

# Electronic Waste

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Increasingly, news reports and environmental activists are claiming that we are facing a new solid waste crisis. “Electronic junk [is] piling up everywhere, creating what some experts predict will be the largest toxic waste problem of the 21st century,” reads an article in *Environmental Health Perspectives*.<sup>1</sup> Similarly, Greenpeace claims, “The world is consuming more and more electronic products every year. This has caused a dangerous explosion in electronic scrap (e-waste) containing toxic chemi-

cals and heavy metals that cannot be disposed of or recycled safely.”<sup>2</sup> As a result of such rhetoric, Europe has passed several “e-waste” laws, U.S. states have begun looking into their own regulations, and members of Congress have proposed legislation. Unfortunately, misinformation about the issue and the naive belief that government is positioned to improve electronic waste handling is leading to misguided policies and legislation.

## Background

In 2003, the European Union (EU) passed a couple of e-waste policies that are becoming

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\* This brief is largely a summary of: Dana Joel Gattuso, “Mandated Recycling of Electronics: A Lose-Lose Proposition,” Issue Analysis 2, Competitive Enterprise Institute, Washington, DC, 2005, <http://www.cei.org/pdf/4386.pdf>.

1. Charles W. Schmidt, “E-Junk Explosion,” *Environmental Health Perspectives*, April 4, 2002.

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2. Greenpeace International, “Eliminate Toxic Chemicals,” <http://www.greenpeace.org/international/campaigns/toxics>.

models for U.S. regulation. The Directive on the Restriction of the Use of Certain Hazardous Substances (RoHS) phases out certain “hazardous substances”—lead, mercury, cadmium, hexavalent chromium, bromated flame retardants—that are used in electronics. The other directive, the Waste Electronic and Electrical Equipment Directive, mandates that companies take back electronic equipment for disposal starting in 2005.

The costs of these programs are likely to be significant. The EU government estimates that both programs will cost €500 million to €900 million,<sup>3</sup> and industry estimates costs of up to €62.5 billion.<sup>4</sup> According to Gartner Inc., a U.K.-based technology analysis company, the cost of the two directives will raise personal computer prices by about \$60.<sup>5</sup>

The benefits of the programs are assumed, rather than assessed through any comprehensive study. Instead, these programs are based on the precautionary principle, which assumes that in the absence of information about risk, regulators should act to prevent potential risks.

Following Europe’s lead, several members of Congress formed an e-waste task force in 2005 to study the issue and produce legislation. Members of this task force are basing

their policy on misinformation, as is apparent from their comments on the topic in the press.<sup>6</sup>

During the 109th Congress, several members offered e-waste legislation. Representative Juanita Millender-McDonald (D-CA) introduced H.R. 4316 and Senator Ron Wyden (D-OR) introduced S. 510, both of which would provide tax credits for recycling computers and would ban disposal of computer monitors in landfills, among other things. Representative Mike Thompson (D-CA) offered H.R. 425, which would impose a tax on electronic equipment sales, levying up to \$10 per item. The funds would go to the U.S. Environmental Protection Agency (EPA), which would use them to award grants to parties working to recycle computers.

In addition, numerous states are following Europe’s lead. For example, in 2001, California banned the disposal of computer monitors in landfills, and in 2003, it passed a law to place a sales tax on computers—which lawmakers euphemistically call an “advance disposal fee.” This new tax is supposed to fund a state computer recycling program, but if costs of the program grow, the state can increase the tax to cover its costs. The fee is likely to grow, because it costs about \$20 to \$25 to recycle each unit. Some program supporters advocate increasing the tax to as much as \$60 per computer sold. E-waste policies are also in place in Maine, Maryland, Minnesota, Washington

3. U.K. Department of Trade and Industry, “Explanatory Memorandum on European Community Legislation: The Common Position on a Proposal for a European Parliament and Council Directive on Waste from Electrical and Electronic Equipment,” U.K. Department of Trade and Industry, London, March 2002, 7.

4. Orgalime, “Detailed Position of Orgalime’s Electrical and Electronic Liaison Committee in Cooperation with European Sector Committees,” Brussels, September 5, 2000, 1.

5. Meike Escherich, “EU’s New Recycling Rules Could Drive Up European PC Prices,” Gartner Inc., January 6, 2004, as quoted in Fiona Harvey, “The Greening of Your PC,” *National Post*, February 5, 2004.

