

2010 Manufacturing Energy and Carbon Footprints: Scope

The energy and carbon footprint analysis examines fifteen individual manufacturing sectors that together consume 95% of U.S. manufacturing primary energy consumption and account for 94% of U.S. manufacturing combustion greenhouse gas (GHG) emissions. Manufacturing sectors are defined by their respective NAICS (North American Industry Classification System) codes.ⁱ Individual sectors were selected for analysis based on their relative energy intensities, contribution to the U.S. economy, and importance to energy efficiency programs. NAICS code definitions of the sectors considered by this analysis are shown in Table 1 below and described in more detail in the subsequent pages of this document. A sixteenth footprint has also been prepared that shows energy consumption and GHG emissions of the entire U.S. manufacturing sector (NAICS 31 – 33) as a whole.

Table 1: NAICS Codes and Descriptions for Manufacturing Sectors

Manufacturing Sector	NAICS Code and NAICS Code Definition
All Manufacturing	NAICS 31 – 33 Entire Manufacturing Sector
Food and Beverage	NAICS 311 Food Manufacturing NAICS 312 Beverage and Tobacco Product Manufacturing
Textiles	NAICS 313 Textile Mills NAICS 314 Textile Product Mills NAICS 315 Apparel Manufacturing NAICS 316 Leather and Allied Product Manufacturing
Forest Products	NAICS 321 Wood Product Manufacturing NAICS 322 Paper Manufacturing
Petroleum Refining	NAICS 324110 Petroleum Refineries
Chemicals	NAICS 325 Chemical Manufacturing
Plastics and Rubber Products	NAICS 326 Plastics and Rubber Products Manufacturing
Glass and Glass Products	NAICS 3272 Glass and Glass Product Manufacturing NAICS 327993 Mineral Wool Manufacturing
Cement	NAICS 327310 Cement Manufacturing
Iron and Steel	NAICS 3311 Iron and Steel Mills and Ferroalloys NAICS 3312 Steel Product Manufacturing from Purchased Steel
Alumina and Aluminum	NAICS 3313 Alumina and Aluminum Production and Processing
Foundries	NAICS 3315 Foundries
Fabricated Metals	NAICS 332 Fabricated Metal Product Manufacturing
Machinery	NAICS 333 Machinery Manufacturing
Computers, Electronics, and Electrical Equipment	NAICS 334 Computer and Electronic Product Manufacturing NAICS 335 Electrical Equipment, Appliance, and Component Manufacturing
Transportation Equipment	NAICS 336 Transportation Equipment Manufacturing

ⁱ 2012 North American Industry Classification System, U.S. Census Bureau.
<http://www.census.gov/eos/www/naics/>.

NAICS Code Descriptions

31 – 33 Manufacturing Sector as a Whole

The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Establishments in the Manufacturing sector are often described as plants, facilities, factories, or mills and characteristically use power-driven machines and materials-handling equipment. However, establishments that transform materials or substances into new products by hand or in the worker's home and those engaged in selling products made on the same premises from which they are sold (such as bakeries, candy stores, and custom tailors) to the general public may also be included in this sector. Establishments in the Manufacturing sector may process materials or may contract with other establishments to process their materials for them.

311 – Food Manufacturing

Industries in the Food Manufacturing subsector transform livestock and agricultural products into products for intermediate or final consumption. The food products manufactured in these establishments are typically sold to wholesalers or retailers for distribution to consumers, but establishments primarily engaged in retailing bakery and candy products made on the premises not for immediate consumption are included.

312 – Beverage and Tobacco Product Manufacturing

Industries in the Beverage and Tobacco Product Manufacturing subsector manufacture beverages and tobacco products. Beverage Manufacturing includes three types of establishments: (1) those that manufacture nonalcoholic beverages; (2) those that manufacture alcoholic beverages through the fermentation process; and (3) those that produce distilled alcoholic beverages. Ice manufacturing is included with nonalcoholic beverage manufacturing because it uses the same production process as water purification. Tobacco Manufacturing includes two types of establishments: (1) those engaged in re-drying and stemming tobacco and, (2) those that manufacture tobacco products, such as cigarettes and cigars.

313 – Textile Mills

Industries in the Textile Mills subsector group transform a basic fiber (natural or synthetic) into a product, such as yarn or fabric that is further manufactured into usable items, such as apparel, sheets, towels, and textile bags for individual or industrial consumption. Further manufacturing may be performed in the same establishment and classified in this subsector, or it may be performed at a separate establishment and be classified elsewhere in manufacturing.

314 – Textile Product Mills

Industries in the Textile Product Mills subsector group make textile products (except apparel). With a few exceptions, processes used in these industries are generally cut and sew (i.e., purchasing fabric and cutting and sewing to make non-apparel textile products, such as sheets and towels).

315 – Apparel Manufacturing

Industries in the Apparel Manufacturing subsector group have two distinct manufacturing processes: (1) cut and sew (i.e., purchasing fabric and cutting and sewing to make a garment), and (2) the manufacture of garments in establishments that first knit fabric and then cut and sew the fabric into a garment. The Apparel Manufacturing subsector includes a diverse range of establishments manufacturing full lines of ready-to-wear apparel and custom apparel. Knitting, when done alone, is classified in the Textile Mills subsector, but when knitting is combined with the production of complete garments, the activity is classified in Apparel Manufacturing.

