

The **SECRET LIFE** series

A PROJECT OF **INFORM**

PAPER

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FAQ

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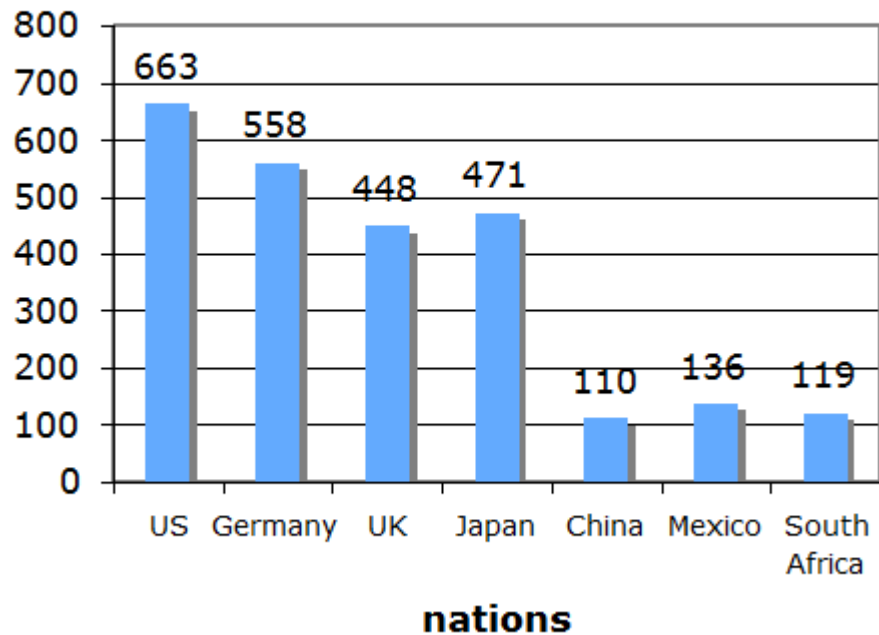
How much paper do we actually use?

Overall in the U.S. we consumed 99,778,437 tons of paper, or about 663 pounds per person, in 2006, the most recent year for which figures are available. We have direct contact with some of this paper -- in the products we buy, in the mail we receive, and in our jobs, schools, or community groups and organizations. We have indirect contact with other parts of it, through the paper and packaging used by the government or by companies and businesses when they provide goods and services for us.

Do people in other countries use as much paper as we do in the US?

No, not nearly as much as we do. Because paper use correlates with the wealth of a country, it's not surprising to see huge contrasts between what we consume in the U.S. versus what people in poorer nations consume. Therefore, it's more revealing to notice the differences between the U.S. and European countries like Germany and the United Kingdom, which have standards of living very close to ours. Here is a graph that illustrates the contrast in paper usage in 2006 in select nations, the most recent year for which we have complete numbers.

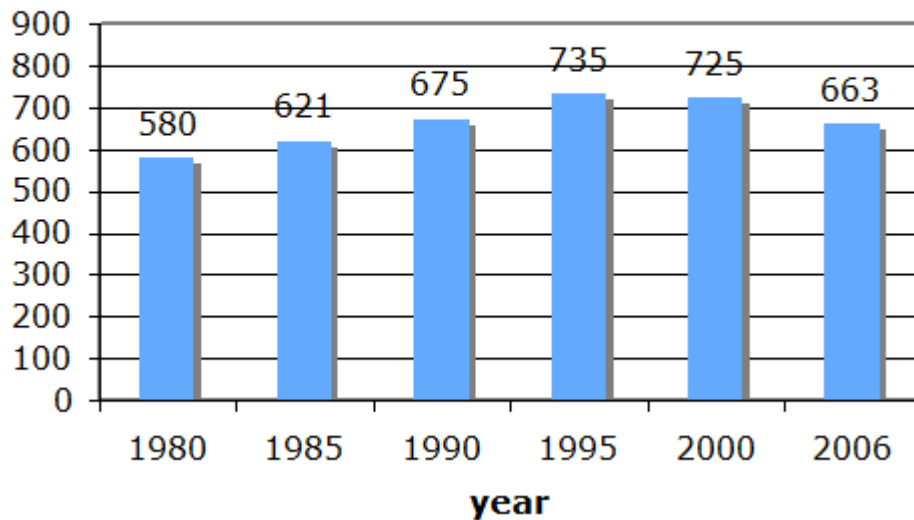
2006 per capita paper consumption in lbs



Don't we use less paper now that there are so many computers in offices and in people's homes?

The electronic world hasn't led to a significant reduction in paper consumption. The graph below shows how paper use has increased over the last 25 or so years, with a small drop occurring in the last 6 years. The reasons for this decline have not been analyzed, but we can speculate that it results from a combination of trends that may include more purely electronic communications and transactions as well as less newspaper readership and new efficiency measures by many large corporations – like Wal-Mart, Hewlett Packard, and Bank of America -- to reduce their packaging and paper use for both economic and environmental reasons.

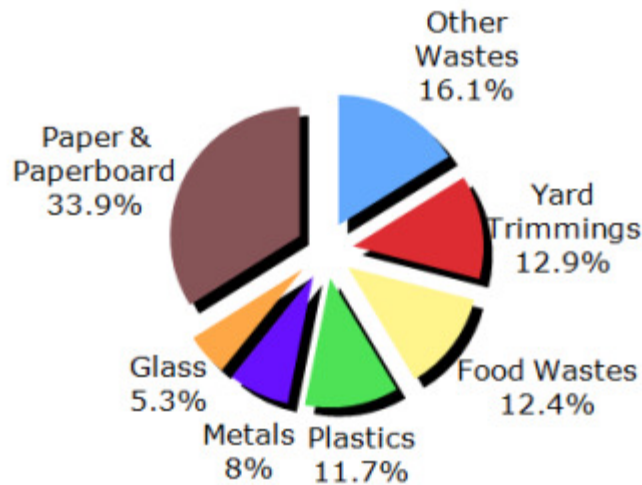
U.S. per capita paper consumption in lbs: 1980 - 2006



What happens to all of that paper?

