The Effect of Climate Change Semantic Expressions on Perceptions and Attitudes Towards Decarbonisation

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Abstract

This paper is proposed to clarify the effectiveness of semantic expressions used to designate climate change in France context, i.e. "*réchauffement climatique*" ("global warming"); "*changement climatique*" ("climate change"); and "*derangement climatique*" ("climate imbalance"). An experimental study (sample size $N = 126$) based on 'linguistic semantics' approach is conducted in order to assess the effect of these expressions on concerns, perceptions risk and sensitivity regarding Climate Change (CC). Our results show that the expression "*réchauffement climatique*" ("global warming") is the most appropriate from a statistical standpoint. It increased the importance of the problem (salience of this issue) relative to other societal issues (e.g. unemployment, social justice, crime, etc.); it also enhanced participants' sensitivity (respondents' emotions associated with CC) more than the other expressions. We can still note however a strong difference in impact among the expressions if we were to calculate their impact on the basis of risk perception and communication objective. Results showed that when focusing our communication campaigns on nature, it would be preferable to use the term "*changement*" ("change"), when focusing our communication on social level, it would be preferable to use the term "*réchauffement*" ("warming"), whereas the term "*dérèglement*" ("imbalance") becomes the most suitable in seeking to build a communication campaign focusing on economic aspects. Semantics therefore should be selected depending on the communication objective.

Keywords: climate change, communication, linguistic semantics, perception

1. Introduction

After a long period of media controversy (Zaccaï et al., 2012), scientific work has proved that climate change (CC) is real, abrupt, irreversible and it can only be minimized (Solomon et al., 2008). The empirical evidence which is now becoming more obvious indicates that we have entered a new disturbing geological era, called the Anthropocene (Crutzen, 2000). That is to say, CC has anthropogenic sources (Álvarez-Iglesias et al., 2012), and therefore can be attributed to human activities (Cook et al., 2013), such as, the elevated consumption of carbon. The expected effects of CC are tragic (IPCC "Intergovernmental Panel on CC", 2007). Minimizing these effects calls for immediate new actions and consumption lifestyles, which means committing to a "social-ecological transition" that will eventually lead to "decarbonisation". Each consumer is then expected (Jackson, 2005) to minimize his greenhouse gas emissions (GHG).

This expectation is increasingly important since it is supported by public authorities who are inclined to favour political incentives over legislative constraints (Bérard & Companion, 2014). This choice involves an imputation of CC responsibility on individual behaviour (Frémeaux & Lalucq, 2014; Wells et al., 2010). The fight against the macro-phenomenon of CC becomes an individual micro-behaviour concern - with the deployment logic of "conduct of carbon conduct" understood as "government of people's carbon dioxide emissions that does not work through the state system, but through people's governing of their own emissions (...), a government enabled through certain forms of knowledge (measurements and calculations of one's own carbon footprint) certain technologies (the turning of carbon emissions into tradable commodities) and a certain ethics (low-carbon lifestyle as desirable)" (Paterson & Stripple 2010, p. 347). The incentive policies developed here are somehow

grounded in the Foucauldian framework of governmentality (Foucault, 2004). They aim to sensitise public opinion related to the issue of CC (Comby, 2009), sensitization which appears to be currently realized: as Bozonnet notes (2012, p. 206), CC is in France, fully "appropriated by public opinion and integrated into its overall perception framework". The growth in risk perception and sensitivity in (western) societies today about CC is due to the high media coverage (Boykoff, 2007).

Nevertheless, despite the many efforts of media and stakeholders (scientists, governments, NGOs, etc.) to create awareness and to promote adaptation strategies around CC, consumer behaviours have not evolved and are not often as responsive as expected by communications specialists. Actually only a small number of consumers are effectively engaged in alternative models of consumption and practices such as low-carbon footprint, low-carbon technologies, low-carbon food, etc. For instance, carbon labelling is not one of the important factors that influence the process of most consumers' purchasing behaviour. However, a behaviour is considered as environmentally friendly since it does not harm directly or indirectly the natural environment, but rather if it helps to protect and/or restore it (Giannelloni, 1998). Indeed, the transition into the eco-innovation system through real environmental behaviours seems difficult. As a result, carbon intemperance persists and the situation of CC has become increasingly critical.

