






Estimated environmental impacts were calculated using the Environmental Paper Network's Paper Calculator(tm). When used publicly, it is required that the information is properly cited as "Environmental impact estimates were calculated using the Environmental Paper Network Paper Calculator Version 4.0. For more information visit www.papercalculator.org".

	NLPS PAPER USE - CURRENT STATE	NLPS PAPER USE - FUTURE STATE
Paper Type:	Uncoated Freesheet	Uncoated Freesheet
Quantity:	7.379 U.S. Short Tons	6.196 U.S. Short Tons
% Recycled:	0%	0%
 Wood Use	29.5 U.S. short tons	24.7 U.S. short tons <i>4.8 U.S. short tons less</i>
 Total Energy	188 million BTUs	158 million BTUs <i>30 million BTUs less</i>
 GHG	133,000 pounds CO ₂ equiv.	111,000 pounds CO ₂ equiv. <i>22,000 pounds CO₂ equiv. less</i>
 Water Usage	158,000 gallons	133,000 gallons <i>25,000 gallons less</i>
 Solid Waste	8,690 pounds	7,300 pounds <i>1,390 pounds less</i>
NITROGEN OXIDES (NO _x)	7,230 O ₃ equiv/m ³ *	6,070 O ₃ equiv/m ³ * <i>1,160 less</i>
PURCHASED ENERGY	107 million BTUs	89.9 million BTUs <i>17.1 million BTUs less</i>
PARTICULATES	2,360 PM _{2.5} equiv/m ³ *	1,980 PM _{2.5} equiv/m ³ * <i>380 less</i>
SULFUR DIOXIDE (SO ₂)	60.5 pounds	50.8 pounds <i>9.7 pounds less</i>
VOLATILE ORGANIC COMPOUNDS (VOCs)	1.08 pounds	0.9 pounds <i>0.2 pounds less</i>
TOTAL REDUCED SULFUR (TRS)	0.9 pounds	0.8 pounds <i>0.1 pounds less</i>
HAZARDOUS AIR POLLUTANTS (HAPs)	11.8 pounds	9.9 pounds <i>1.9 pounds less</i>
CHEMICAL OXYGEN DEMAND (COD)	141 pounds	118 pounds <i>23 pounds less</i>
BIOCHEMICAL OXYGEN DEMAND (BOD)	66.9 pounds	56.2 pounds <i>10.7 pounds less</i>
TOTAL SUSPENDED SOLIDS (TSS)	127 pounds	107 pounds <i>20 pounds less</i>
FOREST DISTURBANCE	2.7 acres	2.3 acres <i>0.4 acres less</i>

THREATENED SPECIES	9 species	9 species <i>the same</i>
OCEAN ACIDIFICATION	22,100 pounds H ₂ CO ₃	18,500 pounds H ₂ CO ₃ <i>3,600 pounds less</i>
MERCURY EMISSIONS	268 milligrams	225 milligrams <i>43 milligrams less</i>
DIOXIN EMISSIONS	23,600 micrograms	19,800 micrograms <i>3,800 micrograms less</i>
FRESHWATER DISTURBANCE	See below	See below
HERBICIDES	See below	See below
OCEAN WARMING	See below	See below
WETLAND DISTURBANCE	See below	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.

- NLPS PAPER USE - CURRENT STATE uses 29.5 U.S. short tons, made from about 177 trees
- NLPS PAPER USE - FUTURE STATE uses 24.7 U.S. short tons, made from about 148 trees
- NLPS PAPER USE - FUTURE STATE uses 4.8 U.S. short tons less, a difference of 29 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.

- NLPS PAPER USE - CURRENT STATE uses 188 million BTUs, equivalent to 224 residential refrigerators operated/year
- NLPS PAPER USE - FUTURE STATE uses 158 million BTUs, equivalent to 188 residential refrigerators operated/year
- NLPS PAPER USE - FUTURE STATE uses 30 million BTUs less, a difference of 36 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.

- NLPS PAPER USE - CURRENT STATE produces 133,000 pounds of CO₂ equiv., equivalent to 12 cars/year
- NLPS PAPER USE - FUTURE STATE produces 111,000 pounds of CO₂ equiv., equivalent to 10.1 cars/year
- NLPS PAPER USE - FUTURE STATE produces 22,000 pounds CO₂ equiv. less, a difference of 1.9 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.

- NLPS PAPER USE - CURRENT STATE uses 158,000 gallons, equivalent to 114 clothes washers operated/year
- NLPS PAPER USE - FUTURE STATE uses 133,000 gallons, equivalent to 95.6 clothes washers operated/year
- NLPS PAPER USE - FUTURE STATE uses 25,000 gallons less, a difference of 18.4 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.

- NLPS PAPER USE - CURRENT STATE produces 8,690 pounds of solid waste, equivalent to 1,980 people generating solid waste/day
- NLPS PAPER USE - FUTURE STATE produces 7,300 pounds of solid waste, equivalent to 1,670 people generating

solid waste/day

NLPS PAPER USE - FUTURE STATE produces 1,390 pounds less, a difference of 310 people generating solid waste/day

Nitrogen oxides/ground level ozone (NO_x , which includes NO and NO_2) 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>).

- NLPS PAPER USE - CURRENT STATE produces 7,230 persons x hrs. x pounds O_3 equiv/ m^3 , equivalent to 9.2 gasoline powered passenger cars/year
- NLPS PAPER USE - FUTURE STATE produces 6,070 persons x hrs. x pounds O_3 equiv/ m^3 , equivalent to 7.7 gasoline powered passenger cars/year
- NLPS PAPER USE - FUTURE STATE produces 1,160 persons x hrs. x pounds O_3 equiv/ m^3 less, a difference of 1.5 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.