Only about 10% of the paper we consume in a year is preserved in the form of filed documents, photographs, and books or magazines. The rest becomes part of the municipal waste stream -- that is, the trash thrown out by both residential and commercial sectors. According to the US Environmental Protection Agency (EPA), about a third of all the trash we generate before subtracting what's recycled consists of paper products (see chart below). If we focus on just the subcategory of discarded packaging and containers, then paper products account for a little over half of this type of solid waste.

Materials generated in U.S. municipal solid waste stream in 2006



Doesn't the paper just get recycled, so that it doesn't matter if we throw it out?

Paper recycling does make a difference, and we've consistently increased the amounts of paper we recycle. EPA figures indicate that in 2006 the country as a whole recycled a little over half of the paper discarded.

While this is good, we know it is possible to do still better by looking at figures for paper recycling in Europe, where, for example, in Germany in 2005 the paper recycling rate was 74%. We also know from the Bureau of International Recycling, a trade association, that about 81% of paper discarded in a year can be recycled; the other 19% is either destroyed in use (e.g., toilet paper and cigarette paper) or contaminated (e.g., food wrappings and containers).

These figures tell us that we have the challenge of adding about another 25% of paper to the recycling stream. [Click here for more on recycling.](#)

Why does it matter that we consume more paper than other nations or don't recycle as much as we could?

Today, paper is made primarily from wood fiber. The more paper we use, the more trees need to be cut down to provide fiber. About 80% of the world's priceless ancient forests have already been cut down for fuel and for the raw materials that go into paper and other wood products. Recycling paper reduces the amount of new or virgin wood fiber needed for manufacturing by allowing for the fiber in discarded paper to be re-used. And reducing the amount we consume is even more helpful. [Click here for more on recycling](#) and on [reducing your paper consumption.](#)



Green-e.org

The loss of forests causes huge damage to our planet. Trees store about 20% of the carbon dioxide on earth, helping to stabilize greenhouse gas levels and our planet's fragile climate. Forests also provide habitat for vast arrays of plants

and animals, and help both to preserve the purity of our water supplies and to prevent soil erosion. These critical services don't even touch on the recreational, aesthetic, and spiritual benefits people derive from forests.

Along with recycling and reducing our consumption levels, are there other things we can do as individuals to reduce the environmental impact of our paper use?

Definitely! As consumers, we can cast a vote for the environment by purchasing more environmentally friendly paper products. These include:

- paper products with high post-consumer recycled content --at least 30% for printing and copier paper
- paper produced without chlorine bleach -- called totally chlorine free (TCF) or processed chlorine free (PCF)
- paper with virgin fiber from sustainably managed forests that are certified by the Forest Stewardship Council

You can identify these characteristics on the cover of a package of paper, and can also get assurance of a product's environmentally friendlier nature if it has the Green Seal or Green-e logo on it . Many national office supply stores like Staples carry environmentally preferable paper at very little or no difference in cost.

Can government policy make a difference?

Government – federal, state, and local -- is the largest single purchaser in the country and, therefore, government purchasing policies have a big impact on the environment and on what industry produces. If government policies required all government agencies and offices to buy just the three things we mentioned above – paper with at least 30% post-consumer recycled content, with no chlorine bleach, and with FSC-certified virgin fiber – that would help to transform the paper industry and greatly benefit the environment. The assurance that government would purchase a significant amount of environmentally friendly paper would promote industry investment in new machinery, chlorine-free bleaching processes, and virgin fiber that is FSC-certified to meet government specifications.

Governments could also do better by requiring its agencies and offices

- to use “best practice” recycling – that is, to make sure that high-quality paper like printing and writing paper gets recycled separately so that it can be made into more of the same rather than being “down-cycled” into lower-quality newspaper or toilet tissue
- to follow consumption-reduction strategies like double-sided printing and copying, making all standard forms and reports electronic, and replacing disposable paper items with reusable ones
- to report back on their annual purchases and paper use in order to be sure that the guidelines have been followed. [Click here to learn more about government policy.](#)

Can industry do things to make a difference?

The pulp and paper industry can also make important changes by increasing the efficiency of their production processes to use less energy and water, by increasing the use of recycled content in all grades of paper, by replacing chlorine and chlorine-compound bleaching with less harmful alternatives, and by sourcing their wood fiber from FSC-certified forests. However, it is our responsibility as consumers to let industry know that we will no longer purchase environmentally damaging paper products, and consequently, in order to keep our business, they must change their practices.

The publishing and printing industry can also make important changes. Some book, magazine, and catalog printers have already agreed to set standards for increased use of environmentally friendly paper in their publications, but many have not yet done so. Once again we can make a difference as consumers by letting publishers know we want our books, magazines and catalogs printed on paper with high recycled content, without chlorine bleach, and with virgin fiber certified as sustainable. [Click here to learn about organizations working with publishers to do that.](#)

What about making paper from fiber that comes from plants rather than trees?

Research has identified a number of alternative sources for paper-making fibers that in some cases are as good as or better than wood. However, careful study needs to take place before deciding that any one of these options would be environmentally preferable on a commercial scale,. It is important to be certain that direct or indirect environmental damage wouldn't result from substituting these fibers for wood-based material. For example, we need to know that forests won't be cut down to plant alternative fibers, that they wouldn't take cropland away from food production, and that they wouldn't threaten existing habitats, either by directly displacing native plants or by introducing new species that could become invasive. [Click here to learn more about alternative fibers.](#)

ENVIRONMENT

[What kind of impact does paper-making have on the environment?](#)

