Print vs. Digital Media:

False Dilemmas and Forced Choices

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A heightened sense of awareness about the environment has developed in recent years. In particular, feelings of guilt and concern are on the rise about the use of paper and its alleged impact on the fate of trees, forests and the environment. Are these feelings justified?

Public opinion polls show that concern about the environment rises and falls based on the state of the economy, but concern about the negative impacts associated with using paper and printing continues to rise. Nothing captures the essence of these feelings more vividly than the signature line appearing at the foot of more and more emails: "Please consider the environment before printing this email."

The false dilemma is:
"By using paper to print your email or by receiving paper bills you are knowingly degrading the environment, destroying forests and/or killing trees."
The forced choice is: "Eliminate your use of paper or feel like a guilty hypocrite."

This seemingly well-intentioned call to action, as well as others like "Sign up for paperless billing, help the environment and save trees" confront consumers with a false dilemma and they present a forced choice that may have unintended consequences.

What's implied is that digital media is the environmentally preferable choice and that print media is the environmentally destructive choice… but is it possible that digital media could be more destructive and a greater threat to trees and forests in the United States than papermaking or printing?

- Is it possible that the public is being intentionally deceived or unknowingly misled?
- Are these concerns and feelings of guilt about using paper based on rhetoric or realities?
- Must we choose between print and digital media? Is one really greener than the other?
- Are there sustainable ways to use paper and print media without feeling like a hypocrite?

In order to make informed and responsible choices it is important to be critical of claims that digital media is categorically greener than print media. Print and digital media both have positive and negative impacts on the environment. For that reason it is important for consumers and watchdog groups to be critical of vague or unsubstantiated claims and demand greater availability, accuracy and comparability of "lifecycle data" about print and digital media. Consumers can feel good about their media choices if they are armed with the facts, rather than being persuaded to feel guilty or hypocritical for not using digital media.

This is the first in a series of reports that will address these issues and explore questions like:

- What is the state of the world's environment and its forests? Are they truly in danger?
- Is our growing reliance on digital information technology and electronic media sustainable?
- What are some of the real environmental impacts associated with print and digital media?
- What is lifecycle analysis and how can it be used to inform our decisions?
- What are some of the current limitations of lifecycle analysis and eco-labeling?
- What are some of the steps being taken by industry and government to discourage "greenwash" and reduce the negative impacts of print and digital media supply chains?
- Where can you learn more about how to employ print and digital media responsibly and feel OK about your choices?

Our primary objective in this series of reports is to shed light on the realities behind the forced choices, false dilemmas and faulty comparisons that we are all too often confronted with. We will also highlight initiatives addressing the truthfulness of green marketing claims as well as corporate and government initiatives seeking to reduce the negative impact of print and digital media supply chains. In addition, this series of reports will present best practices, resources and recommendations about how to make informed choices and employ both print and digital media in ways that are complementary and sustainable.

The story of sustainable media is a bad news-good news story. The bad news is that the public concern about our forests and the environment is justified. The good news is that seeing beyond the rhetoric, looking beyond the obvious and rethinking our uses of both print and digital media will play a major role in allowing us to enjoy and to conserve our forests and the environment.

There is more to print and digital media than meets the eye

Just because we cannot see something does not mean that it doesn't exist. While paper mills emit visible plumes of steam, and waste paper often piles up in plain sight, the invisible "embodied energy" or "grey energy"[2] used to manufacture digital technologies and the toxic "e-waste"[3] associated with electronics are largely out of sight and out of mind.

According to MIT-researcher Timothy Gutowski, manufacturing a one kilogram plastic or metal part requires as much electricity as operating a flat screen television for 1 to 10 hours… the energy requirements of semiconductor manufacturing techniques are much higher than that, up to 6 orders of magnitude (that's 10 raised to the 6th power) above those of conventional manufacturing processes.[4]

Digital media doesn't grow on trees.

In addition to the digital media that we can see there is "dark data." Researchers Roger E. Bohn and James E. Short of the Global Information Industry Center at University of California, San Diego, recently drew attention to "dark data" i.e. data that is exchanged between computers but never seen by human eyes. According to the University of California, the average American consumes almost 34 gigabytes of data each day and much of it is "dark data" that they never see.[5] The phenomenon of "dark data" permeates modern digital technology and researchers are just beginning to study its impacts. Nonetheless, we know that the energy consumed by digital media and information technology is significant and there is ample evidence that it can have significant impacts on forests and the environment. Before choosing between "going paperless" or not we also need to consider the unforeseen hazards associated with digital media and the unintended consequences of a decline in demand for paper and print media.

