

Living on a Carbon Diet

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Abstract

The objectives of this paper are to understand the features of simulated low carbon lifestyles under strong greenhouse gas emissions reduction assumptions (20%, 50%), the nature of trade-offs and the hierarchy of choices operated by households within a limited carbon and financial carbon budget, the acceptability of important changes in consumption patterns, and finally the values and representations, benefits and losses that households express in such changes. The research implemented a protocol combining experimental economy (simulation of carbon budget reductions under financial constraints) and anthropology (semi-structured interviews, to understand the rationale behind choices). Each household of the sample (n = 30) was investigated for 2 - 3 days. Firstly, a very detailed carbon footprint of the household was calculated. Then households were proposed a list of 65 pre-defined solutions covering most of available mitigation options, with financial and carbon cost and savings calculated for their real situation. The sample reached an average of -37% (-12%/-64%), with a preference to act on habitat and food and a reluctance to change transport consumption. Due to the amount of reductions asked, low carbon lifestyles finally impact comfort but allow saving money. Recommendations for policies are presented.

Keywords

Climate Change, Mitigation, Individual, Consumption, Carbon Footprint

1. Introduction

1.1. Citizens, Consumers and Climate Change

Individuals and households, citizens and consumers, have been for long neglected by policy-making and research on climate change. They can be considered as potential supports [1] or barriers to the implementation of new policy measures, as beneficiaries or victims of climate change and climate change policies. Policies are however still based on emission inventories starting from a national and production basis, with a modeling and

some reference scenarios dominated by economics and large scale thinking, for instance introducing variables of technological change and carbon prices and observing effects on the distribution of production and revenues. This is valid for the current generation of IPCC scenarios [2]-[4] as well as for other global scenarios [5]-[7]. A review [8] shows that households, lifestyles and consumption are seldom taken into account in modeling and scenarios exercises, and if so, are analyzed *ex post* rather than as potential drivers of change.

The need to balance better a production and a consumption perspective impules some research on emission inventories and attribution of importation and exportations, therefore extending IPCC guidelines and drawing a consumption based picture of emissions [9]-[16] or assessing the distribution of emissions within the society, now and in the future [17]-[19].

Beyond this “macro” perspective, more understanding of GHG emissions and decision-making at the household level is required, so as to develop specific policy instruments—carbon taxes, carbon budgets, individual tradable permits [20]-[24] and to assess the impact of large scale policies on lifestyles, anticipating inequalities and barriers for change. This reveals some knowledge gaps in people’s representations, behaviors and choices facing greenhouse gas emission mitigation.

1.2. Qualitative Approaches

This obviously calls for more social sciences. If econometrics or quantitative sociology can yield statistical correlations and typologies useful for modeling, they generally fail to go deeply in the interpretation/understanding of choices. A quantitative approach allows reaching some statistically representative results, according to the sample [25], but is of more limited use when the objective is to reach an in-depth understanding and dense descriptions of social phenomena [26]. Quantitative methods offer robustness and rigor, when qualitative methods provide richness and texture. This echoes a general need for more humanities in the field of climate research, since “*The analysis of anthropogenic climate change continues to be dominated by positivist disciplines at the expense of interpretative ones* [27]”. That is the reason why this research is grounded in a frequent qualitative tradition in social sciences and in a less frequent perspective of experimentation, both applied to climate change mitigation.

Qualitative methods have a long history in social sciences [28]. In particular, added value of psychology and anthropology [29] allows some understanding of the cultural background of choices [14], the values, justification, and formation of moral judgments [30] [31].

Several fields of research have been developed concerning individuals and households: opinions [32], factors influencing representations and behavior, such as the peers, friends and relatives or the social status and reputation [33]-[35], willingness and barriers to act [36]-[42], motivations of consumption [43]-[46]. Deniers and climate skepticism, and more generally public understanding have been well investigated following the recent controversies [47] [48] so are the factors influencing a better awareness of climate change, such as the experience of changes [49]-[52]. In the field of energy, processes like the rebound effect are well documented [53] [54].

