



Nudging consumers
towards energy efficiency
through behavioural science

NUDGING

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WHAT IS 'NUDGING'?

1. Definition

'To nudge' is an English word and means 'to gently nudge, push, shove or figuratively nudge' [1].

The term is used in behavioural economics. A 'nudge' is something that helps people so they can make better choices for themselves without affecting their freedom of choice. This can be a small feature in the environment that attracts attention and influences behaviour. A 'nudge' can be either good or bad. [2]

There can be different ways to influence behaviour: [3]

1. facilitate the desired behaviour: by reducing physical or mental effort, e.g. by making information available, making something more accessible

e.g. the stairs in a building in a central location are laid out very visibly and the lifts are placed in the back.

2. confronting people with the (positive or negative) consequences of actions

e.g. A sign on the lifts reads 'Burn calories, no electricity. Take the stairs!' [4]

3. social influence: other people can influence your choice

e.g. If a game gets a lot of 'likes', you will be more likely to be convinced to play this game.

4. reinforcing/rewarding the desired behaviour

e.g. A supermarket gives one vegetable for free when you buy at least 5 types of vegetables.

5. create fear

e.g. With the 'Warm Alarm' campaign, a red line at a height of 2 metres was placed on several public buildings (e.g. the Stadsschouwburg in Leuven) pointing out the danger of rising sea levels.

6. misleading: e.g. by optical illusions, giving information that is not quite correct, ...

e.g. An energy company advertises that you will pay back the purchase of a home battery in three to five years, when in reality the payback period is much longer. [5]

You can read about five strategies against litter on the following website:

<https://shorturl.at/oHPQW>

What other ways are mentioned here to influence behaviour?

For behavioural change, 7 E's are important: these are shown in the 7E model in Figure 1.

