Sobriety

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What are we talking about?

Four options to reduce CO_2 emissions (neither independent nor causally linked): lowering

- the size of the population
- the growth of GDP per capita
- the energy intensity of GDP

$\rightarrow$ { supply side: changing production methods towards a circular economy, recycling, adopting energy-saving technologies, innovating to produce more energy-efficient goods, etc.
demand side: changing behaviors

- the carbon intensity of energy $\rightarrow$ energy transition

- Progress at the global level is mostly due to energy-saving technical progress and, for a small part, to decarbonization of electricity production.
- Progress too limited and too slow.

$\rightarrow$ Recently, the emphasis has been put on reducing demand.

- What demand?
  - global demand $\rightarrow$ degrowth
  - demand for GHG-emitting goods $\rightarrow$ change in the composition of demand.
- Second option better, but not easy to achieve: strong path dependency, addiction to fossils.
- Moreover it may not be enough:
  - debate about the level of sustainable consumption: what is sustainable? what is "too much"? (Arrow et al., 2004)
  - planetary boundaries (Röckstrom et al., 2009)
  - the relevant metrics is welfare, not consumption.

- Reducing demand / changing the composition of demand can be achieved by price policies or it can be voluntary.
- Price policies favored by economists, but only by economists. Acceptability issue. Gilets jaunes.
- I define "sobriety" as the voluntary reduction of demand for carbon-emitting goods.
- I focus first on defining voluntary behavioural changes and their determinants at the individual level.
- I then consider the societal dimension of sobriety.

Changes in preferences at the individual level

Behavioural changes

- IEA (2021): "changes in ongoing or repeated behaviour on the part of consumers which impact energy service demand or the energy intensity of an energy related activity."

$\rightarrow$ adopts the view of a change in the composition of demand.

- 3 main types of behavioural changes:
  1. Reducing excessive or wasteful energy use;
  2. Transport mode switching (shift from car to cycling, walking, ridesharing or taking buses, replacing regional air travel by high-speed rail where feasible);
  3. Making materials efficiency gains, through e.g. higher rates of recycling or improved design and construction of buildings and vehicles.

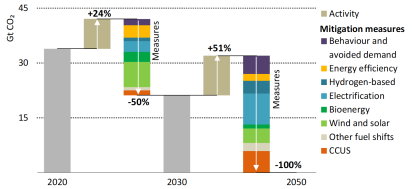
$\rightarrow$ Frontier between behavioural change, technical innovation, infrastructure development and social organization fuzzy.

Table 2.4 ▷ **Key global milestones for behavioural change in the NZE**

Sector	Year	Milestone
Industry	2020	• Global average plastics collection rate = 17%.
	2030	• Global average plastics collection rate = 27%. • Lightweighting reduces the weight of an average passenger car by 10%.
	2050	• Global average plastics collection rate = 54%. • Efficiency of fertiliser use improved by 10%.
Transport	2030	• Eco-driving and motorway speed limits of 100 km/h introduced. • Use of ICE cars phased out in large cities.
	2050	• Regional flights are shifted to high-speed rail where feasible. • Business and long-haul leisure air travel does not exceed 2019 levels.
Buildings	2030	• Space heating temperatures moderated to 19-20 °C on average. • Space cooling temperatures moderated to 24-25°C on average. • Excessive hot-water temperatures reduced.
	2050	• Use of energy-intensive materials per unit of floor area decreases by 30%. • Building lifetime extended by 20% on average.

Note: Eco-driving involves pre-emptive stopping and starting; ICE = internal combustion engine.

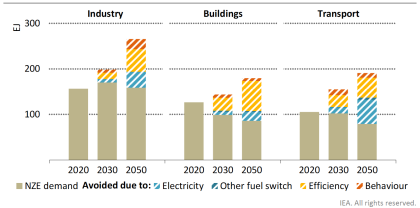
Figure 2.12 ▷ Emissions reductions by mitigation measure in the NZE, 2020-2050



Solar, wind and energy efficiency deliver around half of emissions reductions to 2030 in the NZE, while electrification, CCUS and hydrogen ramp up thereafter

Notes: Activity = energy service demand changes from economic and population growth. Behaviour = energy service demand changes from user decisions, e.g. changing heating temperatures. Avoided demand = energy service demand changes from technology developments, e.g. digitalisation. Other fuel shifts = switching from coal and oil to natural gas, nuclear, hydropower, geothermal, concentrating solar power or marine.