A large number of scientific studies, particularly in social psychology research, have indicated that consumer inertia or inaction is due to various obstacles that may hinder behavioural change which could be adaptive or could help to mitigate CC (Swim et al., 2010). These hurdles are dependent on several factors, including: personal reasons, social representations, philosophical convictions, psychological beliefs, etc. According to Gifford (2011), these barriers actually enter within the frame of the dragon of ecological inaction. Yet, other impediments can also emerge, such as, economic difficulties in changing one's domestic behaviour (e.g. the high price of pro-ecological products such as the solar panels), the educational level, cultural orientation, etc. In this research, we assume that consumer apathy on this issue is not due to the lack of information and/or understanding but rather to the errors in communicating about CC. This could be attributed to the intricacy and deficiency of marketing tools used as means to spread this phenomenon, that is maybe, the bad choices and/or the misuses of "visuals" and "expressions" used to communicate about CC. The marketing "CC" is therefore responsible for the lack of change in the behaviour of consumers. In short, it is globally counterproductive. In this paper, we focus on the effectiveness of expressions used to designate climate change.

To examine this idea, we set our research in the fields of marketing, psychology and semantic linguistics. We investigate the effectiveness of social marketing as a communication technique aimed at encouraging consumers to adopt pro-environmental behaviours (e.g. minimizing their GHG emission). More specifically, we assess the effective use of climate change communications (CCC) which are semantics (specific expressions) exploited in the description of the problem to reduce. In other words, we first explore the impact of semantics related to CC on the audience's emotions, mental and symbolic representations. We then investigate further this influence by assessing consumers' behavioural intentions to decarbonise.

This research was generated for various reasons. Firstly, in order to fill a void in consumer behaviour and marketing literature regarding the topic of CCC. Indeed, CC is both a consumer behaviour issue -, i.e. consumer behaviour is the key to the solution as being the cause of the problem - and a marketing fallacy - "it is no longer a scientist's problem, it's now a salesman's problem" (Futerra, 2009, p. 2). Secondly, on account of the lack of scientific knowledge about the impact of CCC on consumers' engagement in pro-environmental behaviours (O'Neill et al., 2013). Thirdly, because of the failure of CCC campaigns targeting consumer behaviour change. The purpose of this paper is twofold. First, in the light of the existing literature, several problems are stated which affect the "effectiveness" of communications used by associations (or NGOs) aimed at changing consumer behaviour to make them embrace the logic of "carbon sobriety". The second step is to test this idea by using an experimental method.

The linguistic failures of climate change communication

The emerging field of linguistic ecology or eco-linguistics is aimed at elucidating the manner in which the language of ecosystems and ecological problems could be influential (Cohen, 2010; Harré et al., 1999). In this case, eco-linguistics contains a set of assumptions related to the theories of Humboldt-Herder and Sapir-Whorf, whereby linguistic practices have cognitive effects and unconsciously shape representations of the world, which are always culturally constructed (Halliday, 2001, p. 179). On this theoretical basis, eco-linguistics specifically examines the evolution of lexicons dedicated to ecological issues. Syntactic games like passivation and agentivity, nominalisation and nominal composition also produce decisive effects on the perception and understanding of ecological issues (Lechevrel, 2008; Stibbe, 2006). This line of reasoning induces the

prescriptive idea (and not merely descriptive and explanatory) that effective understanding and positive behaviour require a change in modes of expression (Stibbe, 2012). The issue of ecological transition also involves linguistic solutions, i.e. a lexical and epistemic creativity that enhances the mobilisation of imagination. From this perspective, conceptual metaphors are important inasmuch as they allow for effective guided attention, given that they impact mental representations and call for action (Lakoff & Johnson, 1980). Conceptual metaphors also facilitate the cognitive appropriation of scientific data (Nisbet & Mooney, 2007) and intervene in the cognitive construction of a problem (see below under the Methodology section).