Making people feel guilty about their media choices may do more harm than good. We need more credible information about the hidden lifecycle aspects of the energy and material flows required for both print and digital media use require.

When we use digital media we need to consider the purchased energy, embodied energy, dark data and e-waste entailed even though they are invisible or out of sight. Likewise, when we use paper and print media we need to consider the sources and flows of raw materials and energy that these products use.

2 http://www.lowtechmagazine.com/2009/06/embodied-energy-of-digital-technology.html#more
3 http://www.greenpeace.org/usa/campaigns/toxics/hi-tech-highly-toxic/e-waste
4 http://www.endofcyberspace.com/2010/01/digital-devices-and-embodied-energy.html
5 http://hmi.ucsd.edu/howmuchinfo.php

One need not feel guilty or hypocritical for using paper or print media that is purchased responsibly and used wisely. There are forest product certification programs like FSC,[6] SFI[7] and PEFC[8] that can be relied upon to inform our choices about the sources of the fiber used to make the paper we buy, and a growing number of paper brands are working to identify the embodied energy and carbon footprint of paper. When it comes to digital media, ratings like EPEAT[9] and EnergyStar[10] can help you select computers and digital gadgets that are energy efficient. Also, a growing number of manufacturers are conducting lifecycle assessments of their products. Going forward we will need less rhetoric and more credible and independently certified facts about the lifecycle impacts of print and digital media.

Just as it would be irresponsible to rely on any one crop to feed our families, it would also be irresponsible to rely solely on either print or digital media today. Both print and digital media are essential and both can be sustainable, but both print and digital media will need to become far more eco-efficient over the next 10 years. Neither print alone nor digital media alone is capable of meeting the communication needs of business, government and the growing human population as they are used today. Our uses of both print media and digital media will have to change. One of the most important changes needed is in the way media choices are presented by marketers.

We need to ensure that both print and digital media supply chains are sustainable and that we have the facts required to make good decisions. Consumers should reject vague and unsubstantiated green marketing claims. Likewise they should call upon the Federal Trade Commission to aggressively pursue false advertising and greenwash. In addition, government and consumers need to call on manufacturers, retailers and marketers to increase the availability, accuracy, credibility and comparability of carbon footprint and lifecycle data. Recent calls for the disclosure of product lifecycle data being made by Walmart and members of the Sustainability Consortium suggest that these are realistic expectations.

6 http://www.fsc.org/

7 http://www.sfiprogram.org/

8 http://www.pefc.org/

9 http://www.epeat.net

10 http://www.energystar.gov/

11 http://www.guardian.co.uk/environment/2009/sep/24/ redd-reducing-emissions-fromdeforestation

Centuries ago the widespread adoption of paper and printing resulted in a spread of literacy that ended the dark ages, spawned a renaissance and changed our world for the better. Despite these advances, our environment now faces challenges on many fronts that call for a new literacy about the state of the environment and the "hidden" lifecycle impacts of the media choices we make.

The widespread adoption of sustainable print and digital media supply chains can change our world again and help us to restore our environment. On the other hand, if we allow ourselves to be misled by false dilemmas or deceived into making unsustainable choices, our distant concerns about destruction of the environment and the decline our forests will soon become a harsh and uncomfortable reality.

What is that state of the world's environment and its forests? Are they in danger?

Over the last few years two closely related environmental issues have been on the top of the environmental agenda: climate change and deforestation. Threats to the environment, society and the global economy from climate change and deforestation are significant enough that 120 heads of state, negotiators from 193 countries, over 50,000 representatives from civil society organizations and over 3,500 members of the world press convened to address the issues at the COP15 Climate Summit in Copenhagen in December of 2009.

While reports about the success of the Summit are still being debated, it was an unprecedented event that brought attention and support for climate action at the highest possible level. It also resulted in a political agreement called the "Copenhagen Accord" led by China, India, Brazil, South Africa and the US. In addition, major progress was made in development of a protocol for Reduced Deforestation and Degradation Forests[11] (REDD) in developing countries. REDD has emerged as a likely component

of the global climate protection regime and is seen as an essential aspect of global efforts to address climate change and the economic health of the forest products industry.