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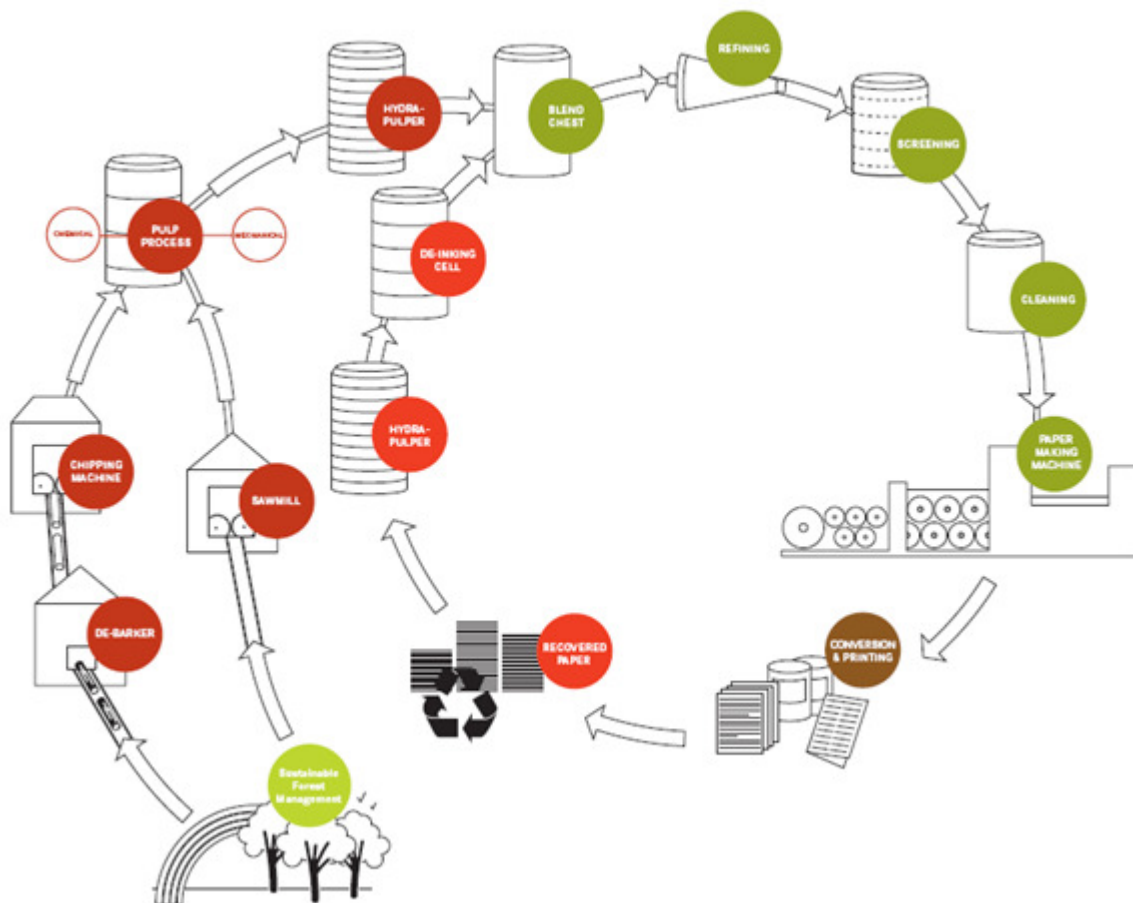
[What is the impact of paper-making itself?](#)

[What is harmful about the chlorine compounds used in bleaching pulp for papermaking?](#)

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[How can we as consumers help the environment when we use and buy paper?](#)

The Papermaking Process



[\[1\] Click on The Paper Making Process for a larger image.](#)

What kind of impact does paper-making have on the environment?

Negative environmental impacts occur at three stages in the life cycle of paper, beginning with the harvesting of trees for fiber, continuing with the processing of wood fiber into pulp for making paper, and finishing with the disposal of paper products at the end of their useful life. The above diagram illustrates this life cycle for an optimal context, in which virgin fiber comes from sustainably managed forests and recycling “closes the loop” by re-pulping old paper to manufacture new. Not only does this way of making paper save trees and forests, but it also reduces waste in landfills, thereby eliminating emissions of methane gas from decomposing paper. Click [here](#) to learn more about the benefits of [recycling](#) and of [sustainably managed forests](#). Unfortunately, this environmentally preferable scenario applies to only some of the paper products manufactured. An increasing but still small amount of virgin fiber comes from sustainably managed forests, and many grades of paper contain far less recycled content than they could.

What is the problem with the way wood fiber is often harvested?

As it exists today, the paper-making industry primarily depends upon virgin wood-based fibers to make the pulp that becomes sheets of paper. Much of the wood used comes from old growth and environmentally sensitive forests in all parts of the world – to give just two examples, the boreal forest in Northern Canada and tropical forests in Southeast Asia. In a number of countries like Indonesia, Papua New Guinea, and Russia, the logging that takes place is not only unsustainable but also carried out in areas where it is illegal to log. Once exported to other countries to be milled and manufactured into a variety of products, including paper, it is difficult to tell whether the wood was legally or illegally logged. .

What happens to the environment as a result of these unsustainable logging practices?

Forests are critical protectors of biodiversity and of climate stability by virtue of the habitat they provide and the carbon they store. Logging companies typically fragment forests or destroy them altogether, often making use of devastating clear-cutting practices. These practices degrade the ecosystems which sustain diverse plants and animals, and are responsible for the release of millions of tons of stored carbon. In many less urbanized nations, forest destruction also displaces traditional peoples, whose lives and cultures are intertwined with local forest environments.

What are the specific effects that typical logging practices have on biodiversity?

Unsustainable approaches to forestry destroy the delicate network of relationships between trees and other living organisms – plants, animals, fungi, and bacteria – in a particular habitat. The interplay of all of these elements is necessary to maintain a well-functioning ecosystem – that is, one which provides an adequate food supply and the conditions that allow its populations to reproduce successfully. Even something seemingly minor, like the construction of roads in previously roadless areas, can have

damaging effects. Roads break up the continuity of forest habitats in ways that affect animals' access to food and shelter, introduce areas of bright light incompatible with the native vegetation, and bring in outsider settlers, who may not have the knowledge to live sustainably in the forest environment.

How do forests store carbon dioxide, and how much of it do they keep out of the atmosphere?

Carbon dioxide is taken in through leaves as part of photosynthesis, the process which produces the sugars that fuel the growth of trees. Excess oxygen is released through the leaves, and the carbon from the sugars becomes part of the tree's living tissue, called the cambium. During each period of growth, the old cambium forms a new ring of wood, thickening the trunk, and more carbon dioxide is taken in to form another layer of living tissue. Carbon is also stored in the earth, as dead leaves, branches, trees, and other vegetation partially decompose and create more topsoil.



According to a 2006 report from the UN, forests store about 312 billion tons of carbon in their biomass alone. If you add to that the carbon in deadwood, litter, and forest soil, the figure increases to about 1.1 trillion tons! The UN assessment also shows that the destruction of forests adds almost 2.2 billion tons of carbon to the atmosphere each year, the equivalent of what the U.S. emits annually. Many climate experts believe that the preservation and restoration of forests offers one of the least expensive and best ways to fight against climate change."