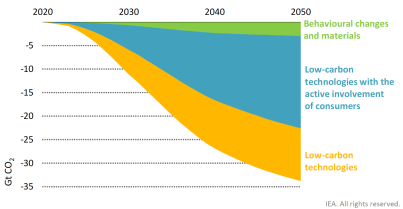
Figure 2.13 ▷ Total final consumption and demand avoided by mitigation measure in the NZE



Energy efficiency plays a key role in reducing energy consumption across end-use sectors

Notes: Other fuel switch includes switching to hydrogen-related fuels, bioenergy, solar thermal, geothermal, or district heat.

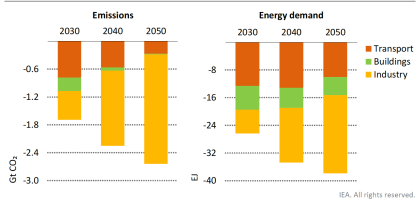
Figure 2.14 ▷ Role of technology and behavioural change in emissions reductions in the NZE



Around 8% of emissions reductions stem from behavioural changes and materials efficiency

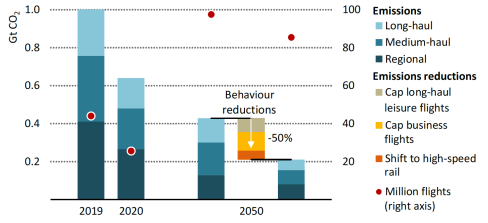
Notes: Low-carbon technologies include low-carbon electricity generation, low-carbon gases in end-uses and biofuels. Low-carbon technologies with the active involvement of citizens includes fuel switching, electrification and efficiency gains in end-uses. Behavioural changes and materials efficiency includes transport mode switching, curbing excessive or wasteful energy use, and materials efficiency measures.

Figure 2.15 ▷ CO_2 emissions and energy demand reductions from behavioural changes and materials efficiency in the NZE



By 2030, behaviour changes and materials efficiency gains reduce emissions by 1.7 Gt CO_2, and energy demand by 27 EJ; reductions increase further through to 2050

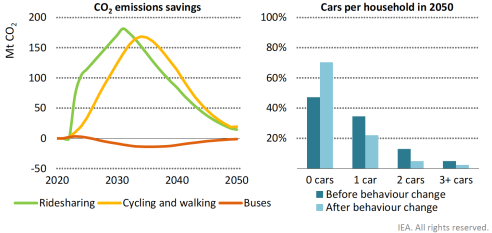
Figure 2.25 ▷ Global CO_2 emissions from aviation and impact of behavioural changes in the NZE



Demand for passenger aviation is set to grow significantly by 2050, but behavioural changes reduce emissions by 50% in 2050 despite reducing flights by only 12%

Notes: Long-haul = more than 6 hour flight; medium-haul = 1-6 hour flight; regional = less than 1 hour. Business flights = trips for work purposes; leisure flights = trips for leisure purposes. Average speeds vary by flight distance and range from 680-750 km/h.

Figure 2.26 ▷ Global CO_2 emissions savings and car ownership per household due to behavioural change in the NZE

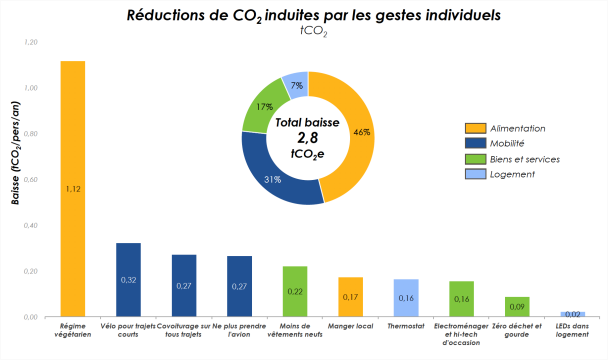


Policies discouraging car use in cities lead to rapid reductions in CO_2 emissions and lower car ownership levels, though the impact diminishes over time as cars are electrified