- NLPS PAPER USE - CURRENT STATE uses 107 million BTUs, equivalent to 128 residential refrigerators operated/year
- NLPS PAPER USE - FUTURE STATE uses 89.9 million BTUs, equivalent to 107 residential refrigerators operated/year
- NLPS PAPER USE - FUTURE STATE uses 17.1 million BTUs less, a difference of 21 residential refrigerators operated/year

Particulates/ $\text{PM}_{2.5}$ 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>).

- NLPS PAPER USE - CURRENT STATE produces 2,360 persons x hrs. x pounds $\text{PM}_{2.5}$ equiv/ m^3 , equivalent to 89.1 gasoline powered passenger cars/year
- NLPS PAPER USE - FUTURE STATE produces 1,980 persons x hrs. x pounds $\text{PM}_{2.5}$ equiv/ m^3 , equivalent to 74.9 gasoline powered passenger cars/year
- NLPS PAPER USE - FUTURE STATE produces 380 persons x hrs. x pounds $\text{PM}_{2.5}$ equiv/ m^3 less, a difference of 14.2 gasoline powered passenger cars/year

Sulfur Dioxide (SO_2) 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 SO_2 emissions, but also other acids and emissions like NO_x .

- NLPS PAPER USE - CURRENT STATE produces 60.5 pounds SO_2 equiv., equivalent to 19.7 eighteen-wheelers/year
- NLPS PAPER USE - FUTURE STATE produces 50.8 pounds SO_2 equiv., equivalent to 16.5 eighteen-wheelers/year
- NLPS PAPER USE - FUTURE STATE produces 9.7 pounds SO_2 equiv. less, a difference of 3.2 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.

- NLPS PAPER USE - CURRENT STATE produces 1.08 pounds, equivalent to 4,510 miles driven in a car/year
- NLPS PAPER USE - FUTURE STATE produces 0.9 pounds, equivalent to 3,790 miles driven in a car/year
- NLPS PAPER USE - FUTURE STATE produces 0.2 pounds less, a difference of 720 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.

- NLPS PAPER USE - CURRENT STATE produces 0.9 pounds
- NLPS PAPER USE - FUTURE STATE produces 0.8 pounds
- NLPS PAPER USE - FUTURE STATE produces 0.1 pounds less

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.

- NLPS PAPER USE - CURRENT STATE produces 11.8 pounds, equivalent to 2.4 passenger cars/year
- NLPS PAPER USE - FUTURE STATE produces 9.9 pounds, equivalent to 2.0 passenger cars/year
- NLPS PAPER USE - FUTURE STATE produces 1.9 pounds less, a difference of 0.4 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.

- NLPS PAPER USE - CURRENT STATE produces 141 pounds COD, equivalent to 0.9 homes/year
- NLPS PAPER USE - FUTURE STATE produces 118 pounds COD, equivalent to 0.7 homes/year
- NLPS PAPER USE - FUTURE STATE produces 23 pounds less, a difference of 0.1 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.

- NLPS PAPER USE - CURRENT STATE produces 66.9 pounds BOD, equivalent to 0.4 homes/year
- NLPS PAPER USE - FUTURE STATE produces 56.2 pounds BOD, equivalent to 0.3 homes/year
- NLPS PAPER USE - FUTURE STATE produces 10.7 pounds less, a difference of 0.06 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.

- NLPS PAPER USE - CURRENT STATE produces 127 pounds TSS, equivalent to 0.6 homes/year
- NLPS PAPER USE - FUTURE STATE produces 107 pounds TSS, equivalent to 0.5 homes/year
- NLPS PAPER USE - FUTURE STATE produces 20 pounds less, a difference of 0.1 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.

- NLPS PAPER USE - CURRENT STATE disturbs 2.7 acres, equivalent to the size of 2.08 football fields
- NLPS PAPER USE - FUTURE STATE disturbs 2.3 acres, equivalent to the size of 1.8 football fields
- NLPS PAPER USE - FUTURE STATE uses 0.4 acres less, a difference of 0.3 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>).

- NLPS PAPER USE - CURRENT STATE impacts 9 species
- NLPS PAPER USE - FUTURE STATE impacts 9 species
- NLPS PAPER USE - FUTURE STATE impacts the same

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.

- NLPS PAPER USE - CURRENT STATE produces 22,100 pounds H₂CO₃, equivalent to 5.7 cars/year
- NLPS PAPER USE - FUTURE STATE produces 18,500 pounds H₂CO₃, equivalent to 4.8 cars/year
- NLPS PAPER USE - FUTURE STATE produces 3,600 pounds H₂CO₃ less, a difference of 0.9 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.

- NLPS PAPER USE - CURRENT STATE produces 268 milligrams, equivalent to 66.9 compact fluorescent lights
- NLPS PAPER USE - FUTURE STATE produces 225 milligrams, equivalent to 56.2 compact fluorescent lights
- NLPS PAPER USE - FUTURE STATE produces 43 milligrams less, a difference of 10.7 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.

- NLPS PAPER USE - CURRENT STATE produces 23,600 micrograms
- NLPS PAPER USE - FUTURE STATE produces 19,800 micrograms
- NLPS PAPER USE - FUTURE STATE produces 3,800 micrograms less

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.