What about the trees that many forestry companies plant to replace what they've logged?

Rather than truly restoring the native forest, these companies usually create monoculture plantations – that is, farms with only one species of tree. Typically, a non-native fast-growing tree species is chosen, diminishing the diversity that once existed. This type of plantation cannot support the plants and animals that once lived in the native forest, and doesn't represent a true restoration of what was lost.

Monoculture plantations, unlike natural forests, rely heavily on herbicides to eliminate any competitive growth. In addition, plantations rely on chemical-based fertilizers that can damage soil and groundwater. And finally, dead trees aren't allowed to fall and decompose, completing the natural cycle that keeps soil fertile and sustains the life of other organisms.

When the trees in a monoculture farm reach maturity, they're all cut down at about the same time, and the process repeats itself. After another application of herbicide, more trees are replanted and additional fertilizer is applied, continuing the run-off of chemicals which harm local soils and water.

How do you know if paper comes from forests that are sustainably managed?

The non-profit Forest Stewardship Council has established an international certification program, based on standards developed from the input of many interested parties such as forest managers and owners, consumers, environmental groups, scientists, indigenous peoples, and union representatives. The certification process not only looks at the forests themselves, but tracks each step in the supply path from the forest through pulp and paper manufacturing to distribution and sales. In this way, it is possible to be reasonably certain that a given product contains fiber that comes only from sustainably managed forests and hasn't displaced indigenous peoples or destroyed their livelihoods. FSC paper carries their logo on its packaging.

It is also important to look for other logos and information which assure that a product is environmentally preferable. They include the Green Seal, the Green-E, an indicator of post-consumer recycled content, and an indicator that the paper is processed chlorine free (PCF) for 100% recycled and totally chlorine free (TCF) for virgin fiber.

What is the impact of paper-making itself?

The pulp and paper industry is very energy intensive, requires extremely large amounts of water, and often entails the use of toxic chemicals, of which the most problematic are the chlorine compounds used in bleaching pulp to make bright white paper. Although many companies have become more energy efficient, and even generate some of their own power from the wood wastes associated with the manufacturing process, the U.S. government figures show that pulp and paper manufacturers are the fourth largest industrial emitters of greenhouse gases.^[3] Further, the pulp and paper industry releases about 212 million tons of hazardous substances into the air and water -- amounts comparable to the U.S. primary metal industry -- and is ranked as the third largest user of industrial water.^[4] These figures highlight the industry's impact on our environment, despite improvements associated with requirements of the Clean Air and Clean Water Acts and with more general efficiency measures.

What is harmful about the chlorine compounds used in bleaching pulp for papermaking?

Chlorine compounds are rated among the most hazardous industrial chemicals in large volume use, affecting both human health and the environment.^[5] By themselves, they have been classified as suspected toxicants to the respiratory and reproductive systems as well as to developmental processes. Their use in the pulp bleaching process also results in

the creation of harmful byproducts called “organochlorines,” which include dioxins and dioxin-like compounds.[\[6\]](#) These substances are known to cause cancer and are suspected of causing developmental, reproductive, and immune system damage.

Although industry has reduced its organochlorine discharges because of strengthened government standards, Environmental Protection Agency (EPA) figures indicate that the pulp and paper industry ranks in the top three or four among U.S. manufacturing industries in the release of dioxin and dioxin-like compounds.[\[7\]](#) If the industry completely replaced chlorine compounds with safer oxygen-based bleaching, then there would be no organochlorine byproducts, and wastewater from the bleaching process could be almost completely recovered and reused.[\[8\]](#)

Does paper manufacturing have to be as damaging to the environment as it currently is?

The industry could do more to reduce its damaging impacts by sourcing its wood fiber from sustainably managed forests, increasing its use of post-consumer recycled paper, improving the efficiency of its use of energy and water, and completely eliminating chlorine bleaching. In fact, a number of paper manufacturers in the U.S. are working to do just this.

One example is provided by Mohawk Paper, a company which offers high quality printing and writing papers that have as much as 100% post-consumer recycled fiber, are processed chlorine free, and are preferentially sourced from FSC-certified forests, when virgin fiber is used. Additionally, savings from energy efficiency measures have allowed Mohawk to purchase wind power and finance renewable energy projects in the U.S. Finally, as a member of the US EPA Climate Leaders Program, Mohawk has inventoried its greenhouse gas emissions and is using that information to become a carbon neutral company, meaning that any CO₂ emissions from its operations will be offset through the support of renewable energy and emissions reduction programs. For its achievements, Mohawk received the "Green Partner of the Year" award in 2007 from the EPA.

If you want to learn more about other companies which manufacture and purchase environmentally preferable paper, [click here](#) to go to the websites of organizations which work with business and industry to improve their paper policies and list sources of environmentally preferable paper.

How can we as consumers help the environment when we use and buy paper?

Our consumption and buying patterns can shape the world we live in, either for good or for bad. [Click here](#) to learn more about what you can do.

SOURCES

- [1] From the Confederation of European Paper Industries (CEPI) (2005) Sustainability Report p. 2 at http://www.cepипrint.com/doc/envirоn_issues/cepi_sustainability_report_2005.pdf
- [2] United Nations. Food and Agriculture Organization (2005). Global Forest Resources Assessment. At <http://www.fao.org/forestry/fra2005/en/page.jsp>.
- [3] US Energy Information Agency at http://www.eia.doe.gov/emeu/efficiency/carbon_emissions/carbon_mfg.html
- [4] US EPA(November 2002). Pulp and Paper Industry. Chemical Releases and Transfers at http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/pulp_pasnp2.pdf and US. EPA. TRIExplorer at <http://www.epa.gov/triexplorer/> ; for water usage, US. EPA (2004). Forest Products at <http://www.epa.gov/sectors/pdf/2004/forestproducts.pdf>
- [5] <http://www.scorecard.org/chemical-profiles/>
- [6] <http://www.scorecard.org/chemical-profiles/>
- [7] US EPA (2006). TRI Public Data Release Section B, p. B-30 at <http://www.epa.gov/tri/tridata/tri06/pdr/SectionB.pdf>
- [8] EPN, State of the Paper Industry, pp. 51-52.

RECYCLING

Why is the disposal of paper in landfills a problem?

In addition to preventing the formation of methane gas in landfills, are there other reasons to recycle paper?

