

Estimated environmental impacts were calculated using the Environmental Paper Network's Paper Calculator. When used publicly, this information must be properly cited. For more information and to view the required citation, please visit www.papercalculator.org.

BASELINE PAPER	
Paper Type:	Uncoated Freesheet
Quantity:	40 Pounds
% Recycled:	0%
 Wood Use	0.08 U.S. short tons
 Total Energy	0.5 million BTUs
 GHG	359 pounds CO ₂ equiv.
 Water Usage	428 gallons
 Solid Waste	23.6 pounds
NITROGEN OXIDES (NO _x)	19.6 O ₃ equiv/m ³ *
PURCHASED ENERGY	0.3 million BTUs
PARTICULATES	6.4 PM _{2.5} equiv/m ³ *
SULFUR DIOXIDE (SO ₂)	0.2 pounds
VOLATILE ORGANIC COMPOUNDS (VOCs)	0.003 pounds
TOTAL REDUCED SULFUR (TRS)	0.002 pounds
HAZARDOUS AIR POLLUTANTS (HAPs)	0.03 pounds
CHEMICAL OXYGEN DEMAND (COD)	0.4 pounds
BIOCHEMICAL OXYGEN DEMAND (BOD)	0.2 pounds
TOTAL SUSPENDED SOLIDS (TSS)	0.3 pounds
FOREST DISTURBANCE	0.007 acres
THREATENED SPECIES	9 species

OCEAN ACIDIFICATION	59.9 pounds H ₂ CO ₃
MERCURY EMISSIONS	0.7 milligrams
DIOXIN EMISSIONS	63.9 micrograms
FRESHWATER DISTURBANCE	See below
HERBICIDES	See below
OCEAN WARMING	See below
WETLAND DISTURBANCE	See below

Explanation of Data Values



Wood use measures the amount of wood required to produce a given amount of paper. Results are reported in fresh/green U.S. short tons of wood. The methodology does not include the forest residues left behind during pulpwood harvest in the forests (i.e., slash, roots). If forest residues were included it could be twice the number, as roughly 50% of biomass is left after harvest.

- Baseline Paper uses 0.08 U.S. short tons, made from about 0.5 trees



Total energy measures all energy required over the paper's life cycle, including all renewable and nonrenewable resource use, including black liquor and all wood sources.

- Baseline Paper uses 0.5 million BTUs, equivalent to 0.6 residential refrigerators operated/year



Greenhouse gases/climate change impacts measures carbon dioxide or CO₂ from burning fossil fuels, methane from paper decomposing in landfills and short-lived climate pollutants (such as black carbon and organic carbon) which contribute to climate change by trapping energy from the sun in the earth's atmosphere. This impact category also includes forest carbon storage loss from logged forests.

- Baseline Paper produces 359 pounds of CO₂ equiv., equivalent to 0.03 cars/year



Water consumption measures the amount of process and cooling water that is consumed or degraded throughout the life cycle of the paper product.

- Baseline Paper uses 428 gallons, equivalent to 0.3 clothes washers operated/year



Solid waste measures sludge and other wastes generated during pulp and paper manufacturing, and used paper disposed of in landfills and incinerators.

- Baseline Paper produces 23.6 pounds of solid waste, equivalent to 5.4 people generating solid waste/day

Nitrogen oxides/ground level ozone (NO_x, which includes NO and NO₂) measures products of the combustion of fuels that contain nitrogen. NO_x can react with volatile organic compounds and sunlight in the lower atmosphere to form ozone, a key component of urban smog. NO_x forms ozone and can also, in parallel, lead to acid rain. *The measurement of NO_x in this calculator is a complex equation that takes into account human exposure across a sample of locations of pulp and paper mills. For more information please see the *Methodology* document under the Resources tab of this website (<https://c.environmentalpaper.org/pdf/SCS-EPN-PC-Methods.pdf>).

- Baseline Paper produces 19.6 persons x hrs. x pounds O₃ equiv/m³, equivalent to 0.02 gasoline powered passenger cars/year

Purchased energy is a subset of total energy, and measures how much energy comes from purchased electricity and other fuels.

- Baseline Paper uses 0.3 million BTUs, equivalent to 0.3 residential refrigerators operated/year

Particulates/PM_{2.5} impacts measures the effect of particulate matter (PM) emissions from pulp/paper production, contributing to smog. Particulates are small airborne particles generated during combustion, and pose a range of health risks, including asthma and other respiratory problems, when inhaled. *The measurement of particulates in this calculator is a complex equation that takes into account human exposure across a sample of locations of pulp and paper mills. For more information please see the *Methodology* document under the Resources tab of this website (<https://c.environmentalpaper.org/pdf/SCS-EPN-PC-Methods.pdf>).

- Baseline Paper produces 6.4 persons x hrs. x pounds PM_{2.5} equiv/m³, equivalent to 0.2 gasoline powered passenger cars/year

Sulfur Dioxide (SO₂) and other acidifying emissions/Regional acidification measures chemical compounds such as sulfur dioxide, nitrogen oxides, and other acids (e.g. ammonia) that are produced when boilers burn fuel containing sulfur and other acid-producing substances. Of the fuels used in the paper industry, oil and coal generally contain the highest quantities of sulfur. These acidifying emissions contribute to air pollution problems like acid rain and smog. This category includes SO₂ emissions, but also other acids and emissions like NO_x.

