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A MIXED-METHOD APPROACH TO INCREASE THE VALIDITY AND RELIABILITY OF SURVEY QUESTIONS

A STUDY OF SOCIAL REPRESENTATION OF BIODIVERSITY

Master thesis in Public Opinion and Survey Methodology

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Abstract

Measures of public opinion in surveys are known to be highly sensitive to apparently small modifications to question wording and format. To investigate this issue this research aimed to test the influence of question wording on the quality of a survey. In particular, the focus was on errors in attitude measurements due to unfamiliarity or complexity of scientific terms used in questions. In order to measure attitude towards biodiversity, the words that respondents associate with biodiversity were first identified, based on statistical analyses of answers to an open-ended question. Items were then composed by these representations of biodiversity. These items were tested in two versions of a questionnaire, which were distributed in January 2015 to urban residents of the canton of Geneva (N = 1'983). Analyses on the 497 respondents showed that the use of social representation of biodiversity to measure individual's attitudes towards this scientific term does not appear to violate validity or reliability criteria. Moreover, the use of more common terms seems to limit errors associated with the measurement of attitudes in several ways. Finally, items designed on the basis of representations of biodiversity seem to provide additional information on respondents' attitudes and behaviour.

Keywords: Errors in attitude measurements, validity, reliability, model of cognitive response, survey satisficing, social representation, terms in survey questions, questionnaire design

Table of Contents

A Mixed-method Approach to Increase the Reliability and Validity of Survey Questions: A Study of Social Representation of Biodiversity. Introduction

In western societies, scientific objects developed in specific "scientific spheres" are often discussed in the public arena. In Switzerland, discussions on "genetically modified organisms" (GMO) are one example. These objects are at a time unfamiliar to the "public". Therefore, people have sometimes no opinion on such scientific objects. Nonetheless, this does not mean that they have no opinion at all, but that the scientific language does not directly activate an opinion about the topic. In order to discuss scientific objects, people use their own vision and words, which often differ from the scientific terms. Therefore, the use of scientific terms in survey questions can lead to errors in attitude measurements, affecting the quality of a survey. In this research, the focus is on measurement errors and response task problems brought by the misinterpretation of a question, which is in particular due to the complexity, vagueness and unfamiliarity of the wording (Blair, Czaja & Blair, 2014). The aim was to try to avoid problems, which can arise when trying to measure peoples' attitude towards an unfamiliar scientific object: biodiversity.

In order to achieve this goal, the use of a Social Representation Theory (SRT) approach is proposed. The aim was to use the objectification – the way we represent something in our mind (Clémence, 2002) – of biodiversity to design attitudinal closed-ended questions. Instead of developing attitudinal items only composed by the complex scientific term biodiversity, I developed items that directly include the wording of respondents.

This research had several theoretical and practical goals (Maxwell, 2000). In particular, I wanted to figure out whether the use of social representation of a scientific topic, instead of the scientific terms, could be beneficial for survey questions by reducing measurement errors. Moreover, I proposed to test and to theorize a quite unstudied way of integrating social representation theories into questionnaire design theory. This research was meant to propose advances for survey methodologists who are interested in scientific or unfamiliar topics. In addition to that, this research also focused on attitudes towards biodiversity, which is a quite

unstudied topic. There were several practical goals associated with this project too. The research was supported by Stéphane Joost's & Alain Clémence's 2014-2015 CROSS project on biodiversity. In addition to that, this research aimed to show that people could have an opinion on scientific topics and support several policies if their "own" language is used.

1. Theoretical Framework

Studies of attitudes and social representation studies are part of two different traditions of research. Whereas the concept of attitudes was mainly developed within the north-American sociology and social psychology traditions, studies on social representations were mainly developed within the European sociology and social-psychology traditions, in particular, through Moscovici studies (1961) in France (Deschamps & Beauvois, 1996). In "Des Attitudes aux Attributions" Deschamps & Beauvois (1996, p.133) argue that: "Nowadays, without really communicating, nor ignoring themselves, both traditions coexist and work on similar topics (free translation)"[1].

As discussed below, many problems and errors can occur when measuring attitudes and representations through surveys, therefore affecting the quality of the data. There is a broad literature on these aspects of data quality (see for example: Biemer & Lyberg, 2003; Blasius & Thiessen, 2012; Dillman, Smyth, & Christian, 2008; Groves, Fowler, Couper, Lepkowski, Singer, & Tourangeau, 2013). In parallel, researches on social representations (see for example: Clémence, 2002; Deschamps & Beauvois, 1996; Kalampalikis, 2003; Moscovici, 1984) propose several tools to study representations trough surveys. While there are few exchanges between both areas of study, the aim of this research is to propose an approach developed within the Social Representation Perspective (SRP) to measure attitudes towards a scientific object – biodiversity.

On the basis of these considerations, the theoretical part of this paper first focuses on the north-American approach by defining the concepts of attitudes and non-attitudes. In addition to that, traditional measures of attitudes and errors, which may occur within this process, are discussed. Within the data quality framework, these errors affect the validity and reliability of the measures. Therefore the two concepts are defined too. The theoretical part then shifts to errors in attitudes measurements related to the questionnaire and survey questions in particular. To address this particular issue, Tourangeau's model of the response process was

[1] Original version : "Aujourd'hui, sans vraiment communiquer, sans vraiment s'ignorer, les deux traditions coexistent et travaillent sur des plates-bandes assez semblables."

used (1984; Tourangeau, Ripps & Rasinski, 2000). This model focuses on respondents' cognition when answering survey questions. It helps to understand measurement errors associated with the questionnaire, in particular, through the theory of survey satisficing (Krosnick, 1991).

As the SRP is proposed to investigate these measurement errors, the next section of the theoretical part consists in describing this approach. Therefore, social representations and the concepts of objectification, anchoring and central core are defined (Buschini & Kalampalikis, 2001; Deschamps & Beauvois, 1996; Moscovici, 1984), followed by an outline on the methodology proposed to measure representations through the "hardware" of language (Clémence, 2002; Deschamps & Beauvois, 1996). Finally, potential errors associated with measuring Social Representations (SR) in surveys are presented. The last part of the theory focuses on presenting a combination of both traditions, via my research question, on the specific topic of biodiversity.

1.1 Attitudes and Errors in Survey Questions

1.1.1 Definition and Measurement of Attitudes

The concept of attitude can be defined in many different ways. Indeed, there is no universally accepted definition of attitudes. According to Alwin and Krosnick (1991 b, p.139), "an attitude is a latent, unobserved predisposition to respond along a positive or negative dimension toward an attitude object". Moscovici (1961) also shared this view as he considered the polyvalent concept of attitudes as a latent variable (Moscovici cited in Deschamps & Beauvois, 1996). Within the social representation theory framework, Clémence (2002, p.4) defines an attitude as "position statement embedded into opposite social relationships" (free translation)[2].

The attitudinal object, which can be concrete (e.g. cars) as well as abstract (e.g. biodiversity) (Haddock & Maio, 2008), is a central element. The object brings attitudinal considerations on: affects, judgments, intention of actions and behaviours (Montmollin, 1984, p.134). As explained by Montmollin (1984), the relationship between these elements is considered in many different ways by researchers. For many, affect is the central component of attitudes. For example, Eagly and Chaiken (1993, p.1) define an attitude as "a

[2] Original version: "prise de position imbriquées dans des relations sociales opposées".

psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour", which can differ in strength and valence (or direction). Haddock & Maio (2008, p.114) also share this view as they consider that "any stimulus that can be evaluated along a dimension of favourability can be conceptualized as an attitude object".

Rosenberg and Hovland (Deschamps & Beauvois, 1996, p.28) propose another less restrictive model by integrating the affective, cognitive and behavioural components of attitudes. According to these authors, the affective component is related to positive or negative evaluations of an object. It is about emotions and feelings that are associated with an attitudinal object. The cognitive component is related to individuals' knowledge about an object. It gathers information, judgments and beliefs associated with an attitudinal object (Montmollin, 1984). Finally, the behavioural component is related to past and future behaviours towards the object. It is associated with intention of action towards this latter (Deschamps & Beauvois, 1996). This model has the advantage to link affects, cognition and intention to act.