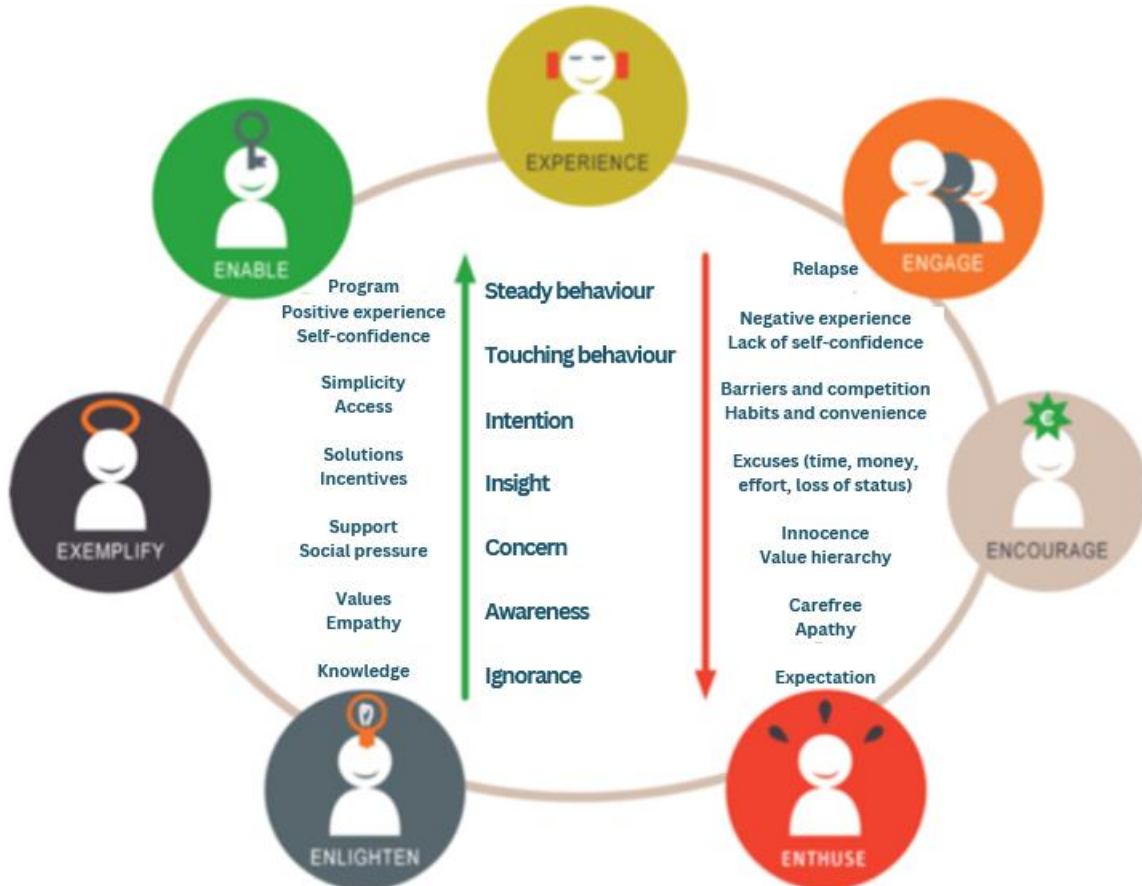


Figure 1: The 7 Es to change behaviour [6]

Look up what the 7 E's mean in English and note the meaning.

Read the following examples where people tried to encourage environmentally responsible behaviour through 'nudging'. Note which way(s) of influencing was used here and indicate in colour which examples would help you change your behaviour.

- A supermarket lowers the price of healthy food and raises the price of unhealthy food.

- In EnergielD, you can find out how much electricity and gas you consume daily/weekly/monthly.

- One can buy solar panels together with the neighbourhood through group purchases.

- With an app, you can check how much electricity your solar panels generate at any time of the day. So you can adjust your consumption of electricity accordingly.

- Flanders launched a simulator to calculate the payback time of a home battery online.

- A counter records how many cars passed a street each day.

- A city provides bike-suggestion lanes for cyclists.

- A city gives free bus passes to its residents.

- A city ensures that all places can be easily reached by bus or tram.

Do you know of any examples of a 'nudge' yourself that you have encountered in everyday life? What way was used to convince people?

2. Nudging energy consumption

In Figure 2, read the summary of the research carried out in Flanders as part of the Nudge project [7].



Flemish people weigh comfort against energy savings

An article by [Stephanie Van Hove](#) and [Peter Conradie](#), imec

For months, rising energy prices have been the concern of everyone who pays an energy bill. In response, we have been overwhelmed in recent weeks with articles that suggest possible strategies for saving energy, because 'the cheapest kilowatt hour is the one that was not consumed'. People are encouraged to save energy by lowering the temperature of the gas boiler to nip their dormant consumption in the bud.

But how many of these strategies are already part of the Flemish people's savings palette? The imec/UGent research group mict took a closer look. Within the European NUDGE project, they are charting the digital and sustainable behavior of Flemings with the ultimate goal of facilitating sustainable behavioral change. This project specifically focuses on energy savings within the home that are repeatedly undertaken, such as turning down the heating or using the eco-program on the washing machine. A survey among 1133 Flemings, conducted in the spring of 2021, shows that a number of savings are already regular habits. Actions such as turning off the lights, closing windows, not leaving water running, turning off the TV when no one is looking and preferring showering to bathing are behaviors that 6 out of 10 respondents always undertake. In terms of sustainable behavior, the Flemish are certainly not at their wits end.

The results did show that people make a trade-off between comfort and saving. If energy saving means that the heating has to be one degree lower or that the water in the shower feels a bit more lukewarm, then people are quick to adapt. The results show that people initially try to go energy-wise, for example by closing the windows (91.9% often/always) or closing off unheated rooms from heated ones in winter

(83.7% often/always). Only after that do people consider saving energy, but preferably with as little loss of comfort as possible. For example, 16.5% of households rarely or never turn down the thermostat, 22.8% rarely or never wear an extra layer of clothes in exchange for a cooler room temperature, and 54% rarely or never lower the boiler temperature. An extra thick sweater or one less shower? The Fleming is quick to decline when his comfort is compromised.

Moreover, the actions that are undertaken most frequently do not immediately result in the greatest energy savings. More than 9 out of 10 respondents usually or always turn off the lights when leaving the room, which is the most energy-saving action undertaken. While nearly 1 in 3 of those surveyed rarely or never turn off appliances completely to reduce standby consumption. Previous research by the Columbia University (NY) has already shown that people overestimate energy actions with a low savings potential, such as turning off the lights. Saving energy therefore requires a profound attitude and behavioral change from the citizen. One that cannot be achieved overnight.