- IPCC, 2022 (6th assessment report, WG III, chapter 5) evaluates the potential of reduction in demand for reducing global GHG emissions in the end-use sectors at 40–70% by 2050 compared to reference scenario (Creutzig et al., 2022).
- The reduction in demand considered wider than behavioural changes:

  Avoid – Shift – Improve

  - Avoid involves giving up some very carbon-emitting consumptions (e.g. abandoning long-haul flights and living car-free).
  - Shift involves adopting less carbon-intensive modes of consumption, like cycling or plant-based diet.
  - Improve corresponds roughly to changing households equipments (adopting green innovations like heat pump or electric vehicle), which IEA (2021) does not consider as a behavioural change.



The impact of the "small gestures" of a "heroic" French person

Source: Dugast and Soyeux (2020)

- Generalized heroic behavior reduces the carbon footprint by 26%.
- "Average" behavior: - 5 to 10%.

Modelling: taste shock

- Simple representation: how a given emissions reduction can be achieved through a price policy or a change in preferences (here, a taste shock).
- Consumption index C, CES aggregate of the consumptions of brown goods C_b and green goods C_g:

$$C = \left(\alpha C_b^{\frac{\sigma-1}{\sigma}} + (1-\alpha) C_g^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

  with σ the elasticity of substitution between brown and green goods and α the distribution parameter ($\sigma \in]0,1[\cup]1,+\infty[$ and $\alpha \in]0,1[$).
- The representative household seeks to maximize utility under her budget constraint. The instantaneous utility function is logarithmic:

$$U(C) = \ln C$$

- Partial equilibrium. Income I and prices p_b and p_c are exogenous.

- FOCs:

$$C_b = \left(\alpha \frac{p}{p_b}\right)^{\sigma} C, \qquad C_g = \left((1-\alpha)\frac{p}{p_g}\right)^{\sigma} C$$

with the price index

$$p = \left(\alpha^{\sigma} p_b^{1-\sigma} + (1-\alpha)^{\sigma} p_g^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$$

and

$$pC = I$$

Green good = numeraire: $p_g = 1$.

- Changes in consumptions following a shock on p_b (carbon tax) and a shock on α:

$$\widehat{C_b} = -(\omega + \sigma(1-\omega))\widehat{p_b} + \sigma(1-\omega)\frac{1}{1-\alpha}\widehat{\alpha}$$

$$\widehat{C_g} = -(1-\sigma)\omega\widehat{p_b} - \sigma\omega\frac{1}{1-\alpha}\widehat{\alpha}$$

with $\omega = \frac{p_b C_b}{pC}$ at the initial equilibrium.

- Change in α allowing to reach the same reduction of C_b as a price policy:

$$\widehat{\alpha}_{eq} = -(1-\alpha)\left(1 + \frac{1}{\sigma}\frac{\omega}{1-\omega}\right)\widehat{p_b} < 0$$

- Magnitude of the decrease larger when σ small, ω large, and α itself large.
- Numerical illustration:
  Initial equilibrium: $\omega = 0.9$, $\sigma = 4$ and $\frac{p_g}{p_b} = 1.2 \Rightarrow \alpha \simeq 0.6$.

	price shock $\widehat{p}_b = +10\%$	preference shock $\widehat{\alpha}_{eq} = -13\%$
$\widehat{C}_b$	-10%	-10%
$\widehat{C}_g$	+27%	+117%
α_{final}	0.6	0.52
ω_{final}	0.87	0.72

  Very large preference shock, very unlikely at least in the medium run.

→ A change in preferences cannot replace carbon pricing.