In this research, attitudes are considered as latent predispositions, which can for some people on some topics be inherently unstable, despite the conventional ideal of fixed and stable "true attitudes" (Zaller & Felldman, 1992). The focus is on measurement of the affective component of attitudes through different measures of intensity and direction of opinions. Therefore, in the following parts of this article, by measurement of attitudes, I mainly meant measurement of the affective component of attitudes. These measures were associated with the behavioural component of attitudes – intention of action and past actions – and actual behaviours too, where attitudes are considered as predictors of behaviours (Deschamps & Beauvois, 1996).

Measurement of attitudes

The aim of many surveys is to measure attitudes towards an object. When measuring attitudes, one can focus on their direction (pro *vs.* con) but also on their strength, differentiating between strong and weak attitudes. Strong attitudes are persistent over time, less subject to change and have more profound impact on information processing and behaviours. On the contrary, weak attitudes are more vulnerable to change and almost have no impact on individuals' cognition and behaviour (Krosnick & Abelson, 1992; Krosnick, Boninger, Chuang, Berent, & Carnot, 1993). These characteristics of attitudes have to be taken into account in surveys.

There are many dimensions of attitude strength that can be measured in surveys. Krosnick and Abelson (1992) focus on five dimensions: extremity (degree of favourableness or unfavourableness); intensity (strong affective responses or little emotional reaction); certainty (degree to which an individual is certain that his attitude towards an object is correct); importance (degree to which an individual considers an attitude to be personally important to him or her); and knowledge (amount of attitude-relevant information towards an attitude object). Each of these dimensions can be measured through survey questions.

There are two major types of survey questions: open-ended and closed-ended formats. The latter is often preferred for measuring attitudes. Open-ended question formats "provide a blank space or box where respondents type or write in their response using their own words, whereas closed-ended question formats or scalar questions provide respondents with a list of answer choices from which they must choose to answer the question" (Dillman et al., 2009, p. 72). Open-ended questions have the advantage to allow respondents to freely answer the question. Thus, open-ended question format does not influence respondents' answers by providing a set of answer choices (Dillman et al., 2009), limiting answers to those the researcher thought of, as do closed-ended ones (Fowler, 1995). It allows the collection of rich, detailed information from respondents and is useful when one inquires about topics on which little information is known (Fowler, 1995). Open-ended question format also has many limitations: it is more cognitively demanding for the respondents who could end up skipping the question; it is dependent on the respondent's ability with words; the answers must be entered and coded (Fowler, 1995). Indeed, according to Blair, Czaja and Blair (2014, p.193), "after the survey is over, the researcher is still a step away from having results that can be analysed quantitatively". These disadvantages lead surveyors to often prefer closed-ended question format, which can be analysed immediately (Dillman et al., 2009). Both types of question formats are included in this research.

1.1.2 Errors in Attitude Measurement: Validity and Reliability Issues

This part focuses on errors in attitude measurement through survey questions in relation to respondents' cognitive work. Before discussing this specific problem, errors, validity and reliability issues are defined within the data quality framework.

When measuring attitudes through survey questions several errors can arise. It is useful to understand the measure, the observed score (y), as a function of the true score (τ) and a random error (ε) (Krosnick, 1991):

$$y = \tau + \varepsilon$$

This formula helps to conceptualize the two different kinds of errors that can arise in surveys: systematic and random errors. *Systematic errors* are associated with the bias of a measure and *random errors* with the variance. The bias is due to errors that tend to agree; the observed scores (y) are different from the true score (τ) in a systematic way among the respondents. For example, the observed scores can always be lower than the true score – i.e. respondents often tend to report a lower weight than their actual weight. When the variance is due to errors that tend to disagree, there is a random error (ε), which is different between the measures (Biemer & Lyberg, 2003), for example, when recoding the data, some processing errors can occur.

These two kinds of errors can help to understand measurement errors. Systematic and random measurement errors can arise from mistakes in conceptualization of the attitudinal object; others errors from characteristics of the data collection process (Herbert, 1984). In other words, a person's observed score on a given measure consists of their true score on the underlying construct of interest, but also of errors associated with the method of measurement (Roberts, 2010). Errors are often associated with the psychometric concepts of validity and reliability of the data. These latter are quality criteria of measurement.

Validity is related to the relationship between the abstract object and the concrete measure. Since a construct is something vague, one has to find ways to operationalize it in order to measure it. There are several types of validity: content validity, criterion validity and construct validity. *Content validity* indicates to which extent the content of the items is representative of the domain of the study. *Criterion validity* is about the empirical correlation between the predictors and a criterion, which should represent the construct. There are two types of criterion validity: *predictive validity* (the criterion is measured after the predictor) and *concurrent validity* (measures are made in the same study at the same time). Finally, construct validity is about the relationship between the construct and its operationalization (Capel 2009; Huteau, 2006). Through survey questions one can intend to measure attitude towards an object. This measurement can either be a direct attitudinal question or several

items that are combined together to measure an attitude. A test is valid when it measures what it is intended to measure, i.e. the construct of interest and not some source of systematic error (Groves et al., 2009; Huteau, 2006; Roberts, 2010). Measurement invalidity is the systematic difference between the observed scores (y) and the true score (τ).

Reliability asks whether the same measurement would be obtained (using the same question) on repeated occasions (Roberts, 2010). It is the discrepancy between ideal measurement and the actual answer (Groves et al., 2009). Reliability is not about the relation of validity between y and τ. It is mainly about random errors (Huteau, 2006) that can arise during the measurement process. This is about the comparison between different surveys that intend to measure the same thing using the same questions. In a survey, some random errors can arise and these latter can be different in another survey, even if the questions are the same. For example, the population being studied can be different and the characteristics of the population can affect the measures differently. Thus the variance of the observed scores will be different from the variance of the true score due to the errors that differ (Krosnick, 1991). There are several ways of measuring reliability. The Cronbach's alpha coefficient, which measures the homogeneity of comparable items, is such an indicator (Huteau, 2006). Whereas validity is about the move from construct to concrete measures via survey questions, reliability is about the respondent and his characteristics that apply when answering the questions.

Reliability and measurement validity are closely related and often difficult to differentiate. Reliability is a necessary condition for empirical validity (Krosnick, 1991) and validity also affects the reliability. Indeed, the greater the validity, the more likely it is to produce the same and reliable answers on repeated occasions (Roberts, 2010).

1.1.3 Measurement Errors and Questionnaire: Non-attitudes, Model of the Response Process, and Survey Satisficing

Measurement errors are, in many surveys, related to the questionnaire, which can be seen as the medium of communication between the researcher and the subject (Brace, 2004). In this research, the focus is made on measurement errors related to the respondent and his/her cognitive work when answering to close-ended survey questions. When respondents answer survey questions, several response effects can arise and affect variability in responses to direct attitudes measures. Response effects are "the impact on people's attitude self-reports of subtle

changes in an attitude question's wording, format, or placement in a questionnaire" (Krosnick, 1992, p. 191).

There are several sources of variability in responses that can lead to measurement errors and affect the quality of a survey. One was first described by Converse (1970). According to him, people may not have a pre-existing opinion on the topic, but, instead of saying that they have no opinion, they pick "on the spot" one among the offered response alternative (Roberts, 2010) or make a choice driven by the structure of the question (Krosnick, 2002). This is called non-attitudes reporting. Therefore, attitude reports, which do not reflect pre-existing attitudes towards an issue and lack coherence, have been referred to non-attitudes (Roberts, 2010). Reporting of non-attitudes can be interpreted in many different ways. The focus here is made on reporting of non-attitudes due to satisficing, meaning the respondents do not perform the cognitive work necessary to report the true opinion they do have (Krosnick, 2002).

Model of response process and satisficing

Answering to survey questions entails cognitive work for the respondents. The model of the response process (Tourangeau & al., 2000) theorizes the respondent's cognitive work. The latter can be divided in four major steps: comprehension of the item; retrieval of relevant information; use of that information to make required judgements; selection and reporting of an answer. According to Tourangeau et al. (2000), specific mental processes might occur within the comprehension component, which consists in: attending to questions and instruction; representing logical form of questions; identifying question focus; linking terms to relevant concept.

This cognitive work is especially important for attitudinal questions. Indeed, attitudes, as latent predispositions towards an object, can sometimes be easily retrieved and reported because they are stored in memory, but, in other cases, they are not consolidated in memory. Respondents have to: find the relevant concepts, distinct ingredients and considerations; combine them in order to report an attitude (Krosnick, 2002). Thus, if people do not have pre-consolidated opinion in memory about the issue, they have to make the cognitive effort to construct their evaluation on the spot.