These findings point to the potential of energy savings and are an ideal breeding ground for future behavioral interventions. Here, nudging is often suggested as a potential cost-effective solution. Nudging makes choices that are positive for the end consumer and/or society easier. By displaying options more attractive or easier without excluding alternatives, the final responsibility remains with the end user. In the case of energy consumption, info about the energy behavior of neighbors or a

default saving program within an energy app can have a positive effect on the saving behavior of the user. In the midst of an energy crisis, it is therefore more interesting to endorse alternative ways of saving energy than hoping for a lower energy bill.

Stephanie Van Hove and Peter Conradie are both researchers at the imec-mict-UGent research group and involved in the European NUDGE project.

The results of this research have been published in a research report: <https://www.nudgeproject.eu/report-profiling-of-energy-consumers-psychological-and-contextual-factors-of-energy-behavior/>

Figure 2: Nudge project article summary [7]

Which three strategies are commonly used in Flanders to save energy according to this article?

Do these three strategies deliver a lot of savings? Why or why not?

Which three savings measures do you think are the most effective? For each measure, invent a way to encourage your family and friends to change their behaviour (i.e. a nudge).

Which nudges are effective for low-income people to reduce their energy consumption?

Some studies tried to divide energy consumers into different groups/profiles, each displaying different behaviour.

In the Nudge project, six profiles of energy consumers were defined based on a questionnaire survey (see Figure 3).

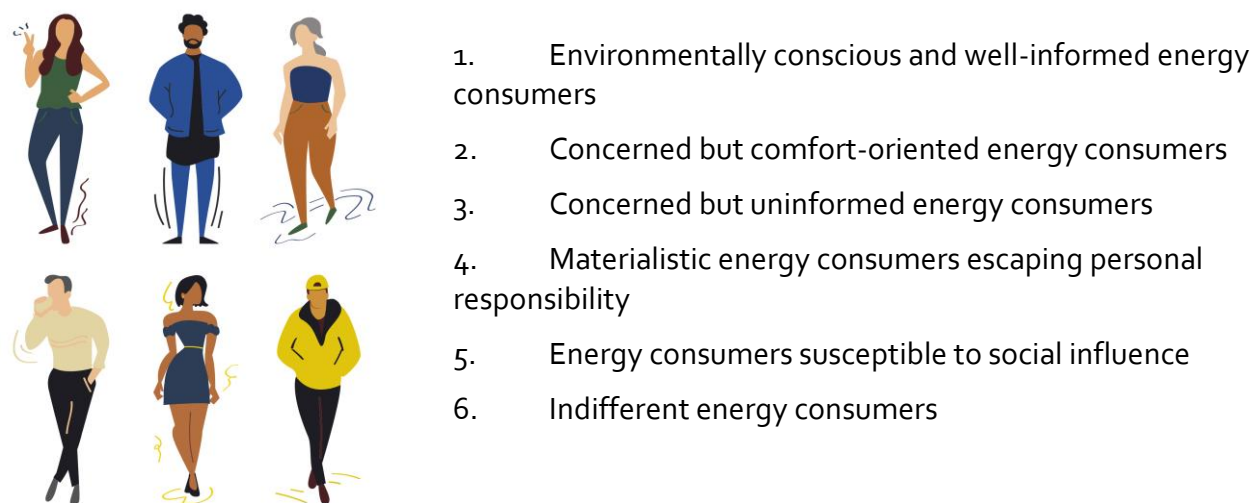


Figure 3: Six profiles of energy consumers [8]

How do you feel about energy and energy conservation? Which category do you think you belong to?

And your family members?

Think about which nudge(s) from p.3 would work best for each profile (see p.8) and fill in the table.

Profile	Most effective nudge(s)
1.	
2.	
3.	
4.	
5.	
6.	

ENERGY QUIZ

To be aware of energy consumption, it is important to be well informed and to know your own energy consumption well.

With a quiz in which you made many questions during the past lessons by yourselves, we will check what you have remembered about the previous lessons on the topics of heating, electricity and water.

Complete the following quiz questions (per group).

1. HEATING

What was the first natural source of energy?

- A. Electricity
- B. Sun
- C. Gas
- D. Wind

Which heat source used to heat houses in Belgium, but not any more?

- A. Natural gas
- B. Fuel oil
- C. Peat
- D. Wood

What is stagnation?