In a study on the linguistic analysis of reports published by IPCC, Barkemeyer et al. (2016) showed that CC information stands out in terms of understanding and is typically perceived differently by audiences. According to Nicholson (2005), in Anglophone countries, a literal interpretation of imagery often accompanies variations in terminology used to discuss CC (e.g. greenhouse effect, global warming, hole in the ozone layer, etc.). In the French context, communicators use many expressions to designate the CC phenomenon. Three expressions, in particular, are commonly used to describe the problem at hand: "réchauffement climatique" ("global warming"); "changement climatique" ("climate change"); and "dérèglement climatique" ("climate imbalance"). These expressions are used indifferently in speeches and are thus understood to be strictly synonymous. From a connotative perspective however, semantic contents vary across the associated ideas and related emotional registers. These semantic contents sensitise and mobilise in various ways (i.e. they are more or less "relevant"). No empirical justification is given to explain this aspect. Are these expressions effective in designating CC? Should existing expressions be replaced by others with a more positive impact on consumers' involvement in this topic? As noted by Nerlich et al. (2010), it was important to identify the right expression (semantic) and check whether people were listening. To answer these questions and fill the research gap, we have tested the effectiveness of these three French expressions.

2. Methodology

Our research methodology was based on an experimental design that investigates the influence of current CCC on people's perceptions and attitudes to mitigate CC. We resorted to linguistic semantics (i.e. the study of meaning relations) to examine their concerns, risk perception and sensitivity in response to the modern-day terminology used to describe the CC phenomenon.

Linguistic communication study using experimental semantics

Experimental semantics seeks to empirically support the core hypothesis of the cognitive linguistics field by accumulating a set of scientific results based exclusively on experimental data. Experimental semantics is derived from the original postulates of cognitive linguistics, and especially from the fact that the elementary structures of language allow us to access concepts, including the most abstract among them (Gibbs, 2007; Matlock & Winter, 2014). From a cognitive linguistics perspective, language ability is seen as a general faculty of the mind that underpins all human cognitive processes. In addition, experimental semantics is a part of the cognitive linguistics tradition, insofar as it focuses on how we make sense of our experiences in the world through the perceptual and interpretative properties of language. Experimental semantics thus examines the extent to which our knowledge of the world, situations and circumstances shapes our language (Lakoff & Johnson, 1980; Nerlich & Clarke, 2007). Accordingly, it falls within embodied and situated approaches to language, endeavouring to demonstrate that the meaning ascribed to things by individuals is expressed by linguistic contexts, which in turn depend on individuals' experiences in the world (Lakoff, 1987; Talmy, 2000). Experimental semantics therefore serves to connect the update processes through which individuals develop an ability to create and interpret the elements of their own environment (Croft & Cruse, 2004; Geeraerts, 2006).

Matlock and Winter (2014) noted that experimental semantics research encompasses the study of both literal and figurative language. Most experiments conducted on literal language test the main characteristics of the conceptualisation process (i.e. the meaning process) of language, as identified by cognitive linguistics. From this perspective, the meaning process is analysed through the lens of: i) the links between signs and mental spaces, i.e. "perspectival meaning" (e.g. Stanfield & Zwaan, 2001); ii) the links between signs and experience as well as language use, i.e. "usage-based meaning" (e.g. Tomasello, 2003); iii) the shared dimension of meaning, i.e. "encyclopaedic meaning" (e.g. Zwaan et al., 2002); and lastly iv) the evolutionary dynamics of meaning construction, i.e. "dynamic meaning" (e.g. Horton & Rapp, 2003). In these kinds of experiments, participants often complete a narrative understanding task after being exposed to a discourse whose content and semantic modalities vary depending on the experimental conditions.

Studies carried out on figurative language are concerned with the manner in which rhetorical figures (particularly conceptual metaphors since the seminal works of Lakoff and Johnson, 1980) shape the way we think and act.

