

EcoHouse

Instructions for Educators



**New England
Aquarium**

Protecting the blue planet

EcoHouse

Materials

Digital scale and readout
(plugs in, needs outlet access
EcoHouse with accompanying
accessories:

- 1 metal oil tank (heavy!)
- 1 metal gas pipe
- 1 large electrical plug
- 1 magnetic solar panel
- 2 roofs
- 3 metal “trash cans”
- 2 wooden clothes dryers
- 2 wooden clothes washers
- 2 wooden refrigerators
- 8 metal windows

Table or other flat surface

Set Up

1. Plug in the scale and set it on the table.
2. Place the house on the scale, placing the digital readout so that visitors can see it. Use the Unit button on the scale to set it to kilograms (kg.)
3. Arrange the accessories on the table next to the house, pairing the choices together so that visitors can see all of their choices. (Optional: You may choose to hide some accessories to change the flow of the conversation.)

Do the Activity:

There are at least four ways to structure this activity. You may choose one, or let the visitor choose which path they wish to take.

1. Your house

- a. Ask visitors to choose the accessories they have in their own house. Do they use oil or gas heat? Do they have double-paned or single-paned windows? As they choose what is in their own house, have them place those objects in the EcoHouse.
- b. Note the kg reading on the scale. At this scale, each kilogram is equivalent to 5,000 lbs CO₂ produced per year.
- c. Ask visitors to swap out any accessories that they can see themselves changing: Could they get new windows? New insulation? Better appliances?
- d. Note the new reading on the scale.

2. Lightest house

- a. Ask visitors to choose the accessories that they think would make the house the lightest it can be: What are the ‘best’ options when it comes to appliances, insulation, etc.?
- b. Are there any surprises as they make these choices?

3. Heaviest house

- a. As visitors to choose the accessories that they think would make the house the heaviest it can be: What are the ‘worst’ options when it comes to appliances, heat, etc.? Are there any accessories that many families have two of?
- b. What one or two things could they change about this house to have the biggest impact on its weight?
(Hint: In the accompanying chart, there is a column for % of Total Change)

4. Simplified

- a. Preset the house with your preferred set of accessories—this can be the heaviest set, or a mix, but not the lightest set.
- b. What one or two things could they change about this house to have the biggest impact on its weight?
(Hint: in the accompanying chart, there is a column for % of Total Change)

Things to think about

I'm a renter. I don't have control over any of these things!

This activity can be a challenge for those who do not own their own home. You can still look at the impact window insulation (plastic-wrapping windows is not quite as good as double-paned, but close), recycling and compost (worm composting), and appliance use. (Is there a place to air-dry laundry? Do they use shared laundry facilities?) Also, their landlord may be open to suggestions, especially if utilities are included in rent—these modifications would save them money. Energy saving changes are also a selling point when looking for new renters.

We're not advocating replacing everything in your house.

A functioning appliance is an appliance to keep. The embodied energy (the energy needed to make and transport an object) of an appliance is fairly high—if the one you have works, keep using it. If, however, you are in the market for new appliances, try to get the most energy-efficient model you can find.

All my appliances are EnergyStar rated, so I'm all set, right?

The EnergyStar program has useful information, but you need to know how it works. An appliance receives the EnergyStar rating if it is in the top 20% for energy efficiency within its class of appliances. This means that different types of refrigerators are compared only within their type, not across type. For example, a side-by-side refrigerator can use as many as 100kwh/year more than a similarly-sized top-down refrigerator, but they would both have the EnergyStar rating. Use the kwh/yr numbers on the yellow tags on appliances at the store to compare. Or you can download spreadsheets of data from energystar.gov.

The data sheet is for your reference.

Educators may share the data in the data sheet with visitors, but that is not its goal. The goal is for you to be more familiar with the data behind the objects in the activity. Pay particular attention to the % Savings and % of Total Change columns. The % Savings column shows the percentage difference in CO₂ output between the heaviest and lightest options in that category. A complete switch from all of the heaviest options to all of the lightest options represents a savings of 18,140 pounds of CO₂ per year,

or 39% of the overall output of the house. The *% of Total Change* column shows what proportion of this change is represented by each object. For example, switching from a standard to a high-efficiency washer saves 66%, but only represents 1% of the overall savings. On the other hand, switching from oil heat to natural gas also saves 66%, but represents 36% of the overall savings.

Data Sources:

kWh to CO₂ Conversion Factor for MA:

Energy Information Administration
www.eia.gov/oiaf/1605/ee-factors.html

Appliances and Insulation:

EnergyStar
www.energystar.gov

Window U-Values:

National Fenestration Rating Council
www.nfrc.org

Solid Waste, Heat Source, and US Averages:

EPA Household Carbon Footprint Calculator
www.epa.gov/climatechange/ghgemissions/ind-calculator.html

Category	Object	lbs CO ₂	Weight (kg)*	% Savings	% of total change	Notes
Washer	Standard	370	0.08	66%	1%	Top load washers use more water and more energy. Most front load washers are also high efficiency in other ways.
	High-efficiency	125	0.05			
Refrigerator	Side-by-side	700	0.14	39%	2%	Side-by-side fridges with ice makers are inefficient overall, especially since the ice maker is essentially a hole in the front of the fridge.
	Top freezer	425	0.09			
Windows (all four)	Single pane	3300	0.68	20%	4%	You can have almost as much effect by doing weather stripping and good storm windows on existing single-pane windows.
	Double pane	2640	0.54			
Dryer	Standard	1280	0.26	80%	6%	There is no such thing as an EnergyStar dryer. The lighter dryer here has moisture sensor and is mostly replaced by line drying.
	High-efficiency + line dry	260	0.05			
Insulation	Standard	6600	1.34	20%	7%	Assume this house is insulated with the standard pink fiberglass (R19). Replace it with tighter, thicker closed-cell foam (R55).
	High density	5280	1.07			
Solid Waste	Trash only	3070	0.63	44%	12%	Trash and recycling have to be transported, and trash has to be either incinerated or put in a landfill.
	Trash and recycle	1725	0.36	48%		
	Trash, recycle and compost	900	0.18	71%		
Electricity Source	Grid	6000	1.21	99%	33%	This accounts for other appliances, lights, etc. Solar still has some CO ₂ impact, due to construction.
	Solar panel	50	0.01			
Heat	Oil	9800	1.99	66%	36%	Oil is inefficient and burns fairly 'dirty'. Natural gas has other issues (fracking, etc.), but it burns cleaner.
	Natural gas	3300	0.67			
House	House weight	15550	3.13			Brings the total closer to the US average.
High total		46670	12.15			*each gram (0.01 kg) equals 5 lbs CO ₂
Low total		28530	7.46	39%		