Comparing Outdoor Furniture (1 of 3)

Plastic Resin Furniture Set

1. What are the basic raw material inputs necessary to produce polypropylene and other plastic resins?
    Crude oil and natural gas.

Aluminum Furniture Set

2. When processing aluminum, most of the emissions are the result of which step?
    Most emissions are the result of the energy-intensive process of producing pure aluminum from bauxite (not from the process of recycling aluminum scrap).

3. How many times can aluminum be recycled?
    If processed appropriately, aluminum can be recycled indefinitely.

Pine Furniture Set

4. When calculating emissions over time, why isn't the carbon dioxide emitted from wood burned for power during the manufacturing process included?
    Trees absorb CO_2 as they grow, and when a tree decomposes or burns, the carbon stored in the tree is released to the atmosphere in the form of CO_2. Over time, the CO_2 emitted to the atmosphere is consumed by new growing trees. This assumes that trees are not harvested faster than new ones can grow. Because this carbon cycle is balanced, it is typically not included when calculating CO_2 emissions over time.

Summary

5. Which furniture type would be best for your school? Why?
    In the context of global climate change, the wood set results in the least amount of greenhouse gases. Buying wood from the Southeast may also be desirable in order to support local economies.

6. If every school in your state purchased this type of outdoor furniture, what might the short and long-term impacts be?
    To answer this question, you can estimate how many sets of furniture might be needed to supply the all the schools in your state. From there, you can multiply that number to the savings in greenhouse gas emissions (from buying the pine set rather than the plastic or aluminum sets). This will provide the number of greenhouse gas emissions avoided statewide. Short-term impacts for schools in the Southeast may include a boost to local economies and a preservation of forests as forest owners opt to sustainably maintain their forests rather than shift to other means of income from their land. In the long term, reducing greenhouse gas emissions can help reduce the impacts of climate change worldwide.

✔ ANSWER KEY

Comparing Outdoor Furniture (2 of 3)

Greenhouse Gas Emissions Tables

Plastic Resin Set

Stage of Life Cycle	CO_2 Emissions (kg/set)	CH_4 Emissions (kg/set)	N_2O Emissions (kg/set)
Oil and Natural Gas Extraction	4.20	0.164	0.00000588
Refining Oil / Processing Natural Gas	6.87	0.0571	0.0000350
Manufacturing Polypropylene	32.4	0.427	0.000280
Manufacturing Plastic Furniture	15.6	0.0372	0.0000622
Use	0.00	0.00	0.00
Disposal	12.8	0.292	0.0000319
TOTAL EMISSIONS	71.9	0.977	0.000415

Cast Aluminum Set

Stage of Life Cycle	CO_2 Emissions (kg/set)	CH_4 Emissions (kg/set)	N_2O Emissions (kg/set)
Bauxite Mining (for ½ Primary Material)	10.1	0.00203	0.000221
Processing Aluminum (½ Primary and ½ Secondary)	187	0.302	0.266
Furniture Manufacturing	108	0.437	0.000113
Use	0.00	0.00	0.00
Disposal (Recycling Aluminum)	1.76	.0000299	.0000440
TOTAL EMISSIONS	306.86	0.7410599	0.266

Pine Set

Stage of Life Cycle	CO_2 Emissions (kg/set)	CH_4 Emissions (kg/set)	N_2O Emissions (kg/set)
Sustainable Wood Production	2.84	0.00245	0.0000352
Wood Processing—Lumber Production	5.96	0.0110	0.0000134
Pressure Treatment	6.17	0.0143	0.0000741
Furniture Manufacturing	5.24	0.00686	0.0000410
Use	4.25	0.00976	0.0000432
Disposal	24.6	1.63	0.0000733
TOTAL EMISSIONS	49.0	1.67	0.0002802

Comparing Outdoor Furniture (3 of 3)

Calculating the Global Warming Contribution of Greenhouse Gas Emissions

Gas	Emissions (kg)	Global Warming Potential (100-year period)	Carbon dioxide Equivalents (kg CO_2-eq)
Plastic Resin Set			
Carbon dioxide	71.9 kg	x 1	71.9 kg CO_2-eq
Methane	0.977 kg	x 25	24.4 kg CO_2-eq
Nitrous oxide	0.000415 kg	x 300	0.125 kg CO_2-eq
		TOTAL	96.4 kg CO_2-eq
Aluminum Set*			
Carbon dioxide	307 kg	x 1	307 kg CO_2-eq
Methane	0.740 kg	x 25	18.5 kg CO_2-eq
Nitrous oxide	0.266	x 300	79.8 kg CO_2-eq
		TOTAL	405 kg CO_2-eq
Pine Set			
Carbon dioxide	49.0 kg	x 1	49.0 kg CO_2-eq
Methane	1.67 kg	x 25	41.8 kg CO_2-eq
Nitrous oxide	0.000280 kg	x 300	0.0840 kg CO_2-eq
		TOTAL	90.8 kg CO_2-eq

*Without recycling, the total for aluminum furniture would be more than 600 kg CO_2-eq