This effort taps into the conceptual foundations of language (Gibbs & O'Brien, 1990) and, more precisely, tests the notion that figurative language is the product of our embodied experiences in the physical and social world (Johnson, 1987; Lakoff, 1987, 1993). Regarding metaphors, Lakoff and Johnson (1980) pointed out that they are not only literal but conceptual as well; so as not to be reduced to words, they are also non-verbal. According to these authors, metaphors lodge into concepts and help organise our thinking. Metaphors establish an assimilation not only between two terms, or else they would solely be literal, but between two concepts. Metaphors are "conceptual" since they reflect a mechanism whereby two "conceptual domains", one abstract (called a "target domain") the other more often concrete ("source domain"), are linked to one another. Lakoff and Johnson (1980) explained that the link between these two conceptual domains is built as follows: target domain "A" is enhanced by source domain "B" as "A" IS / IS NOT "B". For example, in the DISCUSSION IS WAR metaphor, the experience of a debate is understood in terms of wartime experience (Lakoff and Johnson, 1980, p. 14). As a result of this metaphor, our perception of the concept of a "discussion" is altered, primarily in the way we characterise the experience of a discussion argument using everyday language. As such, expressions can thus be used, like: "we have demolished his argument", "our affirmations are indefensible", or "he has attacked every weak point in my argument" (examples from Lakoff and Johnson, 1980, p. 14). This use of language is then subsequently modified in the associated behaviour we adopt, e.g. giving up the discussion (i.e. beating a retreat), or opting for a line of argument that corresponds to our correspondent as "adversary" (i.e. choosing war strategies and tactics). Based on these theoretical proposals, research conducted in experimental semantics has sought to reveal the impact of figurative language on our understanding and interpretation of things in the world. Many conceptual metaphors have been studied in experimental studies. Such is the case for metaphors like: TIME IS A MOVING OBJECT (Boroditsky and Ramscar, 2002), SOCIAL DISTANCE IS A SPATIAL DISTANCE (Matlock, 2011), and LOVE IS A JOURNEY (Gibbs, 2013). In these experiments on conceptual metaphors, the impetus always lies in showing that the source domain exerts an influence on people's understanding of the target domain.

In the present research, we argue for the use of experimental semantics in testing the language failures of the "living with less carbon" communication programs mainly because experimental semantics is likely to elicit questions in line with the cognitive construction of the CC problem statement. Experimental semantics might also be of interest in revealing that the three expressions used as CC synonyms, i.e. "global warming", "climate change" and "climate imbalance", actually mean different things. In other words, their semantic contents might activate different imaginaries in participants' minds since the meaning of each expression does not give rise to identical representations of CC as regards, for instance, the salience of this issue and the notion of self-efficacy. Along these lines, we tested the three common expressions ("*réchauffement*"/"global warming", "*changement*"/"climate change" and "*dérèglement*" *climatique/*"climate imbalance*") through an experimental protocol in which participants were asked to read a text dedicated to CC. This text was two pages long (771 words) and recounted all the CC challenges society faces. Three experimental conditions were defined on the basis of a single independent variable: "semantic expression used". This independent variable had three modalities, corresponding to the three expressions of CC mentioned above. The text was thus converted into three different versions depending on the expression used. The participants ($N = 126$), who were the same as for the collage part, were randomly assigned to the three different experimental approaches. Following the collage construction and reading tasks, participants responded to a questionnaire designed to measure the output variables, which were: i) the perceived relative importance of CC among other societal issues; ii) the perception of CC causes and consequences (note: these first two questions provided an idea of individual perception and certainty about the CC risk); iii) the participant's sensitivity to CC (this output variable enabled assessing respondents' emotions associated with ecological issues); and iv) socio-demographic information about the participants (e.g. age, gender, family status).

3. Analysis and Results

The data analysis focusing on the data collected through questionnaires.

3.1 Analysis of Questionnaires

The objective of this part is to determine whether any of the terms "changement" ("change"), "dérèglement" ("imbalance") or "réchauffement" ("warming") had more influence than the others on participants' responses. The purpose of these questionnaires was to explore the relationship between the semantics used and the ability to generate ecological imaginaries. After being exposed to the textual stimuli, respondents completed questionnaires designed to measure their concerns, risk perceptions and sensitivities regarding CC.