1.3. Experimental Perspectives

Research relying on opinion surveys faces the objection that for issues of public interest like climate change, individuals tend to overestimate their capacity to act. Research relying on what individuals declare in terms of actual behavior or willingness to change will always face this “implementation” gap. [55] described for instance the “green fakers” category, characterized by a gap between discourses and action.

This paper does not focus on opinion surveys, but introduces a perspective of simulation and experience, more rare in social sciences, even though quite common in psychology [56], and other experiments on cognitive dissonance), marketing (focus groups, applied to climate change adaptation and mitigation [8] [57]-[59], sociology [60] or experimental economy [61]. Experimental economy in particular tries to simulate individuals’ behavior as close as possible to the reality and not to start from a theoretical *homo economicus*. In social science, experimental methods will also involve surveys, but using controlled environments, so as to understand precise processes (e.g. pricing or buying process) in stable conditions. The basic question “Should we have to reduce our GHG emissions by 50%, what would be the priorities, the hierarchy of choice, the personal trade-offs, the impact on our ways of life?” does not inform on the reality of the future implementation of choices, but is very productive to inform the formation of decision in a context of climate change mitigation.

2. Methods

The objectives of this paper are to understand the features of simulated low carbon lifestyles under strong greenhouse gas emissions reduction assumptions (20%, 50%), the nature of trade-offs and the hierarchy of choices operated by households within a limited carbon and financial carbon budget, the acceptability of important changes in consumption patterns, and finally the values and representations, benefits and losses that households express in such changes.

The research, conducted in 2011-2012 in France, implemented a protocol combining experimental economy (simulation of carbon budget reductions under financial constraints) and anthropology (semi-structured interviews), to understand the rationale behind choices). Each household of the sample ($n = 30$) was investigated for 2 - 3 days. The sample was recruited so as to combine contrasted situations of revenues (middle classes, excluding higher and lower percentiles), habitat (individual and collective), region of residence, gender, age, family structure, and the existence of strong characteristics affecting the initial carbon footprint (e.g. a large house in cold climate travel by plane...). We first calculated, using a tool developed for the project, a very detailed carbon footprint of the household, on habitat, transport, food, holidays and other consumption features. We then proposed households a list of 65 pre-defined solutions covering most of available mitigation options, with financial and carbon cost and savings calculated for their real situation, introduced in an ad-hoc simulator. Households were proposed to reduce their carbon footprint by 20%, and then by 50%, choosing one option after the other, after a careful analysis of the solutions offered. A coding of solutions (replacing/reducing/renouncing, behavioral/financial choices, habitat/transport/consumption/holidays/food, order of choices, first order and second order choices...), associated with the data on financial and carbon consequences, allowed a quantitative processing of results and the use of indicators like eco-efficiency (euro per ton of CO₂ avoided), which is usually not affordable in such qualitative research. Between these simulation stages of the research, some in-depth interviews were conducted so as to understand the perception and representation of individuals, and the rationale they put behind their choice, in particular to discriminate financial and non-financial (values...) drivers of choice.

3. Results

The sample reached an average of 37% (range of -12%/-64%) reduction of the initial carbon footprint, with several households, of different categories of revenues and carbon footprint, pushing the experience beyond 50%. Others stated various limitations to actions (financial, cultural...). Beyond these **Figures 1-3**, the easiness for individuals to enter the simulation and to project themselves into a low carbon future was a result in itself.

The analysis by category of choice reveals (**Figure 1**) a priority given to habitat and food, and a strong reluctance to act on transport. This is explained for transport by constraints (daily commuting) and desires (reluctance to give up air transport), for food by the resonance with other motivations for decision (health), for habitat by the existence of incentives and technical solutions. Transports appear to be, given their contribution to the initial balance, a key for the adoption of low carbon lifestyles, but also the main barrier. The research also yield results on the 65 individual choices proposed.

