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Changing Household Behaviors to Curb Climate Change: How Hard Can it Be?

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The residential sector contributes over 20% of energy-related carbon dioxide emissions in the U.S.¹ In an *Environment* article published two years ago, Gardner and Stern² identified a *short list* of the 27 most effective actions U.S. households could take to decrease their contributions to climate change, suggesting that altering the selection and use of everyday technologies could reduce household energy consumption by nearly 30%. Examples include tuning up the car twice a year, replacing incandescent light bulbs with compact fluorescent bulbs (CFLs), and installing more efficient air conditioning and heating units.

Gardner and Stern noted several barriers to such actions: Renters usually cannot upgrade appliances, for example. They therefore suggested that individuals make the most effective action in each category (e.g., transportation) a priority if it is feasible and has not already been taken. We agree with this approach, which leads people to those actions with the greatest savings potential for them specifically. However, knowing more about people's perceptions of the ease or difficulty of implementing the short-list actions would be helpful for designing information campaigns, incentives, and other efforts to reduce household energy consumption.

As part of a recent national survey on public perceptions of energy consumption and savings³, we asked 505 participants to rate how difficult it would be for them to implement 15 of Gardner and Stern's 27 actions. We omitted 12 other actions because of their specificity (e.g., "Purchase (or trade [for]) 52" Projection HD TV instead of a 48" Plasma HD TV"). Our question, which was adapted from self-efficacy research in other domains⁴, stated: "Please indicate how easy or hard it would be for you to make each of

the following changes. Please consider all aspects of the changes, including the physical or mental effort required, the time or hassle involved, and any relevant monetary costs." The response scale ranged from 1 ("extremely easy") to 7 ("extremely hard"). Participants were also told, "If you already engage in the activity please check the option on the far left," which was labeled "Do it already."

Table 1 lists the 15 actions, starting with those rated as least difficult. All actions were rated as relatively easy, with means significantly below the scale midpoint ("neither easy or hard"), all $ps < 0.05$. The percentage of participants indicating that they "Do it already" ranged from 24.4% (for carpooling) to 51.7% (getting recommended car tune-ups), with several percentages being higher than expected (e.g., 42.0% indicated that they had already replaced 85% of their light bulbs with CFLs). The low difficulty ratings and high implementation rates may reflect a selection bias in our sample (e.g., more respondents with pro-environmental attitudes) or a desirability bias in their reporting.¹ Yet, across the 15 actions, fewer participants reported having taken actions that were perceived as more difficult, $r(13) = -0.79$, $p < 0.001$, suggesting that both measures yield valid information regarding relative difficulty. Despite this correlation, some actions perceived as easy had relatively low adoption rates (e.g., adjusting refrigerator and freezer thermostats), implying opportunities for low-effort energy savings.

In Figure 1, the percentages of household energy saved by these actions² are plotted against mean difficulty ratings. Among actions rated as relatively easy (black symbols), the most energy would be saved by replacing incandescent bulbs with CFLs and by getting recommended car tune-ups (though this does not mean that other actions should be neglected). Figure 1 also indicates that actions saving similar amounts of energy differ in perceived difficulty. For example, carpooling with one other person saves about as much energy as tuning one's car, but the former action is substantially more difficult. Similarly, turning down one's thermostat in winter (easy) saves roughly as much energy as upgrading to a more efficient heating unit or upgrading to insulated windows (more difficult). Reducing the washing



Carpooling with one other person saves about as much energy as tuning one's car, but the former action is substantially more difficult.

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Over 49% reported changing washer temperature settings from "hot wash, warm rinse" to "warm wash, cold rinse."

Action from the short list	Mean difficulty rating*	Percentage who "Do it already"
Replacing two 100-watt kitchen bulbs with 75-watt bulbs	2.18	49.1
Turning up the refrigerator thermostat from 33° F to 38° F and the freezer thermostat from -5° F to 0° F	2.27	33.7
Replacing 85% of all incandescent bulbs with equally bright compact fluorescent bulbs	2.30	42.0
Changing washer temperature settings from "hot wash, warm rinse" to "warm wash, cold rinse"	2.33	49.5
Getting recommended car tune-ups (including air filter changes)	2.46	51.7
Cutting highway speed from 70 mph to 60 mph	2.48	32.2
In the winter: turning down thermostat from 72° F to 68° F during the day and to 65° F during the night	2.63	48.9
In the summer: turning up the air conditioner thermostat from 73° F to 78° F	2.71	45.1
Watching 25% fewer hours of TV each day	2.95	29.1
Replacing poorly insulated windows with highly insulated windows	3.55	26.1
Carpooling with one other person to work	3.62	24.4
Installing a more efficient washer (replace a 2001 or older non-Energy Star washer with a new Energy Star unit)	3.62	30.1
Installing a more efficient heating unit (92% efficient)	3.63	25.7
Buying a more fuel efficient automobile (31 vs. 20 mpg)	3.64	30.5
Drying clothes on a clothes line (not using the dryer) 5 months of the year	3.73	25.9

*Difficulty ratings are from participants who did not report that they had already taken the action. Means that differ by more than 0.21 are significantly different at $p < 0.05$ by paired t tests.