I've heard that it can cost cities and towns more to recycle than to send paper to a landfill.

Is it true that a lot of the paper we recycle in the United States gets exported to other countries?

Is it more important to recycle some types of papers than others, or should we recycle it all?

What does the term "post-consumer recycled content" mean?

Isn't there a limit to how many times you can recycle paper?

Why is the disposal of paper in landfills a problem?

Like any organically-based substance left to decompose in landfills, paper gives off methane, a greenhouse gas that is 23 times more potent than carbon dioxide. If you recall that discarded paper and paperboard make up about one-third of the entire waste stream in the United States, or about 85 million tons per year, it becomes clear that wasted paper can produce substantial greenhouse gas emissions over time.

In addition to preventing the formation of methane gas in landfills, are there other reasons to recycle paper?

When paper is made from recycled fiber, many negative environmental impacts are reduced across its life cycle. These include: the number of trees harvested, the energy used in pulp and paper mills, the greenhouse gas emissions from both fossil fuels and discarded paper decomposing in landfills, the volume of wastewater discharged from mills, and, finally, the solid waste generated by both the manufacturing process and end-of-life disposal.

If every U.S. household bought 25 pounds, or 5 reams, of 100% recycled copy paper each year instead of virgin fiber-based paper, here's what the savings would be: [\[1\]](#)

	Virgin Fiber Paper	100% Post Consumer Recycled Paper	
Total quantity of copy paper	1,318,500 tons	1,318,500 tons	
Postconsumer Recycled Content	None	100%	
Wood Use	4,836,752 tons	None	Savings equivalent to about 33,485,208 trees
Total Energy Use	53,526,118 million BTUs	23,309,205 BTUs less	Savings equivalent to energy for about 256,145 U.S. homes
Greenhouse Gas Emissions	7,939,058,692 pounds of CO2 equivalent	2,941,235,133 pounds less	Savings equivalent to removing about 267,069 cars from the road
Wastewater	26,614,037,738 gallons	12,208,422,213 gallons less	Savings equivalent to about 18,486 Olympic-sized swimming pools worth of water
Solid Waste	3,178,791,366 pounds	1,567,732,807 pounds less	Savings equivalent to about 55,990 garbage trucks

Or, to give another example, if every U.S. household bought just one roll of 100% recycled content toilet paper, the results would be the equivalent of preserving about 330,000 trees, saving about 106,000,000 gallons of water, and preventing about 25,000,000 pounds of greenhouse gas emissions.

These figures make a strong argument for buying paper products with the highest recycled content possible.

I've heard that it can cost cities and towns more to recycle than to send paper to a landfill.

Under certain conditions, it can cost municipalities more to recycle than to discard trash. The price depends on a number of variables such as the cost of collecting and transporting waste to landfills or incinerators, the fees charged at landfills or incinerators, and the going market price for recovered paper, including for different grades of paper. Because of this last factor, a municipality may want to be sure that the more expensive printing and writing papers are sorted and sold separately, so long as that doesn't add on extra garbage truck pick-ups which have their own economic and environmental costs.

However, overall, it is important to remember that budgetary savings are not the main reasons for recycling. In our increasingly carbon-constrained world, the larger environmental benefits need to be given considerable weight. Recycling is an easy way for us all to contribute to reduced greenhouse gas emissions and climate change as well as to save valuable resources.

Is it true that a lot of the paper we recycle in the United States gets exported to other countries?

An increasing proportion of the recycled paper from both North America and Europe is sent to Asia, where demand for paper grew by more than 500% between 1996 and 2006.[\[2\]](#) In 2007 alone, China imported about 24,900,000 tons of recovered paper, of which the US supplied 44% or about 10,961,383 tons. [\[3\]](#)

Although it is important to have sufficient recycled paper to keep U.S. deinking and repulping mills operating at capacity, and even expanding their capacity, it is not a bad thing to export wastepaper to countries with less supplies of their own. Since climate change is a global problem, increasing the use of recycled paper anywhere in the world offers an important way to reduce greenhouse gas emissions and preserve forests. One expert has estimated that in 2006 alone the wastepaper exports to China may have saved 59.5 million tons of wood from being harvested for pulp. [\[4\]](#)

Is it more important to recycle some types of papers than others, or should we recycle it all?

We should maximize our recycling of all types of paper. However, it's especially important to increase supplies of recovered paper for the higher grade printing and writing category. Although this category accounts for 27% of the paper manufactured in the U.S., overall only 6% of the fiber in these papers is recycled. In contrast, newsprint averages over 30% recycled fiber, and commercial (as opposed to residential) tissue paper averages about 45%. [\[5\]](#)

An important reason for this difference has to do with recycling practices. Most often, recycled paper is collected in mixed batches, meaning that higher quality papers are mixed together with lower grade newsprint or paperboard. Without adequate sorting at the material recovery facilities which process recycled waste, printing and writing papers will be "down-cycled" rather than directed to their "highest and best use" -- that is, the manufacture of more printing and writing paper. In order to encourage appropriate source separation of high quality paper, be sure to buy copy paper with the highest post-consumer recycled content available.

What does the term "post-consumer recycled content" mean?

When buying paper with recycled content, it is important to be sure that it contains at least 30% post-consumer recycled fiber -- that is, fiber recovered from paper products that have been sold on the wholesale or retail market. Paper manufacturers have always

recovered and repulped their mill scraps as well as trimmings from makers of envelopes, boxes, and other specialty items. These sources are considered to be “pre-consumer.” Although they’re important to recycle into new paper to gain the kinds of savings noted above, their recovery doesn’t achieve the goal of maximizing recycling from residential, commercial, and governmental waste streams. Thus, it is important for us as consumers to ask for products which use otherwise wasted resources from what have been called our “urban forests.”

Isn’t there a limit to how many times you can recycle paper?

The number of times paper can be recycled depends upon the quality of the fiber. Poorer quality paper like newsprint has shorter fibers that will break down after 3 or 4 cycles of repulping whereas high-quality printing and writing paper may be able to be repulped up to about 10 times. [6]

Manufacturers definitely need new fiber input, but it is extremely important that this virgin fiber comes from sustainably managed forests, when the fiber is wood-based. For more on fiber from sustainably managed forests, [click here](#). Fiber for paper can also come from other sources, some of which may offer environmental advantages. To learn more about alternative fibers, [click here](#).