A growing number of international organizations, countries, states and regional governments, and non-governmental organizations are producing peer-reviewed reports providing an overview of the "state of the environment." One of the key topics these reports focus on is the declining health of many of the world's forests. Food and Agriculture Organization of the United Nations (FAO) estimates that land use change resulting in deforestation is approximately 50,000 square miles of forest a year, an area roughly equal to the size of the state of Louisiana.

As a result, it's little wonder that consumers have been bombarded with calls to "go paperless." In addition to activist campaigns and the viral spread of email signatures "guilting" people into going paperless, extremely well funded corporate marketing campaigns are promoting e-billing as a way to help the environment, save trees and reduce their carbon footprints. But is going paperless really greener? Are there unintended consequences associated with increased dependence on digital media and depressed demand for paper and print media?

Consumers are correct to feel concerned about the environment, and they should be concerned about deforestation. However, it is misleading to imply that all of the world's forests are in danger, or that papermaking and printing are primary causes of deforestation or environmental degradation. In fact, healthy demand for paper and printing from sources certified as sustainable play an important role in preventing land use change that results in deforestation.

Deforestation is primarily driven by the need for land uses such as agriculture, human settlements, infrastructure and mining. Researchers at the Earth Institute's Center for Environmental Research and Conservation recently analyzed remote-sensing images of forest cover across 41 nations in Latin America, Africa and Asia from 2000–2005. Their research showed that the highest forest losses were correlated with two factors: urban growth within countries; and, mainly in Asia, growth of agricultural exports to other countries.

Carbon emissions from land-use change resulting in deforestation are estimated to account for one-fifth of current global carbon emissions, and maintaining existing forests through sustainable forestry has been promoted as one of the least expensive climate change mitigation options. Your use of print media employing responsibly sourced paper and forest products play an important role. According to US Secretary of Agriculture Tom Vilsack, "A healthy and prosperous America relies on the health of our natural resources and particularly our forests."[12]

The scourge of illegal logging and your legal obligations under the Lacey Act

Most of the losses in the world's forest cover are taking place in developing countries, in particular in South America, Africa and Southeast Asia where another key set of factors behind deforestation are corruption and weak governance for forest conservation and sustainable management of forest resources. Illegal logging is a significant problem that US consumers have a legal obligation to confront in their choices of paper.

One of the most important steps you can take to help the environment and stop deforestation is to know the chain of custody associated with the paper you buy and assure that it came from sources that are certified to be legal and sustainable. In May 2008 the United States Congress passed landmark legislation to address the U.S. market's role in the global illegal logging crisis, becoming the first country in the world to ban the import of illegally harvested wood and wood products, including paper, under the Lacey Act. [13]

The Lacey Act makes it unlawful for any person to import, export, transport, sell, receive, acquire, or purchase any fish or wildlife or plant taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law whether in interstate or foreign commerce. Violation of the Lacey Act can result in civil penalties up to $10,000 per each violation or maximum criminal sanctions of $20,000 in fines and/or up to five years imprisonment.

In 2006, the World Bank estimated the annual global losses from illegal logging of forests at more than US$10 billion, plus annual losses in government revenues of about US$5 billion. Other than weak governance and corruption, the underlying causes of deforestation are complex and less well understood… particularly when it comes to ways in which demand for consumer electronic devices and digital media impact deforestation.

It is also not well understood that greater demand for responsibly sourced paper helps to save forests and protect the environment. Increased awareness and support for the purchase of wood and paper products certified under the major sustainable forestry schemes has resulted in a more than tenfold increase since 1998. Unfortunately forest certification is limited in developing countries with less than 2% of forests in Asia, Africa and Latin America being certified. In comparison, the Food and Agriculture Organization of the United Nations (FAO) reports that 90% of all certified forests are in North America and Europe.

The little known links between digital media, deforestation and our rivers

While deforestation is an acute problem in developing world in countries such as Indonesia, where tropical forests are being destroyed at an alarming rate, the USDA Forest Service reports that forest cover in the United States has increased over the past 100 years despite the fact that America's per capita consumption of paper is over 700 pounds (lbs) and second only to Finland's.

