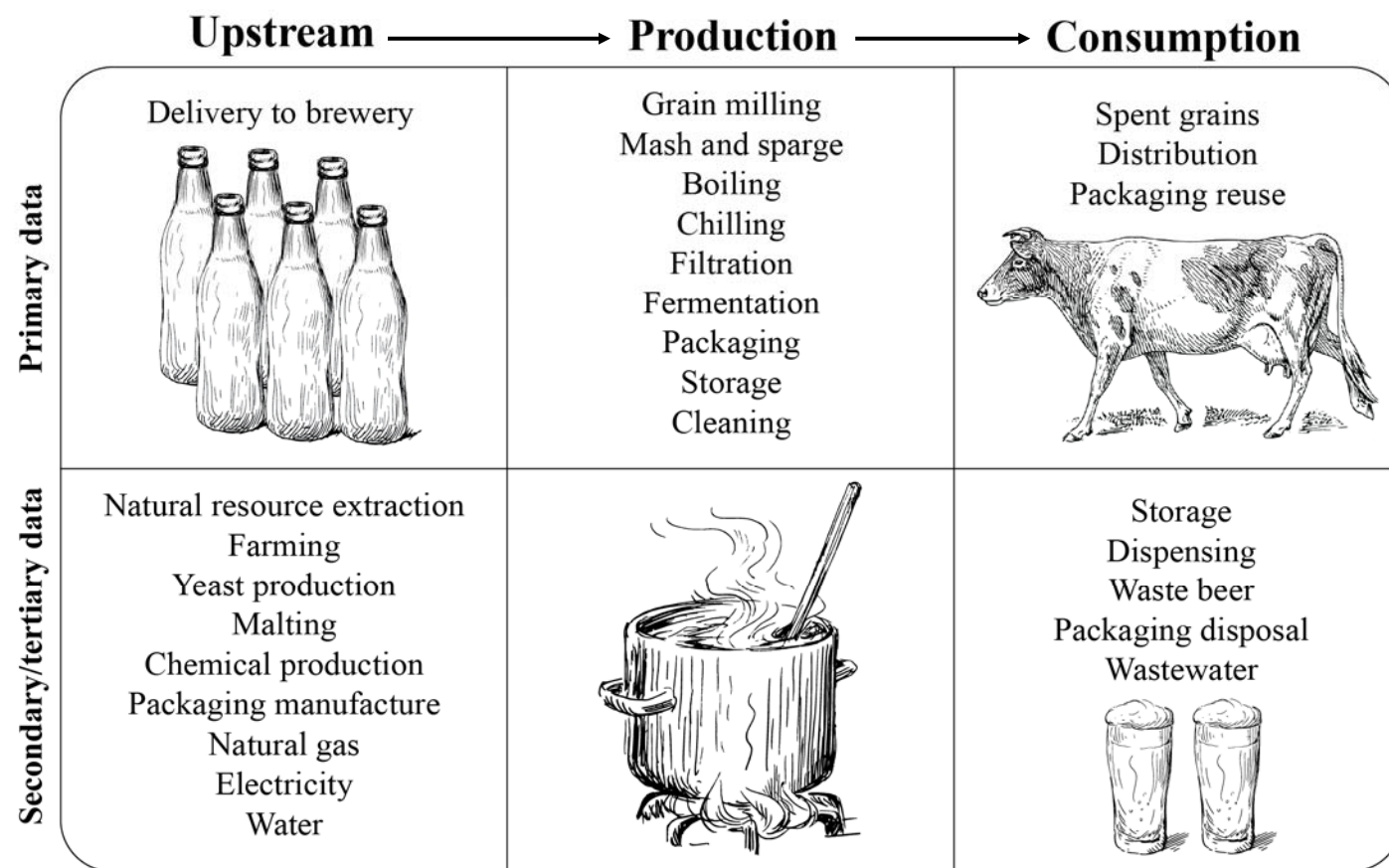


Life cycle environmental impacts of brewing

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Product Category Rule (PCR):

- defines which data is used in a life cycle analysis
- defines how the data is collected and reported

Life Cycle Assessment (LCA):

- analyzes the data specified in the PCR
- measures inputs, outputs, and environmental impacts of a product
- considers a product's lifespan from cradle to grave

Environmental Product Declaration (EPD)

- summarizes data collected in the LCA as specified by the PCR
- enables comparison of a category of products on environmental impacts
- can be verified by an independent third party



Carolina Wild Ale - This beer was made with a base of Heritage Malt, a 6-row malt from Riverbend Malt House (Asheville, NC), grown and malted in North Carolina. Flaked wheat, Vienna and Acid malts, and Cascade hops are used for flavor and body. Yeast from local nectarines, harvested and distributed by SouthYeast Labs (Clemson, SC), was used to produce its "wild" flavor.