316 – Leather and Allied Product Manufacturing

Establishments in the Leather and Allied Product Manufacturing subsector transform hides into leather by tanning or curing and fabricating the leather into products for final consumption. It also includes the manufacture of similar products from other materials, including products (except apparel) made from "leather substitutes," such as rubber, plastics, or textiles. Rubber footwear, textile luggage, and plastic purses or wallets are examples of "leather substitute" products included in this group. The products made from leather substitutes are included in this subsector because they are made in similar ways leather products are made (e.g., luggage). They are made in the same establishments, so it is not practical to separate them.

321 – Wood Product Manufacturing

Industries in the Wood Product Manufacturing subsector manufacture wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured homes (i.e., mobile homes), and prefabricated wood buildings.

322 – Paper Manufacturing

Industries in the Paper Manufacturing subsector make pulp, paper, or converted paper products. The manufacturing of these products is grouped together because they constitute a series of vertically connected processes. More than one is often carried out in a single establishment.

324110 – Petroleum Refineries

This sector comprises establishments primarily engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following activities: (1) fractionation; (2) straight distillation of crude oil; and (3) cracking.

325 – Chemical Manufacturing

The Chemical Manufacturing sector is based on the transformation of organic and inorganic raw materials by a chemical process and the formulation of products. This sector distinguishes the production of basic chemicals that comprise the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry groups.

326 – Plastics and Rubber Products Manufacturing

Industries in the Plastics and Rubber Products Manufacturing sector make goods by processing plastics materials and raw rubber. Plastics and rubber are combined in the same sector because plastics are increasingly being used as a substitute for rubber; however the sector is generally restricted to the production of products made of just one material, either solely plastics or rubber.

3272 – Glass and Glass Product Manufacturing

This industry comprises establishments primarily engaged in manufacturing glass and/or glass products. Establishments in this industry may manufacture glass and/or glass products by melting silica sand or cullet, or purchasing glass.

327993 – Mineral Wool Manufacturing

This industry comprises establishments primarily engaged in manufacturing mineral wool and mineral wool (i.e., fiberglass) insulation products made of such siliceous materials as rock, slag, and glass, or combinations thereof.

327310 – Cement Manufacturing

This industry comprises establishments primarily engaged in manufacturing portland, natural, masonry, pozzolanic, and other hydraulic cements. Cement manufacturing establishments may calcine earths or mine, quarry, manufacture, or purchase lime.

3311 – Iron and Steel Mills and Ferroalloy Manufacturing

This industry comprises establishments primarily engaged in one or more of the following: (1) direct reduction of iron ore; (2) manufacturing pig iron in molten or solid form; (3) converting pig iron into steel; (4) manufacturing ferroalloys; (5) making steel; (6) making steel and manufacturing shapes (e.g., bar, plate, rod, sheet, strip, wire); and (7) making steel and forming pipe and tube.

3312 – Steel Product Manufacturing from Purchased Steel

This industry group comprises establishments primarily engaged in manufacturing iron and steel tube and pipe, drawing steel wire, and rolling or drawing shapes from purchased iron or steel.

3313 – Alumina and Aluminum Production and Processing

This industry comprises establishments primarily engaged in one or more of the following: (1) refining alumina; (2) making (i.e., the primary production) aluminum from alumina; (3) recovering aluminum from scrap or dross; (4) alloying purchased aluminum; and (5) manufacturing aluminum primary forms (e.g., bar, foil, pipe, plate, rod, sheet, tube, wire).

3315 – Foundries

This industry group comprises establishments primarily engaged in pouring molten metal into molds or dies to form castings. Foundries may perform operations, such as cleaning and deburring, on the castings they manufacture.

332 – Fabricated Metal Product Manufacturing

Industries in the Fabricated Metal Product Manufacturing sector transform metal into intermediate or end products. Important fabricated metal processes are forging, stamping, bending, forming, and machining, used to shape individual pieces of metal; and other processes, such as welding and assembling, used to join separate parts together. Establishments in this sector may use one of these processes or a combination of these processes.

333 – Machinery Manufacturing

Industries in the Machinery Manufacturing sector create end products that apply mechanical force. Some important processes for the manufacture of machinery are forging, stamping, bending, forming, and machining that are used to shape individual pieces of metal. Processes such as welding and assembling are used to join separate parts together. Although these processes are similar to those used in metal fabricating establishments, machinery manufacturing is different because it typically employs multiple metal forming processes in manufacturing the various parts of the machine. Moreover, complex assembly operations are an inherent part of the production process.

334 – Computer and Electronic Product Manufacturing

Industries in the Computer and Electronic Product Manufacturing subsector group manufacture computers, computer peripherals, communications equipment, and similar electronic products, as well as the components for such products.

335 – Electrical Equipment, Appliance, and Component Manufacturing

Industries in the Electrical Equipment, Appliance, and Component Manufacturing subsector manufacture products that generate, distribute, and use electrical power. Electric Lighting Equipment Manufacturing establishments produce electric lamp bulbs, lighting fixtures, and parts. Household Appliance Manufacturing establishments make both small and major electrical appliances and parts. Electrical Equipment Manufacturing establishments make goods, such as electric motors, generators, transformers, and switchgear apparatus. Other Component Manufacturing establishments make devices for storing electrical power (e.g., batteries) and for transmitting electricity (e.g., insulated wire), as well as wiring devices (e.g., electrical outlets, fuse boxes, and light switches).

336 – Transportation Equipment Manufacturing

Industries in the Transportation Equipment Manufacturing sector produce equipment for transporting people and goods. Transportation equipment is a type of machinery. An entire sector is devoted to this activity because of the significance of its economic size in all three North American countries.