SOURCES

[1] According to the U.S. Census Bureau, there were 111,617,402 households in 2006, the most recent date for which figures are available. See http://factfinder.census.gov/servlet/ADPTable?_bm=y&-geo_id=01000US&-ds_name=ACS_2006_EST_G00_&-_lang=en&-_caller=geoselect&-format= . Environmental impact estimates were made using the Environmental Defense Fund Paper Calculator available at <http://www.papercalculator.org>

[2] According to the AP, reprinted at http://www.terraviva.com/reports/Voracious_China_Gobbles_Up_Forests_Recycled_Paper_999.html

[3] Figures from Bureau of International Recycling reported in Recycling Bizz at http://www.recyclingbizz.com/paper_textile/LA806262.html

[4] Brian Stafford (July 2007). Environmental Aspects of China’s Papermaking Fiber Supply, p. vi for Forest Trends at <http://www.forest-trends.org/documents/publications/ChinaFiberSupply.pdf> and Editorial Staff (April 1, 2008). BIR Paper World Mirror March. Recycling Bizz at http://www.recyclingbizz.com/paper_textile/LA806262.html

[5] EPN, State of the Paper Industry, p.17

[6] EPN, State of the Paper Industry, p. 21

ALTERNATIVE FIBERS

[Does the fiber for making paper have to come from trees?](#)

[What other fibers could be used for papermaking?](#)

[What would the advantages be to using these alternative fibers?](#)

[What are the potential environmental advantages of the more promising of these fiber sources?](#)

[Are there any projects that use these alternative fibers in making paper?](#)

Does the fiber for making paper have to come from trees?

Historically, paper was made from a variety of plant fibers such as cotton and flax as well as from recycled materials such as rags and waste paper. Only after the growth of industrialization in the mid to late nineteenth century did virgin fiber from trees become the primary raw material for pulp and paper manufacturing. As this transition occurred in the United States, papermaking companies began to assimilate into the larger lumber and timber-products industry, eventually represented by a combined trade organization called the American Forest and Paper Association. Today, a massive pulp-and-paper industry is structured around the use of wood fiber. Modern integrated pulp-and-paper mills require capital investments in the range of \$1 - \$2 billion. Because their machinery is designed and calibrated to process this fiber source, it is difficult to shift the practices of the sector toward alternative fibers. [1]

What other fibers could be used for papermaking?

A number of other fibers could be used for making paper. These include agricultural residues such as wheat, barley, oat, rye, and rice straws or sugarcane bagasse; non-cereal straws such as red fescue or rye grasses; bamboo; cotton; flax; hemp; hesperaloe; and kenaf. In the past, some of these fibers were commonly used for papermaking, and still are used to some degree in other parts of the world. Globally, 9% of paper fiber comes from fibers other than wood; about 85% of this amount consists of non-wood papers made in China. [2]

Research carried out by U.S. Department of Agriculture and by the University of Arizona has identified two of these plant fibers as particularly suited to paper-making: kenaf and hesperaloe.[3] Other researchers have focused on the advantages of using agricultural residues, by-products of harvesting that are often burned in the field to dispose of the portion not needed for reconditioning the soil.[4]

What would the advantages be to using these alternative fibers?

First, the availability of alternative fibers could reduce the pressure to harvest trees for papermaking. Second, alternative fibers may be grown or collected after harvesting food crops in parts of the country where there are no forests, thereby helping to decentralize

and diversity the pulp and paper industry and to create additional jobs for struggling rural economies. Third, some of these fibers may even offer environmental advantages.

However, as with all proposals for introducing new raw materials, it is important to be certain that there aren't hidden costs, especially once production reaches a commercial scale. [Careful life-cycle analysis](#) is needed to demonstrate that these alternative fibers would not cause unanticipated environmental damage, as has recently been shown to be the case with biofuels.[\[5\]](#)

What are the potential environmental advantages of the more promising of these fiber sources?

Three of the more promising alternative sources are offered by agricultural residues, hesperaloe, and kenaf.

Agricultural residues have the advantage of providing fiber without growing anything beyond what is already produced. As noted above, channeling excess residues into papermaking would mean they are not burned in open fields, a practice that contributes to air pollution and releases greenhouse gases. Researchers have estimated that as much as 280 million tons of residues are available in the U.S. alone and could be diverted for paper production. [\[6\]](#)

Hesperaloe, an arid-zone perennial, can be farmed with 30% less water than cotton and can be harvested at 18-month intervals over an 11-year period without replanting. Because of its superior fiber quality, 1 pound of hesperaloe pulp can replace 2 to 4 pounds of typical wood-fiber pulp. As a result, lighter weight paper can be manufactured for a given purpose than is possible with wood-based fibers. That results in lower costs for purchasers because paper is sold by weight and also in the use of less fossil fuel for shipping because products are lighter. Additionally, pulping and bleaching hesperaloe fiber reduces environmental impacts because the process can take place with less water and energy and without damaging chemicals. [\[7\]](#)

Kenaf is a fast growing annual, related to cotton and okra, that absorbs more CO₂ than trees, outcompetes most weeds, and is resistant to many pests and diseases so that it can be farmed with minimal chemical inputs. It produces two types of fiber suitable for papermaking. Like hesperaloe, it is easier to pulp than wood-based fibers so that it, too, can be processed with less energy and water, and less environmentally problematical chemicals. Farmers could rotate kenaf into production with other row crops like corn or soy.

All three of these sources of alternative fiber seem to offer advantages over the use of trees for papermaking. But, as noted above, it is important to carry out careful life-cycle analyses of any new raw materials before concluding that they would be environmentally preferable at a commercial scale of production. Moreover, it is unlikely that any one alternative fiber alone could replace wood altogether in manufacturing paper. Rather, the goal would be to diversify and decentralize the pulp and paper industry, so that it could

incorporate multiple fiber sources as a means of lessening the pressure on forests and reducing the environmental impact of industrial processes connected with pulping fiber for paper.

Are there any projects that use these alternative fibers in making paper?