Satisficing theory focuses on respondents who do have relevant considerations available in memory but do not integrate these considerations and conduct the cognitive work to construct an overall evaluation. Respondents who perform carefully the four steps of the model of Tourangeau "optimize" (Krosnick, 1991). More often, they will not conduct each of these steps and will "satisfice" (Krosnick, 1991).

The likelihood of satisficing is a function of three factors. The first one is the task difficulty of a question. Some questions can be difficult to interpret and are especially likely to provoke satisficing (Krosnick, 1991). The problem of misinterpreting a question can be, for example, due to grammatical ambiguity of the study architecture – a question could map onto two or more underlying representations, be excessively complex, address vague concepts, unfamiliar terms or terms that are understood in different ways by the respondents (Blasius & Thiessen, 2012; Blair, Czaja & Blair, 2014; Groves et al., 2009; Tourangeau et al., 2000). The retrieval, judgement and response's selection stages of the model of Tourangeau (2000) can also be difficult for the respondents (Krosnick, 1991).

The second factor is respondent ability. Indeed, respondents' attributes, such as their verbal skills or their ability to retrieve the information, also affect the data quality (Blasius & Thiessen, 2012). For some respondents, the cognitive work is easier, because they have a higher training and learning experiences or because they have a higher amount of experiences on the topic. Finally, respondent ability is also dependent on the degree to which an individual has a pre-consolidated attitude on the issue in question (Blasius & Thiessen, 2012).

The third factor is the respondent motivation. It depends on how much the topic is personally important to the respondent, but also on how much the respondent thinks that his answer is important for the survey. Interviewer behaviour, accountability and length of the interview/questionnaire also affect respondent motivation (Krosnick, 2002). When ability and motivation are at their minima and task difficulty is at its maxima, respondents will be inclined to implement strong satisficing (Krosnick, 2002).

There are many response strategies that might reflect satisficing. A satisficing respondent might: select the first response alternative that seems reasonable, agree with an assertion made by a question, endorse the *status quo*, fail to differentiate among a set of diverse objects in ratings, saying "don't know" instead of reporting an opinion, and randomly choose among the response alternatives offered. This latter response alternative also called "mental coin-flipping" (Krosnick, 1991a), applies when respondents randomly choose from among response alternatives offered by a closed-ended question. Random responding is a form of satisficing, which is relevant to the reporting of non-attitudes as it leads to a lack of attitude constraint, i.e. weak relations between beliefs that ought to be related, affecting the data quality.

Specific case of errors in measurement of attitudes towards scientific objects

The problems described above are also a factor of the nature of the attitudinal object. Indeed, several objects due to their complexity or unfamiliarity – such as scientific objects – can be characterised by heading a high cognitive work for the respondents. The language used in surveys being one component of task difficulty (Blasius & Thiessen, 2012), such questions on unfamiliar scientific topics are often characterized by a high task difficulty, as the term is complex and ambiguous for many respondents. Moreover the characteristics of such questions – task difficulty and unfamiliarity – imply that respondents' ability will affect the quality of group comparison. In addition to that, educated respondents often have greater "cognitive skills" and are also likely to have more experience filling out the questionnaire. For this reason, one would expect that the responses of the more educated should be less affected by survey characteristics. Therefore the characteristics of questions on scientific unfamiliar topics can not only affect the quality of the data in general by leading to more survey satisficing, but can, as respondents will be affected differently by the difficulty of the task, also affect the quality of group comparison. In this case, task difficulty interacts with respondent ability, question difficulty having more impact among the less educated (Blasius & Thiessen, 2012; Holbrook, Krosnick, Moore, & Tourangeau, 2007; Krosnick & Alwin, 1987). This means that for traditional measures of people's opinion about scientific unfamiliar topics, which include directly the scientific term in the question – i.e. the Eurobarometer on biodiversity –, the likelihood of satisficing is higher because the cognitive demand is higher.

To sum up this part on attitudes measurements, one could say that measurements of attitudes through a questionnaire can lead to several errors affecting the total quality of a survey. The focus in this research is on question wording and format, which affect measures of attitudes in surveys. When the question is too complicated for the respondents, they may face problems in understanding and answering the question. In particular, the complexity or vagueness of the terms associated with the attitudinal object, which enhance the difficulty of the question, may lead respondents, especially those with a lower ability, to satisfice. This behaviour can be reflected through several response styles, which will affect the quality of a survey. These problems are particularly likely to occur with surveys on attitudes towards scientific topics, as scientific objects often are complex and ambiguous for respondents.

Scientific topics are one of the objects of study in the social representation perspective.

When one is interested in measuring attitudes towards an unfamiliar scientific object, which can be considered in many different ways by people, one is talking about social representations. Several approaches and methods were developed within the social representation's field to deal with such objects (Bauer & Gaskell, 1999; Buschini & Kalampalikis, 2001; Clémence, 2002; Deschamps & Beauvois, 1996; Doise, 1989; Doise, Clémence, & Lorenzi-Cioldi, 1996; Moscovici, 1984). In this paper, it is proposed to apply these methods to face errors in attitude measurements towards unfamiliar scientific topics, as the aim of social representation is "to make something unfamiliar, or unfamiliarity itself, familiar" (Moscovici cited in Buschini & Kalampalikis, 2001, p. 202). The following part focuses on presenting the social representation approach and methods.

1.2 A Social Representation Perspective

1.2.1 Definition, Concepts and Methods

The social representation perspective (SRP) deals with knowledge and its circulation in general. According to Flick (2001), Serge Moscovici (1961) introduced the social representation approach to social psychology. Moscovici (1982, p. 139, cited in Buschini & Kalampalikis, 2001, p. 202) considered that this field was about "the genesis of naïve psychology" and studying "what happens when there are transformations from one way of knowing things to another way – for instance form science to common sense – and what effect these transformations have on communication and action". In other words, SRP focuses on the diffusion of information from the scientific sphere to the public sphere but, more generally, the interaction between the scientific sphere and the public sphere (Clémence, 2002). Thus social representation theory (SRT) focuses on the transformation of scientific information during its diffusion and how an unfamiliar topic becomes salient within the common knowledge (Elejabarrieta, 1996). It distinguishes between two modes of thinking: science and common sense. According to SRT, scientific mode of thinking is characterised by informative thinking – the reference standard in science, which is dominated by the search for empirical validity, abstract concepts, and the use of an expert vocabulary–, whereas common mode of thinking is characterised by representational thinking – it is the typical everyday thinking and is dominated by consensual validity, symbols, and images and it tolerates all forms of vocabulary (Courvoisier, Clémence, & Green, 2011; Moscovici & Hewstone, 1984).

The transformation of informative thinking into representative thinking is conceived in terms of objectification and anchoring.

Objectification is about the process of transformation of information when introduced in various social contexts (Clémence, 2002). In general, it is the concretisation of an abstract object (Elejabarrieta, 1996). Within these terms, a parallel between the SRT concept of objectification and the methodological concept of operationalization could be made as both concepts are about the concretisation of abstract concepts. Objectification of complex objects, such as a scientific concept, can be divided into several steps. The first step is called the iconic transformation. Within this process, some information is selected from the object and decontextualized from the source. Then the abstract entity is materialized and simplified through an image, a figurative scheme. The second step is the process of naturalization where these elements become part of the reality in itself, separated from the object (Elejabarrieta, 1996; Jodelet, 1984).

Anchoring consists of the incorporation of unfamiliar events in a familiar universe of prior beliefs, knowledge, and attitudes (Clémence, 2001; Elejabarrieta, 1996; Purkhardt, 1993). Two modalities can help to understand anchoring. The first one is the integration of new information into a pre-existing known reference framework and prior belief system (Elejabarrieta, 1996; Courvoisier et al., 2011). The second one is the social instrumentalisation of the object. It is the diffusion of this adapted new information (Courvoisier et al., 2011). It allows the insertion of representations in social dynamics by providing communication tools of mutual comprehension. Therefore anchoring allows members of the same group to communicate together with the same language (Elejabarrieta, 1996), the objectification of the scientific term.