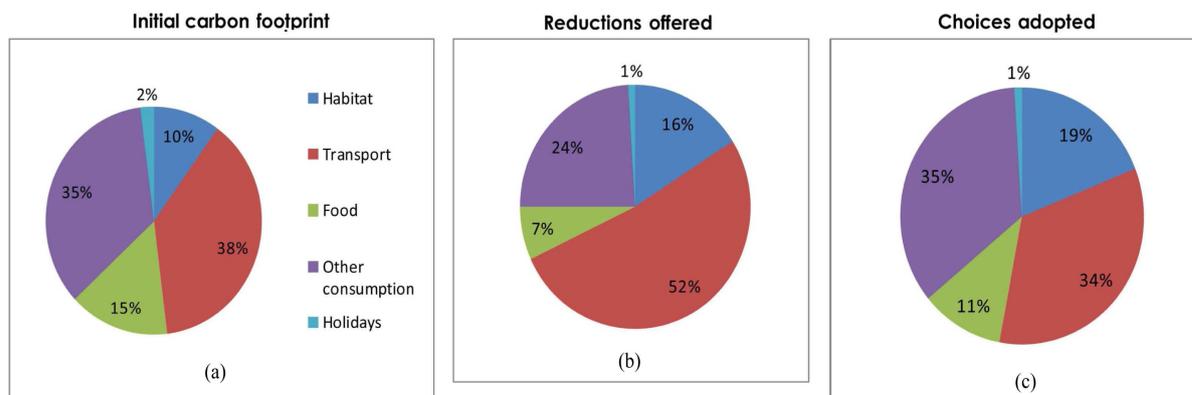


Figure 1. (a) Initial carbon footprint, (b) reductions offered and (c) choices adopted—breakdown by categories—all samples.

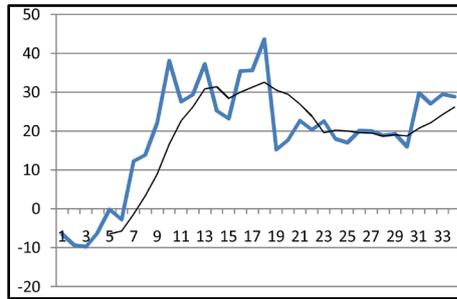
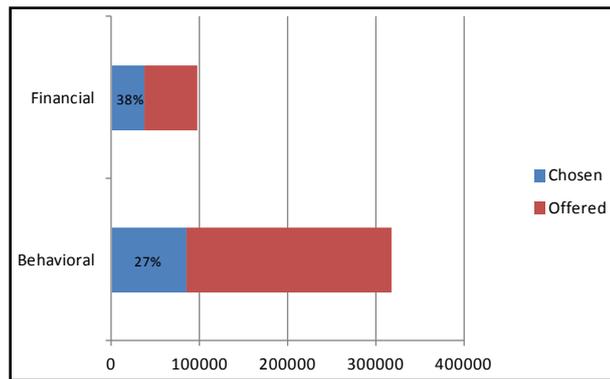
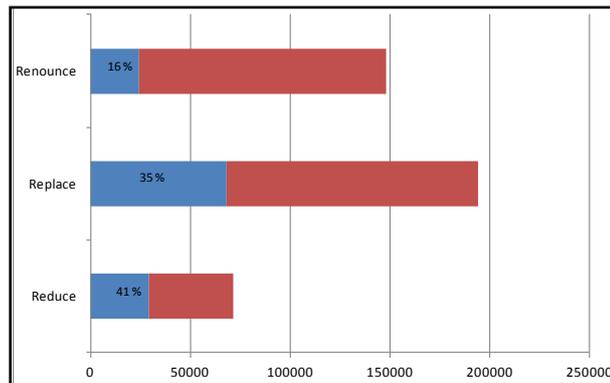


Figure 2. Cumulated average costs of solutions adopted (average of rank 1 choices, cumulated with average of rank 2 choices, etc. until 33), in euros per month. Black line: trend curve.



(a)



(b)

Figure 3. Share of GHG emissions reductions chosen in the total of GHG emissions reductions, by categories. (a) Behavioral changes are requested, but households prefer paying; (b) A reluctance to renounce, even if this is necessary.