Table 1. Mean difficulty ratings (ordered from least to most difficult) and percentages of participants reporting that they "Do it already" for 15 energy-saving actions from Gardner and Stern's short list.

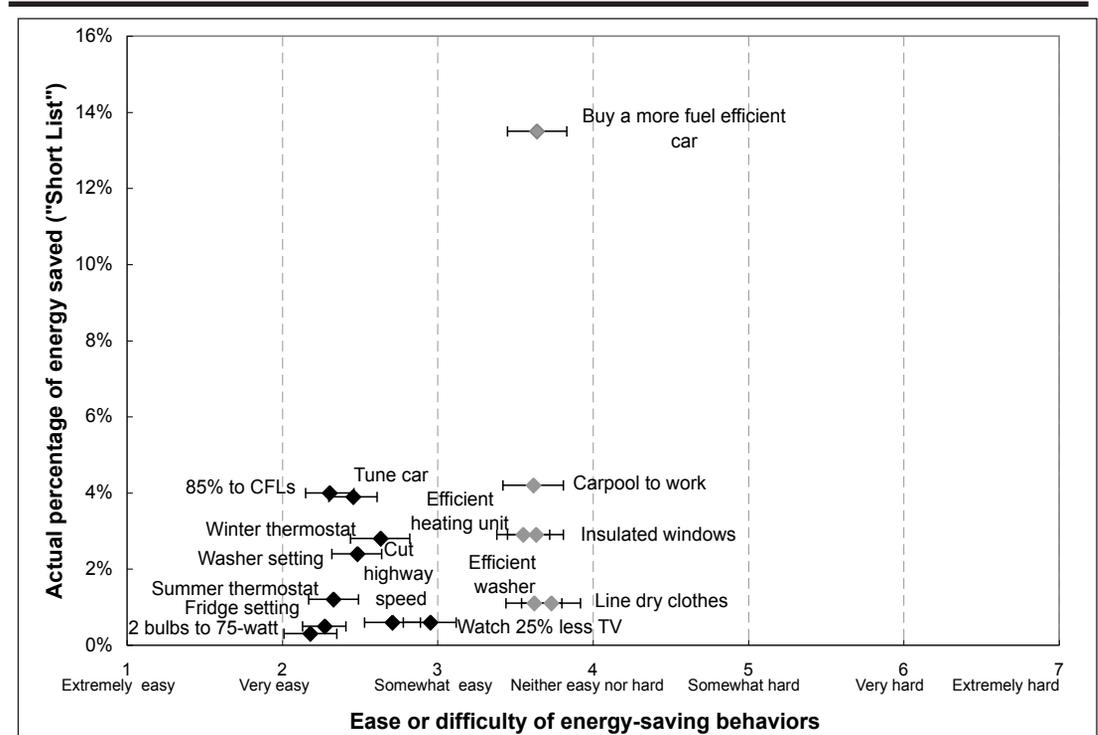


Figure 1. Actual household energy savings versus the perceived ease or difficulty of implementing 15 actions from Gardner and Stern's short list. Error bars indicate 95% confidence intervals for mean perceptions. Symbols in black represent mean scores from 2-3; those in grey represent mean scores from 3-4.

machine's temperature settings (easy) saves slightly more energy than upgrading to a more efficient washer or line-drying clothes for five months of the year (more difficult).

Campaigns targeting energy-saving actions that are both effective and easy to implement may help people to identify and harvest the "low-hanging fruit"⁵ for decreasing household energy consumption.⁶ While such efforts are greatly facilitated by simple, well-organized effectiveness information like that in Gardner and Stern's short list,² our results suggest that the design of energy-conservation programs would also benefit from a better understanding of perceived barriers to action.

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Reducing the washing machine's temperature settings (easy) saves slightly more energy than upgrading to a more efficient washer or line-drying clothes for five months of the year (more difficult).