Abric (1984) developed the notions of central core and peripheral elements to help understand the structure of a social representation. According to him, each social representation is composed by a *central core* – central stable elements which give sense to the representation and are common among members of the same group– and *peripheral elements* – which protect the stability of the central core and allows groups adapting themselves to specific situations by integrating individual experiences (Abric cited in Elejabarrieta, 1996; Abric & Flament, 1996).

Within this theoretical framework, several methodological approaches to catch the structure of the objectification and to give account of the contextual anchoring have been proposed (Clémence & Lorenzi-Cioldi, 1996). One of these methods focuses on the

discourses and the words associated with the representation by the individuals (Kalampalikis, 2003)[3]. Within this methodological approach, words are considered as mode and medium of representations. They are considered as objectification, concretisation, of a scientific concept. The words associated with the concept in question will, by the process of anchoring, differ depending on the prior knowledge and belief system of the individual. This method, called "social representations' methodology" in this dissertation, allows identifying, through answers to open-ended questions, the representations of a concept and its structure among respondents. Such measures, based on open-ended questions, are often characterized by high item non-response affecting the validity of the measures (Dillman et al., 2009; Scholz & Zuell, 2012). The cognitive process described for measures of attitudes (Tourangeau & al., 2000) also works for open-ended questions and helps to understand item non-response. When answering to open-ended questions, the respondent has to: understand the question, retrieve the information and note the adequate information. The likelihood of answering to open-ended questions is also a factor of respondents' ability and motivation. Respondents with lower ability and motivation are therefore more likely to fail answering the question. This systematic bias will therefore affect the quality of the data (Krosnick, 1991a; Scholz & Zuell, 2012).

1.3 Social Representation's Methodology and Errors in Attitude Measurement: the Case of Biodiversity

1.3.1 Social Representation's Methodology and Errors in Attitude Measurement

The focus on words allows linking SRT approach with questionnaire design theory and measurement errors. Indeed, according to Groves et al. (2009, p .460):

> "Words in survey questions are shorthand, an utterance that is meant to evoke in the respondents' minds a consistent image. Words are imperfect mechanisms to perform this task because, as any dictionary exhibits, they have more than one meaning. One source of variability in response error over persons interviewed may be associated with different meanings given to words in the questions. One obvious way to eliminate this source of error, is to choose words with unambiguous meaning, but that goal may never be attainable".

[3] A more complete explication of this method can be seen on pp. 26-27

As discussed above, social representation perspective also deals with words. According to Pepitone (2001, p. 158) the object of SRT, circulation of knowledge, "includes the hardware of language and such software as beliefs, values, attitudes and ideologies".

Several methods are used to identify the structure of representation of a concept. The method used in this research can be divided into two parts. The aim of the first part of this social representation methodology is to identify each objectification through words associated by the respondents with the scientific term. The aim of the second part is to understand the anchoring of the concept among the different respondents. For this part, instead of asking questions designed with the scientific term, which is subject to different representations, its objectification is used. The same method could be applied to avoid invalidity and measurement errors. Indeed, one could construct questions using the different words associated with the forms of objectification, which is thus the operationalization, to measure attitudes and anchoring.

In this research, an application of this method to limit measurement errors due to the questionnaire design is proposed. As mentioned above, the problem of misinterpreting a question – e.g. due to grammatical ambiguity, complexity, vagueness or unfamiliarity of the terms – can lead to measurement errors (Groves et al., 2009; Rips & Masinski 2000; Tourangeau et al., 2000). Identifying the objectification and anchoring of a social representation is also about specifying complex, too vague and unfamiliar scientific terms. The approach used in this research was to integrate social representation theory and methodology in questionnaire design and survey satisficing theory.

Having these considerations in mind, one could ask the following questions: To which extent can one limit measurement errors in particular due to reporting of non-attitudes associated with a scientific object by using social representation theory? In which ways, might the use of the concepts of objectification and anchoring simplify respondents' response task? Could we consider that using directly the "common" representations of an object in survey questions to measure attitude towards this latter might limit measurement errors due to complexity of a question?

Application of the methodology on a scientific concept: biodiversity

In order to answer this question, I wanted to explore the extent to which this method and approach might be useful. Thus, I decided to test the latter on a scientific topic, biodiversity. Studies on scientific topics, such as biodiversity, can be framed within the Public Understanding of Science (PUS) perspective. PUS is about understanding of scientific manners by non-experts (Burns, O'Connor & Stocklmayer, 2003). Within this perspective, the so-called "deficit model" is quite central. It assumes that a lack of public understanding or scientific knowledge has led to a climate of scepticism toward science. This means, reversely, that scientific knowledge leads to positive attitudes and behaviours towards the scientific object (Sturgis & Allum, 2004). The deficit model has been criticized by several authors who endorse a contextualized perspective (Irwin & Wynne, 1996; Kerr, 1998; Michael, 1992). These authors have pointed out the fact that other knowledge domains, and not only scientific knowledge, influence attitude towards science (Sturgis & Allum, 2004). Within this perspective, authors argue that survey-based quantitative approaches are not a sufficient instrument to catch public's knowledge and attitudes as "surveys take the respondent out of their social context and are intrinsically unable to examine or control analytically for potentially variable, socially rooted meanings that key terms have for social actors" (Wynne, 1995).

Therefore, one could say that measures of attitudes and knowledge through surveys sometimes lead to bias and unreliability of the measures, due to the presence of scientific knowledge and terms instead of more common contextual terms and meanings. As argued by Sturgis and Allum (2004), integrating this perspective within a survey-based quantitative analysis is a key issue, as one has to find satisfactory and reliable operationalization of the knowledge domains. In this research, I try to address this issue by using the SRP to measure attitudes through surveys. I argue that attitudinal questions designed with scientific terms, such as biodiversity, might reduce measurement quality because the scientific term used in questions is too complicated and has different meanings for the respondents. Facing these problems, I propose to use representations of biodiversity instead of the scientific concept.

When people try to understand this "relatively new" scientific concept, they use already existing representations of more familiar objects, such as nature and landscape (Buijs, Fischer, Rink & Young, 2010). These representations can differ from the "scientific"

definition of biodiversity. Biodiversity is a concept, which comes from the "scientific sphere". Initially:

> "Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems." (Convention on Biological Diversity 1992).

This initial definition already included many different components and potential representations. In this research, I wanted to capture what people think of when they hear the term biodiversity to find more about the ways they objectivise and anchor biodiversity.

In addition to the fact that biodiversity is an interesting object of social representation on which I could test my question design approach, biodiversity is also a relevant object to study *per se*. Indeed, nature conservation and biological diversity conservation are central in public opinion. Many policies are directed towards environment and this topic. As argued in Buijs et al. (2010, p. 65) paper:

> "Lack of public support for, and protest against, biodiversity management measures have often been explained by the apparently inadequate knowledge of biodiversity in the general public. In stark contrast to this assumption of public ignorance, our results from focus group discussions in the Netherlands, Germany and Scotland show that members of the general public use very rich and complex social representations of biodiversity to argue for particular approaches to biodiversity management".

Several studies have already focused on the social representation of biodiversity (Buijs, et al., 2010; Home, Bauer, & Hunziker, 2010; Hunter & Brehm, 2003). For example, Buijs et al. (2010) used focus groups to objectivise the different representations of biodiversity. Several surveys already measured individuals' attitude towards many aspects of biodiversity. For example, the Eurobarometer conducted a survey to measure attitudes towards biodiversity in 2013[4]. Most questions asked in the Eurobarometer directly used the scientific term biodiversity and a definition was proposed. This study aims to identify these representations and to develop survey questions that could measure – using public representations instead of the scientific term– attitude towards the latter.

[4] http://ec.europa.eu/public_opinion/flash/fl_379_en.pdf

In this research, one general question was asked. To which extents can the use of social representation of biodiversity, to measure individuals' attitudes towards this scientific object, limit measurement errors associated with reporting of non-attitude and problems due to a lack of information on individuals' considerations? I tried to answer two more specific questions. In which ways can validity and reliability of items that involve the representation of biodiversity be assessed? In which ways can items using words associated with the representation of biodiversity limit measurement errors found in questions –for example in the Eurobarometer – that include the scientific term instead of its representation?