- A. Almost no economic growth
- B. Product prices rise, but wages do not.
- C. A synonym for an oil crisis
- D. A lot of economic growth

Which energy source do most people in Belgium use to heat their homes today?

- A. Fuel oil
- B. Wood
- C. Electricity
- D. Natural gas

What percentage of Flemish households' heaters operate on natural gas?

- A. 28%
- B. 48%
- C. 68%
- D. 88%

After natural gas, which type of energy source is the second most frequent heating method in Belgium?

- A. Heat pump
- B. Wood

- C. Electricity
- D. Fuel oil

What percentage of the Flemish population uses pellets for heating?

- A. 2%
- B. 5%
- C. 8%
- D. 10%

What is the average gas consumption of an average family (heating its home and water with gas) per year?

- A. 2 300 kWh
- B. 4 600 kWh
- C. 23 300 kWh
- D. 34 900 kWh

Which month on average consumes the most gas?

- A. May
- B. April
- C. January
- D. October

Which savings measure is most effective in reducing your gas consumption?

- A. Cook with a lid on your pot to avoid losing heat.
- B. Turn your thermostat down one degree during the day.
- C. Install an economy shower head.
- D. Set your thermostat to 15°C one hour before you go to sleep.

2.ELECTRICITY

What is the power of a device?

- A. It is how much capacity the appliance can hold.
- B. That is how long this appliance can last.
- C. That is the amount of energy consumed per unit of time.
- D. That is the amount of energy an appliance has to absorb before it can work.

In which unit is the consumption of electricity expressed on your bill?

- A. kilowatt hour
- B. kilowatt
- C. degrees Celsius
- D. joules

What is 1 kWh?

- A. Consuming 10 watts for one hour.
- B. Consuming 50 watts during one hour.
- C. During one hour consume 100 watts.
- D. During one hour consume 1000 watts.

On average, how much electricity does a refrigerator consume to run for one day?

- A. 2 watt-hours
- B. 2 kilowatt hours
- C. 2 megawatt hours
- D. 2 gigawatt hours

Which uses the most electricity for 2 hours?

- A. Charging a laptop
- B. Charging a smartphone
- C. Watching television
- D. Running a refrigerator

Which appliance uses the most electricity to work for 2 hours?

- A. A washing machine
- B. An LED desk lamp
- C. A dryer
- D. A computer

What can't you do with 1 kWh?

- A. Use your mobile phone for 4 months
- B. Watch 3 to 5 hours of television
- C. Driving an electric car for 10 km
- D. Working on a laptop for half a day

Which appliance uses the most electricity on average every year?

- A. Washing machine

- B. Boiler
- C. Oven
- D. Refrigerator

Approximately how many kWh does an average family consume per year?

- A. 1 600 kWh
- B. 3 500 kWh
- C. 3 900 kWh
- D. 4 100 kWh

Which way do you use the most energy to heat up one litre of water: on an electric hob of e.g. 2000 W, with a kettle of e.g. 2200 W or with a microwave oven of e.g. 1000 W?

- A. Hotplate
- B. Kettle
- C. Microwave oven
- D. About the same amount for all three

What is the voltage at a socket in your house?

- A. 70 V
- B. 230 V
- C. 36 kV
- D. 70 kV

How many kilowatt hours is 1 terawatt hour?

- A. 1 000
- B. 1 000 000
- C. 1 000 000 000
- D. 1 000 000 000 000

Approximately what percentage of electricity in Belgium has come from renewable energy sources in recent years?

- A. 10%
- B. 20%
- C. 30%
- D. 40%

Rank the following electricity sources according to the amount of electricity they generate in Belgium (from many to few):

- A. Nuclear power plants, offshore wind turbines, onshore wind turbines, gas power plants, solar panels
- B. Nuclear power stations, gas power stations, offshore wind turbines, solar panels, onshore wind turbines
- C. Nuclear power plants, solar panels, offshore wind turbines, onshore wind turbines, gas power plants
- D. Nuclear power plants, gas power plants, offshore wind turbines, onshore wind turbines, solar panels

3. WATER

On average, how many litres of water do you use per person per day for cooking?

- A. 10 litres
- B. 50 litres
- C. 200 litres
- D. 3 litres

Which appliance consumes the most water per year?