The World Resources Institute (WRI) maintains that new means of production and more efficient consumption patterns are needed to satisfy the world's growing appetite for wood and paper. WRI also sees recycling as an important component of reducing overall demand for virgin wood fiber, but it is not a catchall solution since forest products cannot be recycled indefinitely nor does it make economic or environmental sense to recycle all such products. According to WRI: "Improved forest governance

and greater demand for certified forest products are also needed to ensure that production is sustainable. A combination of such efforts could go a long ways toward curbing worldwide deforestation, maintaining the health of forest ecosystems, and, consequently, promoting human well-being."

The major drivers of deforestation

Ironically one of the most significant causes of deforestation in the United States can be linked to greater use of digital media in an effort to reduce paper use and save forests. America's adoption of networked broadband digital media alternatives to print is driving record levels of energy consumption. According to the US Department of Energy, the electricity consumed by data centers in the United States doubled from 2000 to 2006, reaching more than 60 billion kilowatt hours per year, roughly equal to the amount of electricity used by 559,608 homes in one year.[14] According to the EPA that number could double again by 2011.

The growing energy demands of consumer electronic devices, desktop computers, cellular networks, Internet servers and data centers are contributed to the destruction of more than 500 mountains and over 600 square miles of forest. The Southern Appalachian forest region of the U.S. is responsible for 23% of all coal production in the United States and 57% of the electricity generated in the US comes from coal… including the rapidly growing power consumed by many U.S. datacenters, networks and consumer electronic devices. One of the more significant direct causes of deforestation in the United States is Mountaintop Removal Coal Mining in the states of West Virginia, Kentucky and North Carolina.

12 http://www.usda.gov/wps/portal/usdahome?contentidonly=true&contentid=2009/08/0382.xml
13 http://www.eia-global.org/forests_for_the_world/lacey.html
14 http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency_study

Your digital connection to deforestation

If your home or business is on the electric grid, chances are that the electricity flowing through your digital media devices and their servers is linked to mountaintop removal coal from the Appalachian Mountains. To find out how much of the energy you use comes from mountaintop coal you can visit What's My Connection to Mountaintop Removal?"[15] It is an interactive tool built by the nonprofit organization Appalachian Voices. By entering your zip code it allows you to see if the electricity you are buying came from a coal mine employing mountaintop removal. If you thought you were saving forests and protecting the environment by going paperless… think again. The real dilemma you face is that you may be doing more to cause environmental degradation and deforestation by going paperless than you think, and making responsible choices requires make informed decisions and rational tradeoffs.

Coal powered digital media can be destructive to forests and the environment in many ways. Coal fired power plants are responsible for 93% of the sulfur dioxide and 80% of the nitrogen oxide emissions generated by the electric utility industry.[16] These emissions cause acid rain that is destroying red spruce forests in the Northeast and Appalachia, and killing brook trout and other fish species in the Adirondacks, upper Midwest and Rocky Mountains. According to a paper published in the journal Science, researchers found that recent scientific studies showed mountaintop removal coal mining does irreparable environmental harm. The researchers said their analysis of the latest data found that such mining destroys extensive tracts of deciduous forests while also hurting fish and plant life.[17]

The widespread practice of mountaintop removal has been described as "strip mining on steroids" in which forests are clear-cut and topsoil is scraped away. Next, explosives are used to blast up to 800 feet off the mountaintops and then dump tons of "overburden" – the former mountaintops – into the narrow adjacent valleys, thereby creating "valley fills." The U.S. Fish and Wildlife Service estimates that mountaintop removal's destruction of West Virginia's forests buried over 1,500 miles of biologically crucial Appalachian headwaters streams, disrupted key nesting habitat for migrant bird populations and decreased migratory bird populations throughout the northeast United States. The Office of Surface Mining reports that more than 1 million acres of land in northern and central Appalachia were undergoing active mining operations as of 2004. In some areas of West Virginia, more than 25% of the land surface is under permit for current or future mountaintop removal.

It is ironic that print media and the papermaking industry are so often targeted for "killing" trees and digital media is so often characterized as the greener "environmentally friendly" alternative. In fact, the North American forest products industry has made great strides in the adoption of sustainable forestry and certification practices. In addition, the majority of the U.S. paper industry's power and electricity needs are derived from renewable biomass from sustainably managed forests. On the other hand, the reliance of digital information technology on coal-powered electricity derived from mountaintop removal goes largely unreported. If your goal is to feel that you are saving trees or doing something good for the environment by going paperless, the choice to go digital may not be as green or simple as some would like you to think.