In order to answer these questions, a two-phase mixed model study was conducted (Tashakkori & Teddlie, 1998). The first phase of the study was a qualitative one, whereas the second phase was quantitative. I first used qualitative data – answers to one open-ended question – to explore the structure of representation. These data had already been collected by Joost & Clémence in 2014 in the context of a Collaborative Research on Science and Society (CROSS) research project on biodiversity. Their target population was the urban residents of Geneva. They mailed (and with the possibility to answer on Internet) a questionnaire composed by one open-ended question in the beginning ("Quels sont les mots ou expressions qui vous viennent à l'esprit quand vous pensez à la biodiversité?") and several closed-ended questions on biodiversity, health and environment (N_R = 351). I "quantified" the qualitative answers of the open-ended question (Stoneman et al., 2012) using statistical procedures encoded in the software package IRAMUTEQ[5]. This analysis allowed structuring the words into thematic classes. With the results, I developed items, composed by words that were given by the respondents, to measure attitude towards each identified representation of biodiversity. By already providing representations of biodiversity to the respondents – thus limiting problems in measurements due to a lack of information on respondents' considerations –it was expected to limit measurement errors due to survey satisficing. In order to control this expectation, an experimental survey was conducted on a splattered sample of 1'984 urban residents of Geneva (N_R = 497). More precisely, I developed two similar versions (A and B) of the questionnaire (see annex). Both versions contained items designed with the words associated with biodiversity by the respondents of Joost's and Clémence's study. There were slight differences between version A and B. The main idea was to compare the answers to version A of the questionnaire, which only involved representations and definitions of biodiversity to version B, which involved the scientific term "biodiversity" without any

[5] http://www.iramuteq.org

definition. This allowed me to identify and compare reporting of non-attitudes and measurement errors associated with the questionnaire.

The next parts of this paper are divided into two main sections. The first section is dedicated to the first study (Joost & Clémence study). The target population and sample are first presented, followed by a discussion on modes of data collection and fieldwork. Then the measures are described. Finally, the analyses and results are discussed and used to design items for the second study. The second section is dedicated to the second study. The mode of data collection is first presented, followed by a description of the target population and sample. Then the measures, as much as hypotheses based on results of the first study, are discussed, followed by an overview of the fieldwork. Finally, analyses, results and their discussion are presented.

2. First Study: Greentrace Research Project on Biodiversity

2.1 Method

2.1.1 Target Population and Sample

The sample was randomly selected on the basis of geographical criteria. More precisely, they selected a sample of individuals who previously agreed to take part in a survey led by the "Unité d'épidémiologie populationnelle" (UEP) in Geneva. Each year, the UEP takes a stratified random sample of 1'000 residents of the canton of Geneva. 950 respondents of the UEP sample who live near from five transects – path along which records of biodiversity have been made – of the Canton composed Joost & Clémence sample.

2.1.2 Mode of Data Collection and Fieldwork

The data were collected with a self-completion mode of data collection. Respondents were given the possibility to either fulfil a postal survey – a paper-based questionnaire was sent by post to the respondents – or a web survey – a web survey was also proposed to respondents whose email addresses were available. The first questionnaire was delivered in March 2014. From the 954 sampled people, 357 (N_{valid} = 351) responded to the questionnaire (42.2% of response). The response rates for the web and post surveys were respectively of 42.7% (205 over 554) and 41.5% (152 over 396).

2.1.3 Measures

The aim of the study was:

> "To understand how biodiversity is understood and represented by the residents, how they evaluate the level of biodiversity in their neighbourhood, what is the relative importance of biodiversity in their quality of life, and how they comprehend a biodiversity indicator based on intangible elements (genetic diversity)." (Joost & Clémence, 2013, p. 13)

To achieve this goal, the questionnaire was composed by several questions including one open-ended question, the first question of the questionnaire, related to biodiversity. The question asked was "Which words or expressions come to your mind when you think of biodiversity"[6]. In addition to this open-ended question, several questions on biodiversity (knowledge, attitudinal scale) and respondents' health status were asked. Moreover, the respondents were asked to provide additional social demographic information (age, gender, nationality, educational level, political wing, urban-rural feeling).

2.1.4 Analysis explanation

Using the measures described above, several analyses were conducted. First, I reviewed the socio demographic characteristics of respondents of the first survey[7].

The words given by the respondents were then recoded and several statistical procedures encoded in the software package IRAMUTEQ[8] were applied. I used a linguistic approach based on lexical worlds, in other words the discursive material (Kalampalikis, 2003). In simplified terms, this means that, according to linguistic theories, when several words are mentioned together, there is a verbal association, which often suggests that they are also associated thematically (Kalampalikis, 2003).

IRAMUTEQ allows clustering verbatim responses to open survey questions to reflect common underlying narrative structures (Stoneman et al., 2012). It proposes several textual processing and statistical analysis procedures. First of all, it allows to reorganize, *recognize*, words in the corpus – body of text (Stoneman et al., 2012) – differentiating between "full words" and "tool words" (Kalampalikis, 2002). *Tool words* are common functional words, such as preposition, definite and indefinite articles, pronouns (Stoneman et al., 2012), whereas *full words* are words, which are "without their grammatical forms" (free translation)[9] (Kalampalikis, 2002, p. 4). The analyses are mainly based on full words. The next textual

[6] Lorsque vous entendez le terme biodiversité, quels sont les mots ou les expressions qui vous viennent immédiatement à l'esprit? Notez ci-dessous ces mots et ces expressions".
[7] The following variables were used: a continuous variable "Age", which was recoded "Age2" into four age categories: "<30; 30-50; 50-70; >70"; a dichotomous variable "Gender" with answer modalities: Male, Female; a dichotomous variable citizenship; an ordinal variable "Level of education" with answer modalities: "Obligatory school; Apprenticeship, Professional school; Maturity; Higher professional school; University, EPF; a 7-point scale ordinal-metric variable "political orientation" (from strong left to strong right); and a 5-point scale ordinal-metric variable "urban-rural" (from very urban to very rural).
[8] IRAMUTEQ is a textual analysis and data analysis software. It is based on the statistical software R (http://www.r-project.org) and the language pyton (http://www.python.org). IRAMUTEQ (Loubère & Ratinaud, 2014).
[9] Original version: "déshabillés de leur mise en forme grammaticale"

processing is the *Lemmatisation,* which is the "process whereby words and nouns are reduced to their shortest stem" (Stoneman et al., 2012, p. 855). Then, IRAMUTEQ conducts several statistical analysis procedures such as frequencies of appearance of words and co-occurrence of words. The main analysis is called the method Reinert (Loubère & Ratinaud, 2014). This latter is a factorial analysis, which is based on a *Hierarchical descending classification*, a variant of the hierarchical divisive cluster. In this method, all observations, here the words, start in a single cluster and are successively divided (first into the two most different clusters, then three, and so forth…) according to a Chi-square criterion until each is a single-member cluster (Hair, Black, Babin, & Anderson, 2010; Stoneman et al., 2012). It allows structuring the words into classes thus giving information on objectification of the concept analysed. The derived classes are then cross-tabulated with the words in the corpus and are subjected to a correspondence analysis (Stoneman et al., 2012, p. 856). Correspondence analyses are a special kind of canonical correlation analyses. It allows identifying the proximity of words and classes (Stoneman et al., 2012). In other words, it permits to:

> "Analyse the association between categorical variables representing the categories of the variables as points in a low-dimensional space. Categories with similar distribution will be represented as point that are close in space, and categories that have very dissimilar distributions will be positioned far apart" (Clausen, 1998, pp. 1-2).

Finally, some additional analyses were conducted. In particular, the classes, words and demographic information about the respondents were associated together in order to get information on anchoring. In order to see whether socio-demographic characteristics (such as sex, gender, urbanity, education etc.) were associated with a specific class, Chi-2 associations were used (Loubère & Ratinaud, 2014). Finally, using these results, I developed items that were meant to be tested in a second study. Several items were designed for each class identified via the hierarchical descending classification, using the most representative words of each class.

2.2 Results

2.2.1 Respondents

Open-ended question and item non-response

The first question of this questionnaire was an open-ended one. Thus it was interesting to have information on item non-response. The main issue was to see whether some specific individuals tended to be non-respondents of the open-ended question, therefore affecting the quality of the measure. I first looked at the overall distribution of answers to the open-ended question. 85.5% (N = 300) of the respondents answered the open-ended question whereas 14.5% (N = 51) did not.