3.2 Ranking the Importance of Climate Change

To measure the level of participants' concern, we introduced a "barometer" type of question, in asking them to rank the importance of CC versus other problems in our society, e.g. unemployment, social justice, crime, pensions, school operations, immigration, tax burdens, terrorism and housing. We used an ordinal scale from 1 to 10, with 1 being the most important issue and 10 the least. Through this first question, out intention was to determine if one of the three terms had a greater impact on how participants rate the climate phenomenon. Results indicated that the expressions dedicated to CC do indeed have an influence on how most participants rate this issue compared to other societal problems (see Table B.2). The difference is significant (F = 4.597, p = 0.012). Our analysis specified that participants exposed to the text containing the stimulus "réchauffement climatique" (i.e. "global warming") classified this issue higher among other societal issues, meaning that participants place great emphasis on this expression. When "global warming" is employed, they actually ranked the climate phenomenon in third position (M = 3.3). However, with the expression "changement climatique" ("climate change"), this phenomenon was rated in fourth position (M = 4.3), while "dérèglement climatique" ("climate imbalance") led to a 5th-place ranking (M = 5.1). The term "réchauffement" (or "warming") therefore had more impact on respondents' ranking of CC than other terms. Two justifications can be given for this extra importance ascribed to the term "warming". On the one hand, this term carries a temperature distinction (réchauffement = warming) that has become fairly obvious of late, at least in France, while on the other hand, the popularity of this term in the media has probably made it more meaningful to the general population. Our overall results have also shown that CC was not classified as a priority for French people; at best, it came in third place, behind "unemployment" and "social justice" issues. Furthermore, results of the rank correlation method indicate that the climate phenomenon was negatively correlated with the first two key themes, i.e. "unemployment" (r=-3.06) and "social justice" (r=-0.84) (see Table B.3). The concern over CC increased in the opposite direction from that of these other problems. In other words, the level of concern for CC in French society only increases once the level of interest in other problems decreases.

3.3 Risk Perception Analysis

The objective of measuring this variable is to assess the intensity of climate risk perception at various levels (i.e. environmental risks, economic risks, social risks, political risks, health risks and psychological risks). We assumed that this variable would vary depending on the expressions used in the textual stimulus. To confirm this supposition, participants were invited to answer a couple questions reflecting two components of the risk perception variable (i.e. intensity of danger and certainty regarding the danger). The first question pertained to the intensity of potential multiple dangers and was formulated as follows: "Would you say that ['climate change'/'global warming'/'climate imbalance'] represents ['a great danger'/'danger'/'not much danger'/'no danger'] for/at ['nature'/'health'/'an economic level'/'a social level'/'politics and international relations'/'your personal well-being']?". The second question then focused on the certainty of consequences and was expressed as follows: "Would you say that you are ['not sure at all'/'pretty sure'/'sure'/'absolutely sure'] that ['climate change'/'global warming'/'climate imbalance'] represents a danger for/at ['nature'/'health'/'an economic level'/'a social level'/'politics and international relations'/'for your personal well-being']?". These two dimensions of risk perception were assessed using a four-point verbal / numerical rating scale ranging from 1 for 'great danger' to 4 for 'no danger' on the first question and from 1 'not sure at all' to 4 'absolutely sure' on the second question. The data analysis was conducted by following Cunningham's risk perception measurement procedure (Cunningham, 1967). Data collected were thus analysed by calculating a multi-index, set up as the product of the two ratings (intensity and certainty of dangers). According to this procedure, these two dimensions related to risk perception were analysed complementarily (Volle, 1995), i.e. whereby an index value of 16 indicates low risk while a 1 value stands for high risk.

The results of Cunningham's procedure showed that the intensity of perceived risk for all participants was 'average' (M = 5.4). According to Volle (1995), if the measurement scale result yielded ratings between 4 and 8, then the risk perception is average. The participants were thus probably sceptical as regards the risk associated with CC. Moreover, we calculated the risk perceptions reported by all levels using the expressions (environmental, economic, social, political, health and psychological). Results show that participants perceived a different level of risk for each expression used. For example, with the term "dérèglement" ("imbalance"), they perceived greater risk at the economic and international levels; in contrast, the term "changement" ("change") induced perceptions of greater risk for nature, and when employing "réchauffement" ("warming") participants perceived greater risk on the social and psychological levels.