6. For example, see Representatives Mike Thompson, Louise Slaughter, Randy Duke Cunningham, and Mary Bono, “Electronic Waste,” Letters to the Editor, *Washington Times*, July 14, 2005, responding to Dana Joel Gattuso, “E-Waste: Electronic Paperweight Crisis?” *Washington Times*, July 12, 2005. See also Gattuso’s response, “Straight Scoop on E-Waste,” Letter to the Editor, *Washington Times*, August 21, 2005.

State, Connecticut, Oregon, North Carolina, and Texas.

### Fundamental Problems with These Policies

Despite claims to the contrary, there are many problems with the EU e-waste programs and the U.S. versions of these laws. The recycling mandates, like those under Europe's WEEE program, may actually mean more air, water, and solid waste pollution as products are collected, sorted, and recycled. In fact, the U.K. Department of Trade and Industry notes, "For certain items, [the directive] may not be the best practicable environmental option."<sup>7</sup>

In addition, WEEE presents some serious practical problems associated with collecting and recycling all the products concerned. When the EU implemented a similar program for refrigerators in 1998, the products were collected but there was nowhere to recycle them, leading to a massive stockpiling of refrigerators, now known as the "fridge fiasco." An estimated 6,500 refrigerators piled up daily—2.4 million annually. According to the U.K. government, the cost of managing these wastes was £75 million.<sup>8</sup> WEEE's impacts could be much worse. According to the U.K. Environment Agency, "Fridges are just one tiny part of the WEEE directive—if we think we have problems now, then we ain't seen noth-

ing yet."<sup>9</sup> Retailers are already having a problem complying with WEEE's take back and recycling mandates.<sup>10</sup> California had similar problems associated with stockpiling when it banned the disposal in landfills of computer monitors.

Likewise, RoHS-styled bans on substances used in electronic products are problematic for a number of reasons. First, they ignore important benefits of the so-called hazardous substances that are being banned—benefits that may make final products safer and longer lasting. Moreover, the risks of these substances can be managed without banning them completely.

Ironically, the risks created by the RoHS program itself may be more problematic than the risks it attempts to control. Consider the ban on using lead as solder in computers. Lead is banned for this purpose even though there are no proven problems associated with using lead in computers. However, the substance conveys many benefits, which substitute substances might not deliver.

For one thing, lead solder is very energy efficient; it requires less energy than alternatives because it melts at low temperatures. According to a U.K. Trade and Industry study, substitutes increase energy usage by 6 to 18 percent.<sup>11</sup> Similarly, a University of Stuttgart study of substitutes for lead solder indicates that the envi-

7. U.K. Department of Trade and Industry, "Consultation Paper: Proposed EC Directive on Waste Electrical and Electronic Equipment and Proposed EC Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment," U.K. Department of Trade and Industry, London, August 11, 2000, 52.

8. Nicholas Watt, "Taskforce to Tackle #75m 'Fridge Mountain,'" *Guardian*, January 21, 2002.

9. "Government Warned to Avoid Fridge-like Crisis for Electronic Directive," *letsrecycle.com*, January 30, 2002, <http://www.letsrecycle.com/news/news.jsp?story=1002>.

10. Graham Grant, "Phony War on Waste: Scots Face Huge Bill for Growing Mountain of Discarded Electrical Goods as Shops Fail to Comply with New Recycling Directive," *Daily Mail* (UK), January 4, 2008.

11. U.K. Department of Trade and Industry, *Consultation Paper*, U.K. Department of Trade and Industry, London, 48.

ronmental impacts of the substitutes—carbon emissions, acidification, human toxicity, and ozone depletion—are all significantly higher than those for lead.<sup>12</sup>

Moreover, substitutes are likely to reduce product performance and reliability. For example, tin solder forms tiny strains called whiskers when too much moisture is present; these whiskers can spread along circuit boards and produce short-out failures. Other substitute solders are not strong enough; they consistently fail stress tests and shorten computer life, thereby increasing e-waste.<sup>13</sup> Such problems are currently being cited as firms attempt to comply with RoHS. For example, one firm notes:

“Worse still, standards bodies have already discovered some serious technical misgivings about the long-term performance of lead-free, high tin alternatives such as SAC alloys. What is known so far is that lead-free solders are certainly not a “drop in” solution for their lead forefathers. This presents a daunting prospect for many manufacturers, particularly those making high-reliability products used in safety critical applications where failure puts lives at risk ... Independen-

dent studies—involving exhaustive test programs to evaluate the performance of lead-free alloys in high reliability systems—have revealed situations where lead-free alloys directly compromise electronic circuit reliability.”<sup>14</sup>

Similar problems are associated with the ban on bromated flame retardants. These were banned because they allegedly release dangerous levels of dioxin. Yet the EU risk assessment on the topic found “no identifiable risk.”<sup>15</sup> There were similar findings in studies conducted by the National Academy of Sciences,<sup>16</sup> the World Health Organization,<sup>17</sup> and the U.S. Consumer Product Safety Commission.<sup>18</sup> Yet the absence of such flame retardants presents an increased risk of fires. A Swedish study found that existing limits on the flame retardants in Europe may explain a higher number of television fires in Europe: There are currently about 165 fires per million televisions in Europe. Meanwhile, in the United States, where flame retardants are used in televisions, there are only five fires per million television sets.<sup>19</sup>

12. N. Warburg, C. Herrmann, P. Eyerer, “Lead-Free Soldering Paste from Different Stakeholders’ Point of View,” Keynote presentation, APEX Conference, Anaheim, CA, March 31–April 2, 2003. For more on this issue, see Erik de Kluizenaar, *Environmental Impact of Solder and Solderable Finishes*, Philips CFT Electronic Packaging & Joining, Eindhoven, Netherlands; and Jack Geibig and Maria Socolof, *Summary of Activities for a Life-Cycle Environmental Impact Evaluation of Tin-Lead and Lead-Free Solder*, Center for Clean Products and Clean Technology, University of Tennessee, Knoxville, TN, April 2003.

13. Raymond A. Fournelle, “Lead-Free Solders and Processing Issues Relevant to Microelectronics Packaging,” *Journal of Electronic Materials* 56, no. 6 (2004): 33–49.

14. Graham Naisbitt (Managing Director of UK-based Gen3 Systems), “Learning from the RoHS Experience,” *Electronic News* (Australia), November 1, 2007.

15. Kara Sissell, “EU Finds Deca-BDE Poses No Health Risk,” *Chemical Week*, June 9, 2004.

16. Bromine Science and Environmental Forum, “Study Finds Very Low Detection of DecaBDE,” press release, June 10, 2004.

17. World Health Organization, International Programme on Chemical Safety, “Environmental Health Criteria 172: Tetrabromobisphenol A and Derivatives,” World Health Organization, Geneva, 1995.

18. Bromine Science and Environmental Forum, “Study Finds Very Low Detection of DecaBDE.”

19. Margaret Simonson and Hakan Stripple, “LCA Study of Flame Retardants in TV Enclosures,” Swedish

## Ongoing Private Computer Recycling

In contrast to the many problems with government recycling programs, private efforts to recycle computers have proven much more effective. In 2004, Dell, Hewlett-Packard, and IBM collected and recycled 160 million pounds of computer equipment. These programs are voluntary, fee-based, and affordable. At this point, Dell recycles computers for \$10. (This service provides users with an airway bill for shipping the computer to Dell.)

Ironically, Representative Thompson's bill would tax consumers who buy computers to provide grants to fund computer recycling—but computer recycling is already occurring in the private sector. The difference is that the private initiatives operate without taxing consumers and charge only those who dispose of waste, not everyone who buys a computer. If the Thompson bill passed into law, it could have undermined the productive private efforts by replacing them with a less efficient government program.

## Conclusions

Despite claims to the contrary, there is no real e-waste crisis, and the risks and costs of e-waste are manageable. Government programs promise to promote inefficiencies, increase environmental problems, and hinder market solutions. Market forces can and will produce optimal management of e-waste—if only the regulators allow them.

## Experts

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## Recommended Reading

Gattuso, Dana Joel. 2005. "Mandated Recycling of Electronics: A Lose-Lose-Lose Proposition." Issue Analysis 2, Competitive Enterprise Institute, Washington, DC, 2005. <http://www.cei.org/pdf/4386.pdf>.