Several projects have used agricultural residues for papermaking. An early demonstration project was successfully carried out by a Canadian company named Arbokem, which manufactured a 50% wheat straw/50% post-consumer recycled fiber office printing paper that was test-marketed in the late 1990s. They have also worked on an agri-pulp based newsprint and are in the planning stages of a project in Mexico to produce agri-pulp pizza boxes. [8] More recently a collaboration among the non-profit environmental organization Markets Initiative, Canadian Geographic, the Alberta Research Council, and other groups led to the printing of the environmental issue of that magazine on wheat-straw based paper.[9]

Projects also are actively exploring the possibilities offered by hesperaloe and kenaf. Arbokem is currently involved in a demonstration project with Greenpeace Germany and a Finnish paper mill to produce paper from hesperaloe fiber that is being used in printing the organization's quarterly newsletter.[10] Vision Paper, a company based in New Mexico, has produced kenaf-based papers for a number of years, but, because of the closing of small mills where the fiber was pulped, their products are currently not available. [11] However, the company is working on the development of its own small pulp mill to continue its work with kenaf fiber.

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POLICY

[How can government policy promote environmentally friendly paper?](#)

[Can institutions and companies also use policy to promote environmentally friendly paper?](#)

[Along with environmentally preferable purchasing policies, what else can government do?](#)

[The pulp and paper industry is one of the major sources of pollution in the United States in terms of greenhouse emissions and toxic releases. What role can government play in reducing these pollutants?](#)

How can government policy promote environmentally friendly paper?

Government at all levels – local, state, and federal-- can encourage industry to produce paper with recycled content, without chlorine, and with wood fiber certified by the [Forest Stewardship Council \(FSC\)](#), by requiring their agencies and offices to purchase paper with those characteristics. Setting environmental standards for the purchase of paper or other products is known as “**environmentally preferable purchasing policy (EPP)**.” By requiring high standards, government is effectively creating a market for these environmentally friendly products. Industry can then make the necessary investments to produce environmentally friendly paper to meet this demand.

Along with environmental purchasing requirements, government can require that its offices and agencies use double-sided printing and copying, recycle discarded paper, and replace disposable paper products in cafeterias and kitchens with reusable products such as washable plates and cups.

The United States Federal Government’s Executive Order 13423 of 2007 requires that federal agencies purchase paper with at least 30% post-consumer fiber content. Sixteen states have followed this 30% standard, using guidelines set by the Environmental Protection Agency (EPA) (rather than the executive order itself) as the criteria for their paper procurement. The EPA standard is set at 30% for most paper products.^[1] If consistent standards were adopted across the nation, the market for recycled paper would flourish, resulting in lower costs, which in turn would encourage other entities to purchase recycled paper as well.

Can institutions and companies also use policy to promote environmentally friendly paper?

Yes. Office supply businesses like Staples and FedEx Kinko’s have committed to sourcing significant portions of their fiber from FSC certified wood fiber and to achieving a high level of recycled content for their products. Companies like Bank of America have adopted policies that minimize the use of paper by using electronic communication for reports and memos, by buying lighter weight paper, and by utilizing double sided printing and copying. In the process, Bank of America has saved an

estimated \$10 million. [Click here to learn more about what you can do help your workplace adopt strong environmental paper policies and more about other companies setting high environmental standards for their paper purchasing and use.](#)

Along with environmentally preferable purchasing policies, what else can government do?

Government can set policies that promote the reduction of paper in packaging and require that paper packaging is recycled. In 1991, Germany passed the Ordinance on the Avoidance of Packaging Waste, a law that made industry responsible for its packages after consumers discarded them, including the costs of collecting, sorting, and recycling the packages. In [Germany, Garbage, and the Green Dot: Challenging the Throwaway Society](#), Bette Fishbein discusses the dynamics of this policy. By making industry responsible for discarded packages, industry has an incentive to design packaging that is lighter, smaller, and more recyclable, and to remove packaging altogether when feasible. As she states in The Secret Life of Paper video, as soon as this law was passed, “secondary packages were dropped, for example the box on the toothpaste tube. If you went to the supermarket, you would see the box with the tubes on the shelves without the outer box.”

One of the innovations of this legislation is the flexibility it offers industry. While industry is made responsible for discarded packages, companies are able to achieve economies of scale by using a third party, private company that collects and recycles packaging.[\[2\]](#)

Following the German successes, the European Union adopted similar legislation in 1994, known as the Directive on Packaging and Packaging Waste, and added amendments to this legislation in 2004 and 2005.[\[3\]](#)

The pulp and paper industry is one of the major sources of pollution in the United States in terms of greenhouse emissions and toxic releases. What role can government play in reducing these pollutants?

Among manufacturing industries, the pulp and paper industry is the fourth largest emitter of greenhouse gases in the United States.[\[4\]](#) As the United States government moves toward adopting reduction targets for greenhouse gases, either through carbon taxes or a cap-and-trade approach, the pulp and paper industry will have to become more energy efficient, switch to renewable sources of energy, and/or purchase emission credits (like [Mohawk Fine Paper, Inc.](#)) depending on what type of system is adopted. Such national/international climate policies would significantly reduce the greenhouse emissions from the pulp and paper industry.

In addition to greenhouse emissions, the pulp and paper industry annually releases about 212 million tons of hazardous substances into the air and water.[\[5\]](#) The United States Clean Water Act, Clean Air Act, Endangered Species Act, and Cluster Rules have significantly reduced the pollution from pulp and paper mills.[\[6\]](#) For example, in the late

1990s, the U.S. Cluster Rule required that the industry stop using elemental chlorine. Thus, all mills in the U.S. are now “elemental chlorine free.” However, chlorine dioxide is often still used, which releases significant amounts of dioxin and other pollutants. The U.S. government could amend the above listed acts and require even greater reductions of pollutants.

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<http://www.environmentalpaper.org/stateofthepaperindustry/> (July 31, 2008).

RESOURCES

Inform Publications:

[Germany, Garbage, and the Green Dot: Challenging the Throwaway Society.](#) Bette K. Fishbein (1994, 276 pp.,)

Analyzes the concept of extended manufacturer responsibility as a means to reduce product and packaging waste, through the lens of the German experience.

[Delivering the Goods: Benefits of Reusable Shipping Containers.](#) David Saphire (1995, 32 pp.)

Describes how reusing shipping containers can curtail packaging waste, offering environmental and economic benefits. Discusses institutional obstacles to more widespread use and options for overcoming them.

[Waste at Work: Prevention Strategies for the Bottom Line.](#) John P. Winter & Anne Marie Alonso (1999, 105 pp.)