We completed this risk perception measurement using ANOVA. The goal of this test was to discern the differences in perceived risk regarding the expressions used and then check the statistical significance of this effect. ANOVA results indicated that individuals had an average risk perception under the three experimental

conditions (4 < M < 8). The differences however were insignificant (F = 1.487; p = 0.230) (see Table B.4). We can interpret that the expressions used do not affect or present a significant primary effect on risk perception. These expressions therefore were not useful or effective in increasing social perception of the climate risk.

Furthermore, it is important to point out that before analysing the results of these questions, we measured the value of coefficient alpha to assess the reliability of both scales, with $\alpha > 0.65$. It can therefore be concluded that both questions are sufficiently accurate to be considered in our study (see Table B.5).

3.4 Environmental Sensitivity

The interviewee's sensitivity, as expressed in favour of the environment, was measured using 5-point Likert scales ranging from 1 (not at all agree) to 5 (completely agree). This scale was developed by Zaiem (2005) to assess the degree of emotion that an individual attaches to environmental issues. It seemed necessary to us for this variable to be measured within the scope of the present research given its impact on ecological behaviour.

An ANOVA analysis was undertaken to compare the average sensitivity with respect to the expressions used (Table B.6). The ANOVA revealed a primary effect of the expressions on participants' sensitivity (F = 8.780; p = 0.000). These results also showed that the term "réchauffement" ("warming") was the most favourable in influencing participants' sensitivity to the environmental issue compared to the other terms. Its average was higher (M = 4.08) than that of the other terms: "changement" (M = 3.82) and "dérèglement" (M = 3.57). According to these results, let's conclude that it would be better to use the term "réchauffement" when communicating CC provided the objective is to increase citizens' sensitivity.

Furthermore, we were interested in ascertaining which expression respondents preferred to use when explaining the climate phenomenon in their collage descriptions. Results indicate that the term "réchauffement" was the most commonly used (137 times by all participants, while the terms "déréglement" and "changement" were listed 73 and 46 times, respectively). These results also show that participants exposed to the terms "déréglement" and "changement" still preferred the term "réchauffement". It can therefore be concluded that "réchauffement" is the term most readily marked and memorised in the mental imaginations of participants. Results from our analysis of quotes confirm the outcome derived by experimental semantics on the relevance of terms ascribed to CC.

4. Discussion and Conclusion

Our experiment explored the impact of linguistic contents of CCC on how people perceive this environmental issue. We can generally conclude that CCC has a direct effect on personal imaginations and perceptions. However, this impact was not an effective way of engaging French people in pro-climatic actions. Conversely, it was effective at increasing their affect and conceptualization on the CC problem. It seemed easier to perceive the risks and existing problems through, rather than the solutions.

Concerning the relevance of the semantics used, these results reveal that the term "*réchauffement*" ("warming") was the most appropriate from a statistical standpoint. This term increased the importance of the problem relative to other societal issues; it also enhanced participants' sensitivity more than the other terms. We can still note however a strong difference in impact among the expressions if we were to calculate their impact on the basis of risk perception and communication objective. For example, results showed that when focusing our communication campaigns on nature, it would be preferable to use the term "*changement*" ("change"), whereas the term "*dérèglement*" ("imbalance") becomes the most suitable in seeking to build a communication campaign focusing on economic aspects. Semantics therefore should be selected depending on the objective and target population. It is important to take the following steps: segment the messages, study the combinations (images and terms), address the audience, and determine how the message should be transmitted in order to achieve an increasingly personalized "*one-on-one*" communication.