In order to understand item non-response, I checked for the influence of several characteristics such as version of questionnaire, gender, age, level of education, political orientation, citizenship and urban-rural feeling. Only age and level of education seemed to have an influence on item non-response. Indeed, a Chi-2 independence test for item non-response reported differences between age, X^2 (3, N = 343) = 12.751, p =. 005. Older respondents were more likely to skip the open-ended item than younger respondents. Whereas 90.5% of the youngest respondents (less than 30 years old) answered this question, only 72.6% of the oldest (more than 70 years old) did. A Chi-2 test of independence for item non-response also indicated differences between level of education, X^2 (4, N=331)=18.216, p=.001. Respondents with a lower level of education were more likely to skip this question than respondents with a higher level of education. Indeed, whereas 91.7% of respondents with a university degree answered the first question, only 64% of people with completed compulsory school did.

Distribution of respondents for the open-ended question

The next step of the analysis focused on the open-ended question. The distribution of respondents of the open-ended question (N=300) is thus described[10]. First, 58.3% of the respondents answered the web version of the questionnaire (N=175) whereas 41.7% answered the paper-based one (N=125). The responses rates among modes were quite similar as fewer

[10] In the following parts, by respondents I meant the 300 individuals who answered to the open-ended question.

paper-based questionnaires were distributed (396 paper-based and 554 web questionnaires).

Characteristics of respondents of the open-ended question are displayed on table 1. As a general description, it can be said that most respondents were Swiss, men and held a university degree. The variables *Age, Political orientation,* and *Urban-rural feeling* almost followed a normal distribution.

Table 1

Characteristics of Respondents of Greentrace Open-ended Question (N = 300)

Variables	N	%	Mean	Std. Deviation
Gender				
Male	155	52.7		
Female	139	47.3		
Citizenship				
Swiss	203	67.7		
Other	97	32.3		
Level of education				
Compulsory school	16	5.7		
Apprenticesip/prof. school	74	26.1		
Maturity	24	8.5		
HES	47	16.6		
University/EPFL degree	122	43.1		
Age	293		50.70	17.90
Political orientation[a]	215[b]		3.75	1.62
Urban-rural[c]	288		2.77	0.98

[a] The responses categories are: 1"strong left"… 3"centre" … 7"strong right" [b] The 51 respondents who reported having "no preferences" are not included here. [c] The responses categories are: 1 "very urban" … 3"neither urban, nor rural"… 5 "very rural".

2.2.2 Representations of Biodiversity

Objectification of biodiversity

In order to analyse the data with IRAMUTEQ, it was necessary to code the answers of the open-ended question in a particular way[11]. I first conducted several statistical textual analyses to describe the corpus – the object of study (Reinert, 1990) – and identify potential errors in the recoding. These first results allowed describing the general data. All in all, the 300 respondents wrote 2259 words and 518 of these were different, meaning that one word

[11] This work has been done by A.Clémence.

appeared in average 4.36 times. There were 305 hapax[12] (58.8% of the words). Finally, a respondent wrote, in average, 7.53 words.

The most cited active (meaning full) words were “nature” (N = 128), “espèce”(N = 63), “animal” (N = 62), “plante” (N = 46), “environnement” (N = 40), “diversité” (N = 39), “faune” (N = 34), “variété” (N = 33), “flore” (N = 33), “ vivant” (N = 32), “vie” (N=32), “écologie” (N = 31), “naturel” (N = 30), “végétal” (N = 23), “protection” (N = 23), “équilibre” (N = 21), “ santé” (N = 19), “respect” (N = 19), “écosystème” (N = 17), “durable” (N = 16), “bio” (N = 16), “produit” (N = 15), “richesse” (N = 14), “agriculture” (N = 12), “terre”(N = 11), “préservation” (N = 11), “organisme” (N = 11), “développement” (N = 11), “différent” (N = 10) and “culture”(N = 10). On figure 1, one can see the word cloud, which allows identifying the most central words (on the basis of the frequency of appearance) at one glance.

Figure 1. Word cloud first questionnaire.

The second step of the analysis consisted in looking at the words and the way they were related. Figure 2 shows the relationship between words[13]. This is a clustering analysis based

[12] Words that were only written by one respondent.
[13] All words even the hapax

on a similarity coefficient. Words are linked with a line when the same respondents wrote these words. The more often respondents wrote two words together, the larger is the line. The more often respondents wrote a word, the bigger is the size of the word. The relations on the figure show that the lines outside the core linkage are deleted (for instance between 'faune' and animal' or 'espèce' and 'plante'). This figure allowed identifying several relationships between the words. First of all, words could be structured on the basis of their relationship with three central words: "nature", "animal" and "espèce".

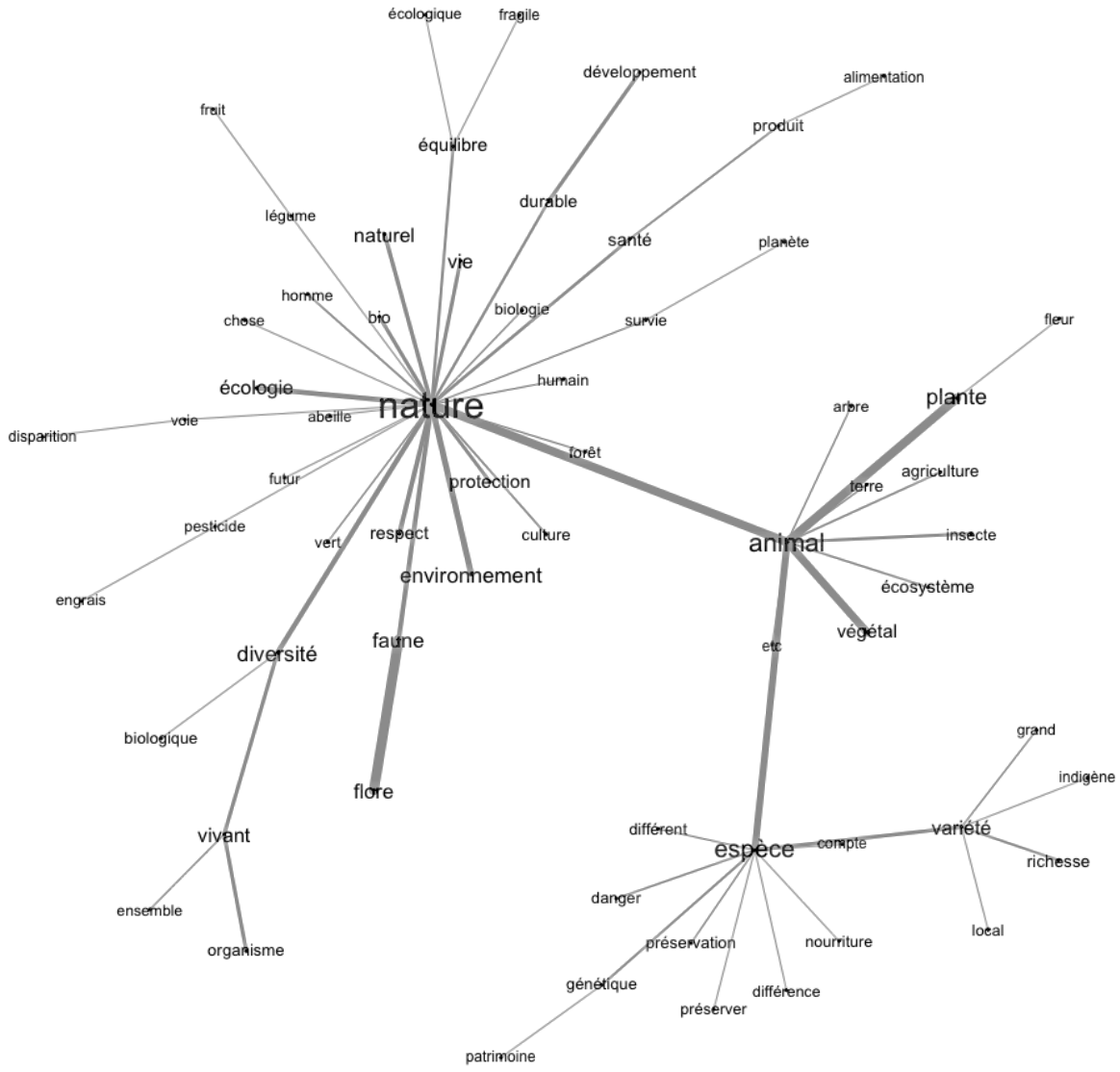

Figure 2. Concordancier first questionnaire.