- A. Toilet
- B. Washing machine
- C. Dishwasher
- D. Shower

If you display water consumption by domicile in a graph, what does the graph look like?

- A. The graph rises.
- B. The graph decreases.
- C. The graph remains constant.
- D. The graph fluctuates.

Which is the best way to save water?

- A. Catch water in the shower and use it e.g. to flush your toilet.
- B. Install a water-saving shower head.
- C. Connect your toilets to rainwater.
- D. Put a bottle in the sink of your toilet.

Approximately how much water does washing dishes by hand consume?

- A. 3 t.e.m. 5 l
- B. 8 t.e.m. 10 l
- C. 15 t.e.m. 20 l
- D. 25 t.e.m. 30 l

CLIMATE IMPACT

Greenhouse gases trap heat around the earth. As a result, the earth's temperature rises. Figure 4 shows the four main greenhouse gases (produced by human activities) that were emitted the most in 2020.

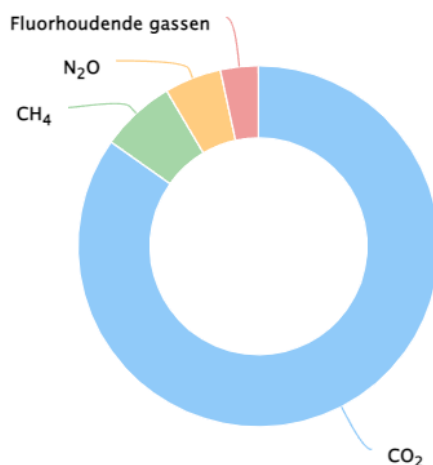


Figure 4: Distribution of different greenhouse gases in the year 2020 [9]

List the four greenhouse gases in order of occurrence. Find an example for each greenhouse gas on the Internet.

1. _____
2. _____
3. _____
4. _____

Since CO₂ is the main greenhouse gas in Belgium as you can see in Figure 4, we will now look further into these CO₂ emissions.

To know what impact we have on our climate, you can calculate your CO₂ footprint. This carbon footprint is the calculation of the total greenhouse gas emissions by, for example, a person or an organisation, expressed in carbon dioxide equivalent. It cannot be calculated exactly because there is too little knowledge and data on how different processes affect each other. Therefore, an estimate is made. [10]

In your family energy bill, you will find an estimate of your household's CO₂ emissions based on your data of electricity and ev. gas of your household, expressed in kilograms of CO₂ emissions. How much do they amount to?

If both gas and electricity were registered, you can also find out how many kilograms of CO₂ were emitted for gas and electricity respectively. For your household, what is the ratio of gas and electricity to your total CO₂ emissions?

What else determines your carbon footprint that was not included in your energy bill?

How can we estimate this impact?

What is your estimated total carbon footprint expressed in kilograms? Compare this with your classmates.

The low impact human aims for an ecological footprint of 1.6 (1.7/1.8 according to other sources) hectares: that is the area to which every earthling is entitled.

Humans cannot use every part of the earth. What else needs to be taken into account?

If you divided the entire surface of the earth by the number of inhabitants, how many hectares could each person use?

The average Belgian has an ecological footprint of about 5.6 ha (other sources say 7 ha). If everyone in the world lived like this, we would need 3 planets of earth to live like this.

Calculate your family's ecological footprint online using the following two tests:

- <https://footprint.wwf.org.uk/questionnaire>
- <https://www.footprintcalculator.org/home/en>

How big is your ecological footprint?

- WWF-test: _____
- Test Footprint calculator: _____

For each test, note the factors that are taken into account in these calculations of your carbon footprint and indicate which factors you scored below average.

WWF	Footprint calculator

What tips do you see feasible to apply to improve your carbon footprint?

OUR FUTURE?

What would you like our country to look like in 2050? What will be different from today?

Natuurpunt also considered this issue together with lots of people from inside and outside Natuurpunt. See their visions of the future in the following film (put English subtitles in the settings):

<https://www.youtube.com/watch?v=kaISVgta8Yc>

Do you think these proposals from the film are feasible? Why or why not?

To take good care of our planet, we all need to do our bit to reduce CO₂ emissions.

In the past lessons, you formulated quite a few actions yourself to change your gas, electricity and water consumption. Which actions do you definitely want to continue doing in the future? Which actions can you make a habit of?

Good luck!

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