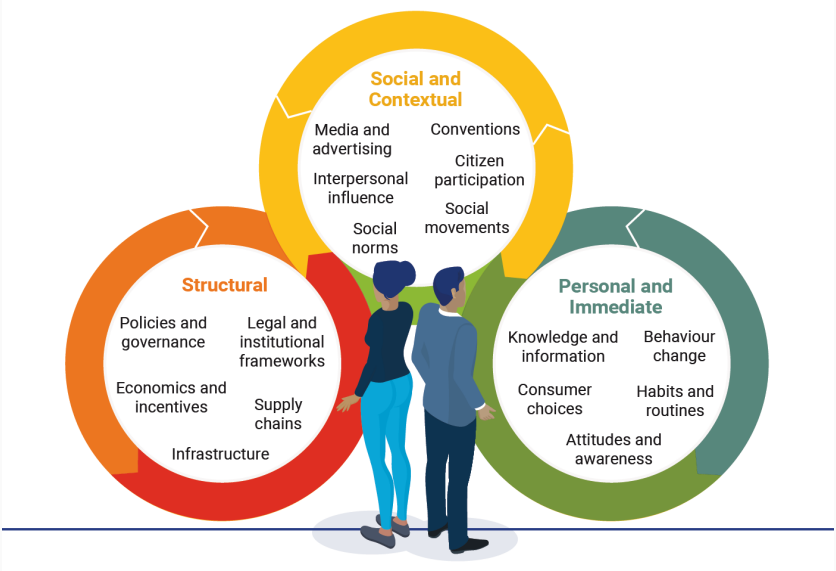
- Comparison of welfare impossible.

Triggering behavioral changes

Behavioural changes may be triggered by:

- information (through education, information campaigns, labels, etc.),
- nudges,
- imitation of (online) influencers,
- switch in the mood of your reference group,
- renewal of generations,
- price policy itself.

Economics has a lot to learn from other social sciences, psychology, sociology, anthropology.



Source: UNEP Emissions Gap Report 2020

Consumer information

- Labels increasingly used to provide consumers information on the carbon footprint of their consumption.

→ Literature on the evaluation of energy efficiency labels (Brounen and Kok, 2010, Aydin et al., 2018, Houde, 2018), information provision and appeals to energy conservation (Burckhardt et al., 2019), information provision about fuel economy when buying new cars (Alcott and Knittel, 2019), not conclusive.

- Apps on mobile phones.
- Information campaigns (government, NGOs).
- Quality of information provided crucial for trust, danger of greenwashing (deceptive or misleading green claims) repeatedly put forward.

Nudges

- Households are far from homo economicus: cognitive biaises, limited rationality, limited willpower and attention, etc.
- Non-pecuniary incentives, nudges, can be used to reduce behavioral biases (Thaler and Sunstein, 2008).
- Nudges modify the decision context.
  - They save people from their errors (raise consumer awareness, bridge the intention to action gap, exploit the behavioural status of defaults, etc.).
  - They encourage people to voluntarily contribute to a public good.
- Evidence is mixed.
- When an effect is found, its permanence is often questioned.
- Moreover, each intervention is very specific. Scaling-up is an issue.

Interactions with price policies

- Accepting to make "small gestures" for climate may
  - be an indicator of the willingness to accept price policies (carbon tax),
  - make people consider that they have done enough for climate.

→ Literature in favor of the second option.

- Does an extrinsic motivation to reduce carbon emissions (a carbon tax) crowd-out the intrinsic motivation which pushes people to perform "small gestures"?

→ Goeschl and Perino (2012): yes.

→ Mattauch et al. (2022): it depends on the context.

Habits and cohorts

- Habits acquired in youth shape behaviour in adulthood (Severen and van Benthem, 2022, on car vs public transport). Scarring effect.

→ Habits are an important obstacle to behavioural changes / disrupting habits may be a powerful way to trigger the change.

- Is the renewal of generations going to trigger the adoption of more sober behaviours?
  Chancel (2014) studies cohort effects in energy consumption. Does not find convincing evidence that younger generations have more environmentally-friendly preferences. Stresses the methodological difficulties of estimating age-period-cohort models and the need for further research.

The societal dimension

IPCC 6th assessment report, Chapter 5 (Creutzig et al., 2022):

- Demand reduction can only happen through societal, technological and institutional change.
- Sobriety cannot depend solely on everyone's willingness to make "small gestures".
- Sobriety should instead target the social, regulatory and infrastructural conditions that support GHG-intensive lifestyles. It should aim to modify both infrastructures and social norms.
- It is inseparable of the reduction of inequalities.

Infrastructures

- Sobriety requires the means to be sober.

$\rightarrow$ Infrastructures (cycling lines, high-speeds railways, network of charging stations, denser cities, etc.).