If you care about the environment and the health of forests you should become more informed about the energy sources used by digital and print media. Research recently published by Bell Labs concluded that today's Information and Communication Technology (ICT) networks have the potential to be 10,000 times more efficient than they are today![18] In fact, they can also be powered by forest bio-refineries that sustainably produce energy, biofuels, polymers, and paper with renewable forest biomass.[19]

ICT network and digital devices will need to become far more efficient and far less dependent on coal-fired power before they can be called sustainable. Forest biomass can provide valuable baseload backup capacity for more intermittent renewables, such as wind and solar. When you purchase paper, you should consider if the brands you buy are investing in the development of renewable energy projects that employ sustainable forest biomass. If consumers make enlightened choices, the forest products industry will play an increasingly important role in providing data centers with the green power they will need in the years ahead.

What are some of the resources you can rely on to help you make responsible paper, print and digital media choices and feel good about them?

In addition to the numerous reports, websites and references in the body of this report there are a few key resources that you can rely on to help you make better informed decisions and feel better about the use of responsibly sourced print media:

Sustainable Procurement of Wood and Paper-Based Products[20]

This WRI/WBCSD publication is an information and decision-making tool to help customers develop their own sustainable procurement policies for wood and paper-based products. It also has information on existing approaches to procurement from legal and sustainable sources organized around ten key issues, posed as "essential questions" related to the sustainable procurement of wood and paper-based products:

- Origin: Where do the products come from?

- Information accuracy: Is information about the products credible?

- Legality: Have the products been legally produced?

- Sustainability: Have forests been sustainably managed?

- Special places: Have special places, including sensitive ecosystems, been protected?

- Climate change: Have climate issues been addressed?

- Environmental protection: Have appropriate environmental controls been applied?

- Recycled fiber: Has recycled fiber been used appropriately?

- Other resources: Have other resources been used appropriately?

- Local communities and indigenous peoples: Have the needs of local communities or indigenous peoples been addressed?

This publication is a decision support tool providing information on twenty-two existing approaches to the procurement of wood and paper-based products from legal and sustainable sources.

The Yale University Program on Forest Policy and Governance[21]

The mission of the Yale Program on Forest Policy and Governance, a core program within the Global Institute of Sustainable Forestry at the Yale School of Forestry and Environmental Studies, is to research, teach, and conduct outreach to foster innovations on sustainable forestry management and policy. The Program maintains a strong focus on forest certification as one unique and potentially revolutionary policy approach that harnesses the power of the marketplace to encourage compliance with environmental and socially responsible standards. This website provides comprehensive information about forest certification to those conducting research in the topic or who are curious for additional information.

15 http://www.ilovemountains.org/myconnection/

16 http://www.eia.doe.gov/fuelcoal.html

17 http://www.reuters.com/article/idUSN0719066720100107

18 http://www2.alcatel-lucent.com/blog/2010/01/green-touch-making-communications-networks-1000-times-more-energy-efficient/

19 http://wecnews.wisconsinenergy.com/news/newsrel/pages/newsrelease_143

20 http://www.wri.org/publication/sustainable-procurement-wood-and-paper-based-products

21 http://www.yale.edu/forestcertification/

The Global Forest & Trade Network (GFTN)[22]

The GFTN is a WWF-led partnership that links more than 360 companies, communities, NGOs, and entrepreneurs in more than 30 countries around the world to create a new market for environmentally responsible forest products and increase the economic incentives for responsible forest management. In addition to providing information on illegal logging, sustainable forest management and responsible wood sourcing, The GFTN provides a wide selection of market information on forest products and search engines listing certified companies globally.

Institute for Environmental Research and Education[23]

IERE is a nonprofit organization that supports environmental decision-making based on factual information gathered through Lifecycle Analysis. Environmental Decisions are made based on two things: what is known about the environmental impacts of human activities (the facts), and how we value the different aspects of the environment and human activities. Our knowledge of the environment is incomplete, but in many cases we have enough factual information to have a reasonable prediction about the effects of our choices. Unfortunately, environmental decisions are rarely based on the facts of the matter, but rely simply on value judgments. That means we are ignoring information about potential environmental damage, and it means that our decisions are just as likely to cause damage to the environment as to benefit it, even where environmental protection was the goal of the decision.