Impacts per pint consumed

Category	Value	Units
Climate Change	1.3	kg CO ₂ eq
Eutrophication	1.2	g N eq
Water Use	51	liters
Land Use	0.4	m ² year
Ozone Depletion	25	µg CFC-11 eq
Photochemical Smog	31	g O ₃ eq
Acidification	0.35	g H ⁺ eq
Toxicity	2.7	CTUe

External reviewer Thomas Gloria. These results follow Earthsure Beer PCR 50202201:2012.

System boundaries (above) are defined by the PCR and include upstream, production, and consumption processes (columns).

Different data sources (rows) are used to generate the life cycle inventory for analysis incorporating primary data from the brewery, secondary data from other scientific studies, and tertiary data which is from aggregated studies (e.g. natural gas, electricity, wastewater treatment). **Impact categories (below)** are also defined in the PCR based on expected impacts from the production, distribution, and use of beer.

Impact Category	Model	Description
Climate change	IPCC	Result of anthropogenic emissions of heat-trapping greenhouse gases
Eutrophication	Redfield ratio	Overgrowth of biomass that results from release of nutrients, particularly nitrogen and phosphorus
Water use	Inventory	Consumptive freshwater use that is not returned to the watershed
Land use	Inventory	Land occupied for crop and wood/fiber production
Ozone depletion	Montreal Protocol	Reduction of upper atmospheric ozone caused by release of substances such as freons and halogenated compounds
Photochemical smog	TRACI	Produced when oxides of nitrogen and volatile organic substances are present in the atmosphere in the presence of sunlight
Acidification	Stoichiometric equivalents	Destruction of aquatic and terrestrial ecosystems from deposition of strong acids and ammonia
Toxicity	USEtox	Release of compounds toxic to aquatic and terrestrial organisms



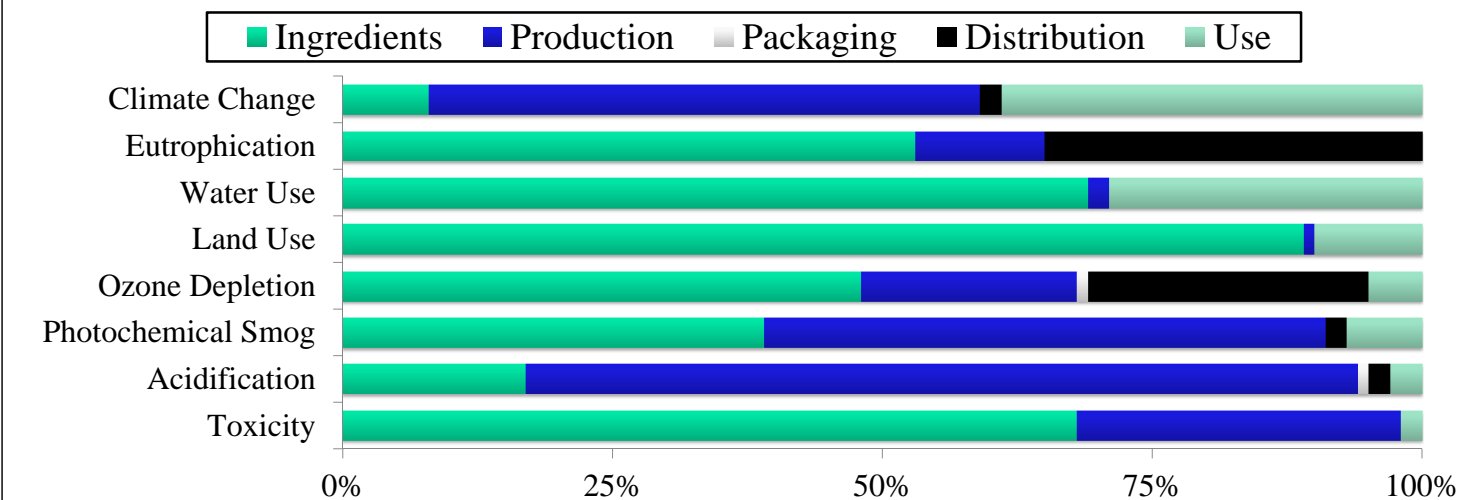
Earthsure® is the Ecolabel program of the Institute for Environmental Research and Education (IERE) and is the first EPD program in North America.

The Earthsure® Brewer project aims to demonstrate that EPDs can be affordable to everyone through a tiered pricing system based on annual production volume.

For more information, follow the QR code here or visit beer.iere.org



Contribution of each process to total impacts



The authors of this poster would like to thank Clemson University and the Creative Inquiry program for their support on this project.