- Remark: also applies to price policies, to enable substitutions.
- Provision of climate-friendly infrastructures $\Rightarrow$ structural behavioral changes: new ways of working, like working from home, new ways of inhabiting space, in denser cities, closer to work, in smaller dwellings, etc.

Social norms

- Changes in values and culture spur long-lasting changes in behaviour (Nyborg et al., 2016).
- Role of cultural transmission (Bezin, 2015, 2019).
- Role of public policy and exogenous shocks (smoking ban in restaurants, Covid).
- Role of social learning and peer effects (Gillingham and Bollinger, 2012, 2021 in the case of residential solar photovoltaic adoption).
- Role of media and social media influencers.
- Change of social values towards sobriety very unlikely to happen in societies that highly value consumption and that showers people with "contradictory injunctions", like appeals to sobriety and simultaneously advertising of SUVs, low-cost air travel, or airport expansion.

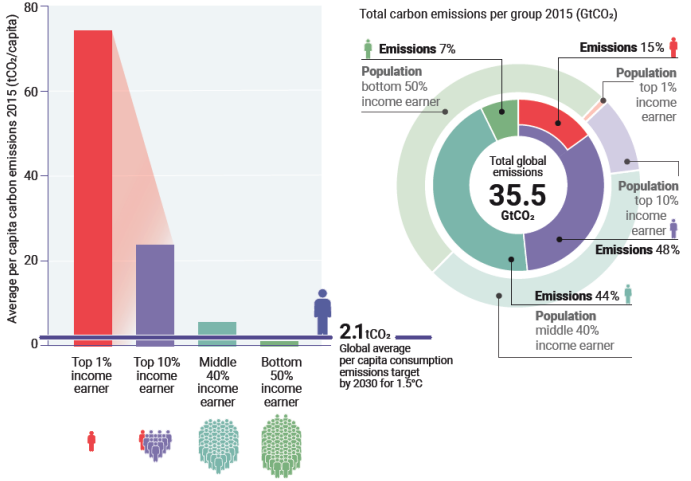
Effort sharing

- Should everyone adopt a more sober behaviour? Clearly no: poor households who cannot satisfy their basic needs cannot be asked to become more sober.
- IPCC (Creutzig et al., 2022): consumption should no longer be based on quantity, but only on what is needed. Those who have "too much" should consume less while those who have "not enough" should consume more.

→ What is too much? what is decent, what is enough?

- Also means that inequalities have to be reduced, both within and between countries.

Figure 6.1. Per capita and absolute CO_2 consumption emissions by four global income groups in 2015



Note: Per capita CO_2 consumption emissions, and absolute CO_2 consumption emissions by four global income groups in 2015, compared with emissions reduction targets for 2030 for limiting warming to 1.5°C. Income thresholds in 2015 are according to US$ purchasing power parity in 2011: 1 per cent > US$109,000; 10 per cent > US$38,000; middle 40 per cent > US$6,000; poorest 50 per cent < US$6,000.

Source: UNEP Emissions Gap Report 2020

- Is it enough to target climate policies on the "super-rich"?
- World Inequality Lab report (Chancel et al., 2022), Chapter 6: the top 10% emitters at the world level emit 47.6% of total carbon emissions, the top 1% emit 16.8% of the total.
  Or, one hundredth of the world population emits about 50% more than the bottom half of the population.

$\rightarrow$ controlling the emissions of the super-rich is essential.

- But it will not be enough: to stay within the carbon budget corresponding to a 2°C target, virtually everyone in the rich countries have to contribute.
- Symbolic dimension: conspicuous consumption by the wealthiest is hardly compatible with injunctions to sobriety.

Conclusion

My view:

- Asking households to voluntarily change their consumption behaviours and become sober cannot be a substitute to ambitious price policies for achieving the necessary demand reduction.
- On the contrary, both are complements, even though in some circumstances price policies can crowd-out voluntary behaviour and vice versa.
- Both have to take place in a social context of inequality reduction.

$\rightarrow$ Policy mix:

- carbon tax with revenues redistributed in order to make it progressive,
- society valuing sobriety,
- investments in infrastructures providing the means to change behaviour,
- regulations targeting conspicuous carbon-intensive consumptions.

Let's hope – the carbon clock runs fast