Representations and structure

The next step of the analysis was to conduct a principal correspondence analysis (PCA). The software IRAMUTEQ conducts a classification method developed by Reinert (1990; 1993). Further explanations were given in the analytical part. I conducted a simple over text segment classification. On the basis of the plot of the PCA (see figure 3), one can say that classes 3 (green) and 4 (blue) were combined together whereas classes 1 (red), 2 (black) and then 5 (violet) were together. With this structure in mind, I could look at the composition of each class.

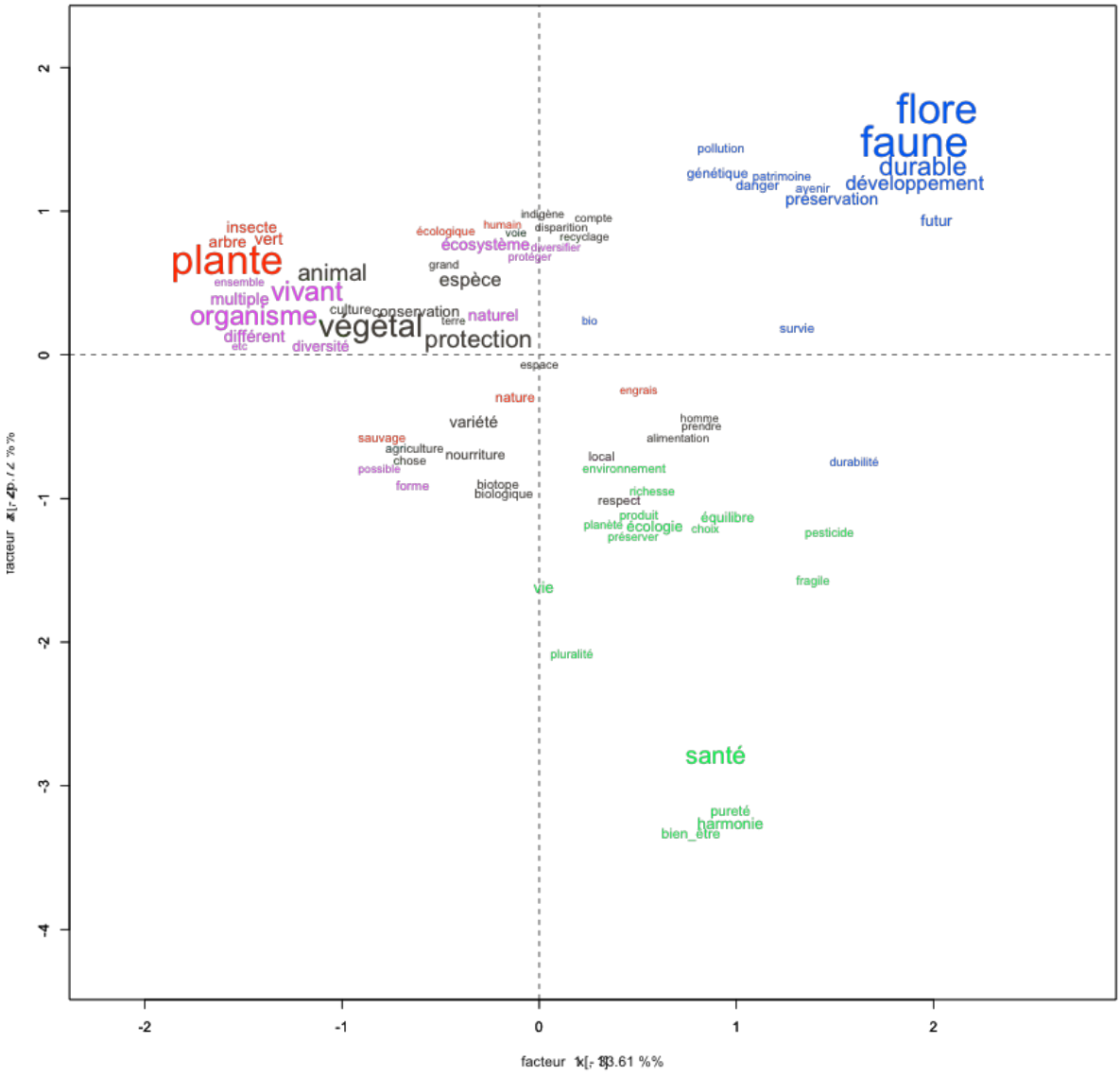

Figure 3. Plot of the principal correspondence analysis (first and second axes).

Class 1 (see table 2) contained 19.7% of the classified units of elementary context (UCE)[14]. The most representative words of the class helped to categorize it (Reinert, 1990). These terms were: "plante, animal, vert, arbre, insecte, nature, diversité et sauvage". In a way, these quite common terms seemed to be part of a definition of biodiversity. I could frame a definition with these words as "diversité que l'on trouve dans la nature (p. ex plante, animaux, arbres, insects, etc.)". Thus, I decided to name this class *common definition of biodiversity*.

Table 2

Description of the Textual Class 1 (1st study): Verbal Forms

Active form	N in class	N total	% in class[a]	χ^2
Plante	30	37	81.1	103.56***
Animal	24	55	43.6	25.58 ***
Vert	6	7	85.7	19.78***
Arbre	4	4	100.0	16.52***
Insecte	5	6	83.3	15.69***
Nature	30	105	28.6	9.07**
Diversité	12	36	33.3	4.92*
Sauvage	2	3	66.7	4.22*

Note. Chi-2 statistics (χ^2) indicate the association between the active forms (words) and the class. A significant Chi-2 indicates that the active form is more often associated by the respondents with the words of this class.

[a] Percentage in class (% in class) = Number of times this active form appears in the class (N in class) / Number of times this active form appears in the whole corpus (N total).

*$p < .05$. **$p < .01$. ***$p < .001$.

[14] *i.e.* Sentences or individual responses

Class 2 (see table 3) contained 17.7% of the UCE. The most active words were "végétal, protection, animal, espèce, variété, conservation, culture, nourriture, respect, biologique, biotope et local". Several elements were inferred from these words. First, words seemed to be less common that the ones of class 1. Moreover many terms were related to a general action of human on nature, for example, protection and conservation of animal and vegetal species. Then, there were some words, less representative of this class, that were related to individuals' every day behaviour to protect nature. These words were: "nourriture, agriculture, biologique, local". I decided to name this class *definition of biodiversity associated with humans' action to protect it*.

Table 3

Description of the Textual Class 2 (1st study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Végétal	18	21	85.7	73.02***
Protection	15	21	71.4	45.57***
Animal	26	55	47.3	42.70***
Espèce	22	52	42.3	27.52***
Variété	13	29	44.8	16.64***
Conservation	3	3	100.0	14.13***
Culture	3	4	75.0	9.17**
Nourriture	3	4	75.0	9.17**
Respect	7	19	36.8	5.19*
Biologique	2	3	66.7	5.00*
Biotope	2	3	66.7	5.00*
Local	3	6	50.0	4.41*

*$p < .05$. **$p < .01$. ***$p < .001$.

Class 5 (see table 4) contained 17.3% of the UCE and was associated with class 1 and 2. The most cited words were "vivant, organisme, multiple, différent, écosystème, naturel, diversité, vie, forme, espèce". These terms could be directly linked with class 1 but also class 2. As for class 1, the terms were mainly related to a definition of biodiversity. Nonetheless, these latter were less common and more prevalent in "scientific definitions". Using the terms I could even find a definition of biodiversity[15]: "Forme de vie multiple, diversité des organismes vivants qui s'apprécie en regardant notamment la diversité de l'écosystème et des espèces". Thus I named this class *scientific definition of biodiversity*.

Table 4

Description of the Textual Class 5 (1st study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Vivant	19	28	67.9	56.62***
Organisme	11	11	100.0	55.14***
Multiple	4	4	100.0	19.46***
Différent	6	8	75.0	19.27***
Écosystème	9	16	56.2	18.19***
Naturel	13	29	44.8	17.47***
Diversité	14	36	38.9	13.80***
Vie	10	27	37.0	8.29**
Forme	2	3	66.7	5.18*
Espèce	14	52	26.9	4.30*

*$p < .05$. **$p < .01$. ***$p < .001$.