The Electronic Product Environmental Assessment Tool (EPEAT)[24]

EPEAT is a tool to help large volume purchasers in the public and private sectors evaluate, compare, and select desktop computers, notebooks, and monitors based on their environmental attributes. EPEAT provides a clear and consistent set of performance criteria for the design of products and provides manufacturers with the ability to secure market recognition for efforts to reduce the environmental impact of their products.

Recognizing the environmental impacts associated with the manufacture, use, and disposal of electronic product, growing numbers of purchasers were seeking ways to buy more environmentally preferable computer products. Purchasers were beginning to ask for a standard set of environmental attributes they could use to compare products. At the same time, manufacturers were seeking clarity about how to define a "green" computer.

Energy Star[25]

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy for the rating of energy efficient products and practices. Among the devices rated are computers[26], displays[27], printers, scanners and multi-function devices[28]. EPA is also working with interested parties to identify ways in which energy efficiency can be measured, documented, and implemented for data centers and for the equipment they house, especially servers. The EnergyStar rating model for data centers is currently being finalized and a release date of June 2010 is anticipated.

The Climate Savers Computing Initiative[29]

The Climate Savers Computing Initiative is a nonprofit group of consumers, businesses and conservation organizations that is supported by the EPA and numerous nonprofit organizations. Climate Savers Computing Initiative promotes the development, deployment and adoption of smart technologies that can both improve the efficiency of a computer's power delivery and reduce the energy consumed when the computer is in an inactive state.

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22 http://gftn.panda.org/
23 http://www.iere.org/
24 http://www.epeat.net/
25 http://www.energystar.gov/
26http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO
27http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=MO
28http://www.energystar.gov/index.cfm?fuseaction=products_for_partners.showPrintersScanners
29 http://www.climatesaverscomputing.org/

Important steps you can take

Better access to facts about the environmental impacts associated with our choices is essential. In a world where decisions based on rhetoric rather than facts can have unintended consequences we cannot afford to be swayed by purely emotional appeals, simplistic slogans, half-truths or catchy tag lines.

The health of our forests is too important to be taken in by vague and unsubstantiated claims that adopting paperless digital solutions will "save trees" or plant trees.

There are many ways to use paper more wisely including the default use of duplex (two-sided) printing mode and the use of recycled fiber content where appropriate. In addition, the purchase of certified sustainable paper and forest products will play an essential role in ensuring the health of our forests and the environment. Likewise, understanding the connections between digital media and our environment will help you to avoid making choices that you may later regret.

The next time someone tells you that their print or digital solution is green ask them if they have an Environmental Product Declaration (EPD) or a Lifecycle Analysis for it. If they say their solution saves or plant trees ask them if they know what "tree wash" is and tell them to show you where the trees are on Google Earth. They may not have an answer today, but asking the question will help to raise their awareness and bring about change.

In addition, consider the following:

1. Know if the paper you use came from sources that are certified to be legal and sustainable.

2. Know if the energy that powers your electronic devices and digital media comes from non-renewable sources emitting greenhouse gasses or causing deforestation.

Lastly, consider using this as a signature line on your print and digital media communications:

"All forms of communication use energy and materials. Please consider the lifecycle impacts that creating, storing, copying, sending, printing or disposing of this message may have on the economy, the environment and society. Our common future depends on making sustainable communication choices."

Our next report in this series will address ways that leaders in industry and government are using lifecycle assessment, carbon footprinting and eco-labeling to make their print and digital supply chains more sustainable. Until then, ISC hopes that you find the reports in this series useful. Please tell us how you are putting the information to use. We thank you for your support and look forward to your questions, comments and suggestions.

Please feel free to contact us at:

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Deforested mountaintop-removal coal mine site in West Virginia Photo provide courtesy of Vivian Stockman
http://www.ohvec.org

Links

http://www.flickr.com/photos/vivian_stockman/4360015819/sizes/l/in/set-72157623442542522/

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http://www.greenpeace.org/usa/campaigns/toxics/hi-tech-highly-toxic/e-waste

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