The analysis of costs shows that, within very contrasted strategies (see infra.), households tend to adopt first solutions that cost money but preserve comfort, and then, urged by the simulation to reach more severe reductions, tend to give up some elements of comfort (less meat, less driving of smaller cars), which save money. Low carbon lifestyles are not necessarily costly. 60% of the options have a net cost at the end of the simulation, 40% a net saving. Some will privilege operating costs (e.g. buying more organic products) while others opt for investment costs (e.g. buying a more energy efficient car).

Read: the first choices adopted by households saves on average 6 euros per month. At the end of the simulation, the average impact on a household monthly financial budget is 29 euros per month.

The “tracking” of choices and the interviews with households reveal some strong points:

- the inequality of some situations, some households combine easy options for GHG reductions or important and sufficient revenues to take decisive actions (e.g. changing their heating system), while others are constrained and forced to accept large comfort losses (households who rent their apartments and do not decide the insulation, and therefore must limit the temperature to save energy);
- contrasted strategies, a minority of households taking “rationally” their decision with a clear vision of the initial situation and the emission target, while most adopt a pragmatic and sequential strategy, adopting first the simplest and most desirable—but sometimes worthless—options, and then moving to the most engaging ones;
- a clear—and somehow understandable—trend for households to favor options changing the less their daily life: even if behavioral change (e.g. heating less, using less the car) can be necessary to reach substantial emission reductions, as well as to renounce to some key elements of a lifestyle (stop flying), households seldom favor these categories, even when a single choice can reduce considerably their footprint. They generally opt for such options when “against the wall”;
- the limited use of financial data (even though this data was particularly highlighted in the simulation), either to choose or to justify a choice, which introduces the idea that as soon as lifestyles are deeply questioned, other arguments, like values and culture are taken into account to build the coherence of a new lifestyle [37].

When provided with a comparison on their current and future lifestyles, households were asked to comment the gains and the losses, but also to express themselves on the conditions that would make such low carbon lifestyles acceptable. It appears that rather than an appeal to large scale—long term values (“saving the planet”), the low carbon lifestyles are a mix of personal values (well being, quality of life, pleasure, health, provided by some solutions), collective harmony (e.g. promotion of proximity for daily purchase), and environmental preservation perceived as a limitation of waste, a compliance with more sober consumption patterns, referring to ancient times. To a certain extent, there seems to be some potential to compensate the loss of material well being by other elements of quality of life (proximity, sociability, pleasure). This is consistent with other research on frugality. At the level of reductions obtained (an average of -37%), the fundamentals of lifestyles are not questioned, but the daily life has to be severely optimized so as to comply with the emission budget.

4. Discussion

This research developed a hybrid protocol, combining experimental economy and anthropology, which lead to an in-depth understanding of households’ perception and potential behavior in front of a limited carbon budget. In particular, it helped understand the complex interactions of factors (financial, non-financial) influencing decision-making. The limits are obviously linked to the size of the sample, which is not statistically representative of the French population, in spite of our efforts to cover a variety of situations. To overcome this limitation, using a more quantitative approach might seem appealing: either assessing emissions at the households’ level using input/output matrix of national accounting systems, or developing large scale simulations, for instance using the carbon emission simulators available on-line. Yet without associated semi-structured interviews as proposed in this research, and a face to face protocol avoiding bias, none of these options would manage to reveal the rationales behind choice.

Several recommendations for future policies are derived:

- a special attention which must be given to fragile households, regarding emission reductions: the retired, rural families depending on their cars, low revenues, individuals already with a low carbon footprint;
- a need to adapt public policies (discourses, incentives) to the key moments of a person’s life, when households rearrange their life: buying a new apartment, having children, retiring, and offering opportunities for change which should be targeted in priority;
- preparedness to solutions is quite diverse: while households seem ready to accept some changes in their lifestyles providing some barriers are offset (using less their car, eating less meat), for others the priority is first to raise awareness, in a context where the reluctance to change is still strong (e.g. limiting the use of plane);
- public campaigns could adapt their message, using the arguments of fear and guiltiness with caution, and favoring the promotion of exemplarity by public authorities, or maximizing the material or symbolic benefits provided by some solutions (well-being, pleasure...).

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