- Baseline Paper produces 0.2 pounds SO₂ equiv., equivalent to 0.05 eighteen-wheelers/year

Volatile organic compounds (VOCs) measure a broad class of organic gases, such as vapors from solvent and gasoline. VOCs react with nitrogen oxides (NO_x) in the atmosphere to form ground-level ozone, the major component of smog and a severe lung irritant.

- Baseline Paper produces 0.003 pounds, equivalent to 12.2 miles driven in a car/year

Total reduced sulfur (TRS) measures emissions of the compounds that cause the odor associated with kraft pulp mills. Exposure to TRS emissions has been linked to symptoms including headaches, watery eyes, nasal problems, and breathing difficulties.

- Baseline Paper produces 0.002 pounds

Hazardous air pollutants (HAPs) measures any of a group of 188 substances identified in the 1990 U.S. Clean Air Act amendments because of their toxicity. Two of the most common occurring in air are formaldehyde and acrolein.

- Baseline Paper produces 0.03 pounds, equivalent to 0.006 passenger cars/year

Chemical oxygen demand (COD) measures the amount of oxidizable organic matter in the mill's effluent. Since wastewater treatment removes most of the organic material that would be degraded naturally in the receiving waters, the COD of the final effluent provides information about the quantity of more persistent substances discharged into the receiving water.

- Baseline Paper produces 0.4 pounds COD, equivalent to 0.002 homes/year

Biochemical oxygen demand (BOD) measures the amount of oxygen that microorganisms consume to degrade the organic material in the wastewater. Discharging wastewater with high levels of BOD can result in oxygen depletion in the receiving waters, which can adversely affect fish and other organisms.

- Baseline Paper produces 0.2 pounds BOD, equivalent to 0.001 homes/year

Total Suspended Solids (TSS)/Freshwater eutrophication measures solid materials suspended in mill effluent, which can adversely affect bottom-living organisms upon settling in receiving waters and can carry toxic heavy metals and organic compounds into the environment.

- Baseline Paper produces 0.3 pounds TSS, equivalent to 0.002 homes/year

Forest disturbance measures the impact of paper production on forest ecosystems and biodiversity. The indicator compares the ecosystem integrity of a harvested site to intact forests over 80 years old in the region, using on-the-ground measurements. It also considers the recovery potential which would be possible on the site if harvesting were halted, reflecting the long-term implication of forest management at suppressing ecosystem integrity.

- Baseline Paper disturbs 0.007 acres, equivalent to the size of 0.006 football fields

Threatened species measures the possible number of species affected by logging for paper production in the North American region that are listed as Critically Endangered, Endangered, or Vulnerable in the IUCN Red List of Threatened Species (<http://www.iucnredlist.org>), though the exact impact will vary by forest of origin. The number of species is based on correlation with logging threats assessed by IUCN and the fiber basket of pulp and paper mills in the region. For more information see the Methodology Document (<https://c.environmentalpaper.org/pdf/SCS-EPN-PC-Methods.pdf>).

- Baseline Paper impacts 9 species

Ocean acidification measures increased ocean acidity caused by CO₂, which has detrimental consequences for many marine organisms. This indicator considers CO₂ emitted during the production of pulp and paper, but also evaluates the amount of CO₂ that could be sequestered in trees if forest harvests used for papermaking were halted.

- Baseline Paper produces 59.9 pounds H₂CO₃, equivalent to 0.02 cars/year

Mercury emissions measure the amount of emissions during the production of pulp and paper. Mercury is a very toxic substance that persists in the environment for long periods of time. Emissions can therefore lead to contamination in the environment, including freshwater bodies and oceanic systems, subsequently exposing flora and fauna to elevated concentrations.

- Baseline Paper produces 0.7 milligrams, equivalent to 0.2 compact fluorescent lights

Dioxin emissions measure the amount of dioxin emissions that are released to air and water from pulp and paper mills. Dioxins are persistent and bioaccumulative, and even small amounts of emission can contaminate local waterways and bioaccumulate in fish.

- Baseline Paper produces 63.9 micrograms

Freshwater disturbance measures the number of freshwater systems possibly affected by logging. Logging can impact streams, rivers and creeks by increasing erosion, removing riverside vegetation and removing large woody debris that many fish species require for habitat. Although this impact is important and relevant, no data is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported here as relevant to pulp/paper production, although results cannot be evaluated at this time.

Herbicides measures the amount of toxic herbicides used in growing trees for paper production. Herbicides are applied to control the spread of non-desirable species. Although this impact is important and relevant, no data is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported as relevant to pulp/paper production, although results cannot be evaluated at this time.

Ocean warming measures increased ocean temperatures linked to emissions of greenhouse gases. Although this impact is important and relevant to emissions and foregone growth from logging, no algorithm is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported as relevant to pulp/paper production, although results cannot be evaluated at this time.

Wetland disturbance measures the acreage of wetlands possibly affected by logging. Logging can increase erosion, which will cause changes in the sediment, temperature and other characteristics of wetlands. Although this impact is important and relevant, no data is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported as relevant to pulp/paper production, although results cannot be evaluated at this time.

If you have questions or would like more information about Paper Calculator V4.0, please see the Life Cycle Assessment Methodology document under the "Resources" tab of this website (<https://c.environmentalpaper.org/resources.html>) or contact us at info@environmentalpaper.org.