Businesses generate up to 45 percent of this country's waste, and managing it costs them billions of dollars a year. This handbook explains how businesses (as well as government agencies) can reduce waste while bringing down their disposal, purchasing, and operational costs. A section on procurement describes the attributes to look for when shopping for products that produce less waste and how to buy, store, use, and dispose of products to reduce or eliminate waste.

Other Publications:

On the paper industry

J.M. Abramovitz and A.T. Mattoon (1999). [Paper Cuts: Recovering the Paper Landscape.](#) Worldwatch Paper 149 at <http://www.worldwatch.org/node/841>

Environmental Defense Fund (1995). [Paper Task Force Report](#) at http://www.edf.org/documents/813_PTFcomplete.pdf and [Paper Task Force White Papers](#) (updated 2004) at <http://www.edf.org/article.cfm?ContentID=1689>

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TAPPI (2001). How is Paper Recycled at http://www.tappi.org/paperu/all_about_paper/earth_answers/Recycle1.htm

White House Task Force on Recycling (1998). Recycling...for the Future at <http://www.ofee.gov/wpr/future.pdf>

On forests

United Nations. Food and Agriculture Organization (2007). Green Facts: Scientific Facts on Forests at <http://www.greenfacts.org>

On environmentally preferable paper purchasing and practices for businesses and organizations

From Inform:

J. P. Winter & A. M. Alonso (1999). Waste at Work: Prevention Strategies for the Bottom Line. at <http://www.informinc.org/wasteatwork.php>

Through the Environmental Paper Network website:

Increasing Paper Efficiency at

<http://www.environmentalpaper.org/documents/paperefficiencyfactsheet.pdf>

Environmentally Preferable Paper Purchasing Guidance at

<http://www.environmentalpaper.org/documents/CommonVision-paperpguidelines.pdf>

Forest Ethics' Business Guide to Paper Production at

<http://www.environmentalpaper.org/documents/REDUCE-BUSINESS-GUIDE.pdf>

From Environmental Defense Fund:

Tips for selecting, buying and reducing paper (updated October 2007) at <http://www.edf.org/article.cfm?contentid=1689>

Allies

Corporate and Individual Responsibility in Paper Purchasing and Consumption

As You Sow at <http://www.asyousow.org/>

A non-profit which gives grants and also works toward corporate and institutional responsibility in relation to the environment and the human condition. Advocates for the purchase of recycled paper and for responsible fiber sourcing by large corporate users as well as for the availability of environmentally preferable papers

through large US paper suppliers.

Catalog Choice at <http://www.catalogchoice.org/>

A free service to help you stop receipt of unwanted catalogues in the mail, sponsored by The Ecology Center with endorsements by the National Wildlife Federation and the Natural Resources Defense Council.

Center for a New American Dream at <http://www.newdream.org/>

An organization with a mission of changing consumption patterns to protect the environment, enhance quality of life, and promote social justice . See their “junk your junk mail” webpage at <http://www.newdream.org/junkmail/> and their responsible purchasing network at <http://www.responsiblepurchasing.org/>. Also look at their news about paper [here](#).

Conservatree at <http://www.conservatree.org/>

An organization that provides information about purchasing of environmental paper for both small-scale and large-scale purchasers. Their website also includes a wealth of information about paper types, papermaking, and environmental issues connected with the paper industry.

Co-op America at <http://www.coopamerica.org/programs/woodwise/>

Among many program areas, their WoodWise program helps consumers buy products that don't promote deforestation at and includes information on ways to reduce junk mail at <http://www.coopamerica.org/programs/woodwise/consumers/whatyoucando/stopjunk.cfm>

Dogwood Alliance at http://www.dogwoodalliance.org/component/option,com_frontpage/Itemid,1/

A group that focuses on southern U.S. forests, with campaigns to change practices in the packaging industry and office supply sector as well as to promote conservation and sustainable forestry, including by exposing the inadequacy of the forest-products industry's Sustainable Forestry Initiative certification system.

Environmental Defense Fund at www.edf.org

One program within this large environmental organization focuses on paper and packaging. Of particular interest is their paper calculator, which anyone can use to determine the environmental impact of a wide range of papers. <http://www.edf.org/page.cfm?tagID=1439> for section on paper and <http://www.edf.org/papercalculator/> for the paper calculator itself

Forest Ethics at <http://www.forestethics.org/>

Wages a campaign to “make junk mail history” with a Do Not Mail Registry. See their petition at

http://salsa.democracyinaction.org/o/281/petition.jsp?petition_KEY=941

Green Press Initiative at <http://www.greenpressinitiative.org/>

Works with the book and newspaper industries to support use of environmental paper in publications. Has information for publishers about model paper policies, sources for environmentally responsible papers, and names of environmentally aware printers. Green Print at <http://www.printgreener.com/> offers a free software download GreenPrint eliminates wasteful pages in any printout automatically, saving you time and money, protecting trees, reducing greenhouse gasses, and decreasing waste. It does so by analyzing each page sent to your printer and looking for typical waste characteristics -- like a final page with just a URL, banner ad, logo, or legal jargon.

Markets Initiative at <http://www.marketsinitiative.org/>

Similar to the Green Press Initiative but located in Canada, MI focuses on the publishing industry – books, newspapers, and magazines – and promoting the use of Ancient Forest Friendly paper. It also provides information about several forest certification schemes to help buyers understand which is preferable.

Forest Protection and Sustainable Paper Production Environmental Investigation Agency at <http://www.eia-international.org/campaigns/forests/>

Engages in work on forest loss and its impact on communities and climate as well as on illegal trade in animals

Environmental Paper Network at www.environmentalpaper.org

As well as being the source of several important publications (see above), the Environmental Paper Network coordinates a range of non-profits involved with forest protection and sustainable paper production and use. It also has a website with useful information about paper.

National Wildlife Federation at www.nwf.org

A large environmental organization with a focus on preservation of wildlife and a section on paper use and recycling at <http://www.nwf.org/paper/index.cfm> Along with the Natural Resources Defense Council, NWF has endorsed Catalog Choice (see above)

World Wildlife Fund at www.worldwildlife.org

A large environmental organization which, among other issues, works on forest protection and responsible forest-product sourcing at <http://www.worldwildlife.org/what/globalmarkets/forests/index.html>