

Manufacturing Energy and Carbon Footprint Scope

The footprint analysis looks at a large subset of U.S. manufacturing, with the objective of capturing the bulk share of energy consumption and carbon emissions. Table 1 lists the fifteen manufacturing sectors selected for analysis; a sixteenth footprint has also been prepared for the entire manufacturing sector. Manufacturing sectors are listed by their respective NAICS (North American Industry Classification System) codes. NAICS descriptions of the specific products manufactured in each sector are provided below.

Manufacturing sectors were selected based on their relative energy-intensities, contribution to the economy, and relative importance to energy efficiency programs. Energy consumption and emissions for all manufacturing sectors within NAICS 31 – 33 are included in the overall manufacturing energy and carbon footprint.

Table 1: Selected Sectors

Manufacturing Sectors Selected for Study
Food and Beverage NAICS 311 Food NAICS 312 Beverage and Tobacco Products
Textiles NAICS 313 Textile Mills NAICS 314 Textile Product Mills NAICS 315 Apparel NAICS 316 Leather and Allied Products
Forest Products NAICS 321 Wood Products NAICS 322 Paper
Petroleum Refining NAICS 324110
Chemicals NAICS 325
Plastics and Rubber Products NAICS 326
Glass and Glass Products NAICS 3272 Glass and Glass Products NAICS 327993 Mineral Wool
Cement NAICS 327310
Iron and Steel NAICS 3311 Iron and Steel Mills and Ferroalloys NAICS 3312 Steel Products
Alumina and Aluminum NAICS 3313
Foundries NAICS 3315
Fabricated Metals NAICS 332
Machinery NAICS 333
Computers, Electronics, Electrical Equipment, and Appliances NAICS 334 Computer and Electronic Products NAICS 335 Electrical Equipment, Appliances, and Components
Transportation Equipment NAICS 336

Source: North American Industry Classification System, US Census Bureau, 2007

NAICS Descriptions

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 industry 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 subsector is based on the transformation of organic and inorganic raw materials by a chemical process and the formulation of products. This subsector 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 subsector make goods by processing plastics materials and raw rubber. Plastics and rubber are combined in the same subsector because plastics are increasingly being used as a substitute for rubber; however the subsector 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 subsector 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 subsector may use one of these processes or a combination of these processes.

333 – Machinery Manufacturing

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