By demonstrating that CC is a marketing problem, all stakeholders and NGOs in particular should reset their strategies of communication and find another register that will motivate people to engage in authentic actions to reduce carbon emissions. For effective transmission, a new language it required (new terms), a language for action that will increase the "techno-market" and "sustainable lifestyle" imaginaries called for (Levy & Spicer, 2013), i.e. which support a positive vision and foster technical and scientific ways to reduce the problem. CC must be treated in terms of "packageable solutions" (Williams, 2000). Using solution-orientated framework would help inspire action to reduce CC (Moser & Dilling, 2007). The shift in the emphasis of CC discourses from problem to actions is necessary to increase an optimistic visualization of the problem and to boost sustainable actions. If not, "climate apocalypse" imagination problems, which are already widely presented, will overshadow likely solutions. In short, consumers need to be aware, responsible and know what actions to take in

order to manage the problem (Wells et al., 2011). It is therefore important to stop using climate communications that appeal to terror language and catastrophic future. These communications increase individuals' scepticism, apathy and anti- CC behaviours. Our findings supported the studies that show that the appeals based on negative emotions could backfire and undermine the expected effects and objectives of the messages (Akil et al., 2017 ; Moser & Dilling, 2011; O'Neill et al., 2009).

The decision of eco-friendly consumption is associated with and dependent on the source of self-worth (Brook, 2005), values and norm systems (Fritsche et al., 2010) of the consumer. It is therefore essential to showcase pro-environmental cultures and people's connection with nature (Schultz et al., 2004), as well as green skills in our societies to make the transition towards a sustainable society. It also seems important to increase the carbon labelling of products and services, which will allow the consumer to become more familiar with this environmental consumption system. Increasing the use of ecological nudges also hinders the worsening of CC by steering the consumer towards green acts automatically.

Our work enriches the corpus of marketing literature through the concepts imported from psychology and climatology to explain the impact of CCC on consumer perceptions and intentions to decarbonise. This is the first paper that investigates in detail the interaction between "linguistic semantic" as representations of CC as social marketing tools to increase the involvement of French people on CC issue. This paper is aimed at obtaining the scientific contributions discussed in other disciplines and absent in ours about the causes of consumer inaction against messages related to anti-CC appeals, unlike to studies on tobacco, road safety, alcohol and drugs abuse which are widely explored. Our mission was to contribute scientifically in reducing GHG by guiding and assisting stakeholders and NGOs in particular to create and develop effective communication strategies for low-carbon consumption. The main challenge is to involve consumers in the ecological transition behaviour via innovative communications carried out by stakeholders in the various fields concerned.

Some limitations have emerged in our study that certainly reduces the internal and external validity of our research. The first of these limitations concerns the population studied. We interviewed participants living in the west of France, and the choice (homogeneity of sample) of this population impacts their statistical and geographic representativeness. To reduce the "selection bias" concerning our sample we only chose people from this region. Therefore, the results of our study may not be explored and generalized to all western societies, despite all the precautions we took with regards to their age, gender distribution, socio-professional category and scales translation. The second is in relation to the stimulus used. In this research, the participants were presented with a text dealing with climate issues.

This text may have induced certain participants to respond positively to validate our hypotheses or to feel valued socially in our eyes and/or in society. In effect, this limitation doesn't impact negatively the internal validity of this research because our goal is to examine the ranking of the importance of CC in relation to the expressions used and not to other problems in society. As a result, the adverse effects on the internal validity of the study are non-existent. This study has demonstrated the impact of CCC on consumer behaviour perceptions and tendencies to decarbonise. It would be important for a future research to replicate this study. For instance, we could measure CCCs effect on the buying behaviour of consumers (real acts actions). Another experiment can be considered by adding other expressions also used in the French media, like "atmospheric pollution". A study of word associations between CC visuals and/or expressions like that of a collage would also be relevant for future research. Furthermore, it will be essential to assess the participants' memorization of CC expressions and imagery presented in the media and then analyse the link between their responses and the informational or emotional content of the expressions and images. Again, it is necessary to largely apply this experimental protocol in other European and Francophone countries to see if the results will be confirmed. This will help to test the external validity of our results. Finally, the validity of our research could be increased if the impacts of CCCs on people's behaviours are compared in with those in other regions and cities.

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