By looking at class 1, 2 and 5, one could say that the most important difference was between common and scientific terms. Class 1 regrouped more specific examples that one can find in every day's life (plante verte, animal, arbre). Class 2 regrouped less specific examples, but still quite common. Class 5 regrouped scientific terms. Thus one could say that going from class 1 to 2 and 5 there is an increase of generalization from common terms to scientific terms (for example, "organismes vivants" gathers "espèce animale et végétale" which itself gathers "plantes" and "arbres").

[15] This latter is really similar to the one on Wikipedia, respondents might have copied this definition.

Class 3 (see table 5) contained 24.7% of the UCE. Thus, this was the most important class. The most active words were "santé, harmonie, vie, écologie, équilibre, pureté, bien-être, produit, environnement". The terms were quite different from the ones of the other classes. Indeed, these were less descriptive of biodiversity. The terms were related to humans and their well-being. Moreover it was about humans and their relationship with the environment: "être en bonne santé en menant une vie en harmonie avec la nature". Another dimension of this class could be associated with the words "écologie, produit, environnement". These words were also associated with individuals' everyday (or general) behaviour to protect the environment. I named this class *human/environment relationship: impact of environment on humans and vice-versa*.

Throughout the analysis I also looked for socio-demographic characteristics of respondents that could be associated with each class. For this class, women and highly educated respondents (university degree) were more represented. It would be interesting to see whether respondents of the second questionnaire would also give these words. Since the first questionnaire was given to respondents who agreed to participate in a study on health and well-being, but also that the logo of HUG[16] was on the cover letter of the questionnaire, it was likely that respondents were influenced by these elements and answered to the first question of the questionnaire (the open-ended one) with these elements in mind.

Table 5

Description of the Textual Class 3 (1st study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Santé	17	19	89.5	46.52***
Harmonie	5	5	100.0	15.57***
Vie	15	27	55.6	15.56***
Écologie	15	29	51.7	12.94***
Équilibre	11	21	52.4	9.48**
Pureté	3	3	100.0	9.26**
Bien_être	3	3	100.0	9.26**
Produit	6	12	50.0	4.35*
Environnement	13	34	38.2	3.90*

*$p < .05$. **$p < .01$. ***$p < .001$.

[16] Hôpital Universitaire de Genève

Class 4 (see table 6) contained 20.6% of the terms. The active words were "faune, flore, développement durable, préservation, futur, génétique et danger". These latter were also less descriptive. Moreover these terms were more related to the context and humans' actions. There was also one dimension of risk, "danger", associated with the future. I decided to name this class *global action on nature and consequences for the future.*

Table 6

Description of the Textual Class 4 (1st study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Faune	30	34	88.2	110.73***
Flore	29	33	87.9	105.84***
Durable	14	15	93.3	51.78***
Développement	9	10	90.0	30.76***
Préservation	8	11	72.7	19.17***
Futur	5	6	83.3	14.83***
Génétique	5	8	62.5	8.90**
Danger	5	8	62.5	8.90**
Survie	4	7	57.1	5.90*
Pollution	2	3	66.7	3.95*
Patrimoine	2	3	66.7	3.95*
Avenir	2	3	66.7	3.95*

*$p < .05$. **$p < .01$. ***$p < .001$.

2.2.3 Discussion and Construction of Items

As mentioned previously, one limitation to open-ended question format is the fact that respondents are more likely to skip open-ended questions than closed-ended ones (Dillman et al., 2009). This was the case for this questionnaire. Nonetheless, the difference between the two responses formats was quite low. I checked for item non-response bias and identified two potential sources of bias. Older and less educated people tended to be more likely to skip this question. As answering to open-ended question format is more cognitively demanding for the respondent (Dillman et al., 2009), these results were quite understandable.

Analyses on answers of the open-ended question allowed identifying the structure of the representation and parts of the objectification and anchoring processes (Buschini & Kalampalikis, 2001; Deschamps & Beauvois, 1996; Moscovici, 1984). Indeed, results showed that the representation of biodiversity was composed by a central core and peripheral

elements. These words, as objectifications of the term biodiversity, were then structured into five different classes. On the basis of these results, several items and definitions proposed in the second questionnaire were constructed. The objectifications and anchoring of biodiversity, identified through the PCA, allowed me to design "Attitude towards biodiversity representations" and "Behaviour towards biodiversity representations" items composed with words of each class. By doing so, I aimed to write questions that assessed the extent to which respondents held these representations. The main idea was to construct items based on representations, instead of the possibly too vague or complex scientific term, to measure attitude towards biodiversity in a more reliable way. Table 7 shows the items and two definitions that were constructed, for each class of objectification of biodiversity.

Table 7

Constructed Items and Class of Origin

Items and definitions	Type
Class 1: Common definition of biodiversity	
Je pense qu'il est important de laisser les **jardins** à "**l'état sauvage**" pour permettre aux **insectes** et aux **plantes sauvages** de s'y développer.	Item
Je pense qu'il faut aménager des **"espaces verts"** dans le canton de Genève pour **préserver** les **plantes** et les **animaux**.	Item
La biodiversité correspond à la **diversité biologique** que l'on peut trouver dans la **nature** (p. ex **les plantes, animaux, arbres, insectes etc.)**	Definition
Class 2: Definition of biodiversity associated with humans' action to protect it	
Dans quelle mesure le fait de consommer de la **nourriture** provenant de l'**agriculture biologique** est important pour vous?	Item
En entrant dans un magasin d'alimentation, je me dirige souvent vers le rayon des **produits biologiques**.	Item
Pour ne pas nuire à certaines **espèces animales** et **végétale**, j'essaie de **polluer** le moins possible[a].	Item
Class 3: Human-environment relationship: impact of environment on humans	
Dans quelle mesure le fait de mener une **vie** en **harmonie** avec l'**environnement** est important pour vous?	Item
Dans quelle mesure le fait d'utiliser des **produits écologiques** et **respectueux** de l'**environnement** est important pour vous?	Item
À quel point considérez-vous que **sauvegarder** l'**environnement** est important pour votre **santé** et votre **bien-être**?	Item
Lorsque je jardine ou je fais le ménage, j'évite d'utiliser des **produits chimiques** qui peuvent nuire à l'**environnement**.	Item
Je pense que le **bien-être futur** de l'être **humain** passe par la **préservation** de la **diversité biologique**.	Item
Je pense que, plus la **nature** est **diversifiée** en **espèces**, meilleure est le **bien-être** de **l'être humain**.	Item
Je pense que ma **santé** dépend directement du degré de **préservation** de la **nature**.	Item
Class 4: Global action on nature and consequences for the future	
Dans quelle mesure le fait de **préserver** la **faune** et la **flore** est important pour vous ?	Item
Dans quelle mesure le fait de promouvoir le **développement durable** est important pour vous ?	Item
Dans quelle mesure le fait de considérer l'impact de la **pollution** sur la **nature** est important pour vous ?	Item
Lorsque je vais en **forêt**, j'ai un comportement **respectueux** de la **faune** et de la **flore**.	Item
Class 5: Scientific definition of biodiversity	
Je pense que la plupart de nos comportements ont une influence directe sur **l'équilibre des écosystèmes**.	Item
La biodiversité correspond à la **diversité** des **organismes vivants**. Elle s'apprécie notamment en considérant la **diversité** des **écosystèmes** ainsi que des **espèces animales** et **végétales**[b].	Definition

Note. The words in bold are respondents' owns terms (objectifications of biodiversity(. These were identified and structured into classes through the analyses described above.

[a] This item also included words of class 4. [b] This item also included words of class 2.

3. Second Study: an Application of the Social Representation Methodology

The aim of this study was to test the influence of question wording on the quality of a survey. Arguing that attitudinal questions designed with scientific terms, such as biodiversity, might reduce measurement quality due to the complexity of the term, I proposed to design items based on representations of biodiversity. These *biodiversity representations* items included words associated with biodiversity by respondents of the first study. In addition to that, I designed several items, which directly included the scientific concept biodiversity. These *biodiversity concept* items were in some cases introduced by a definition of biodiversity based on representations. The main idea of this study was to compare both types of items – i.e. based on representations or not.

This second study aimed to test items based on representations by addressing several research questions: To which extents can the use of social representation of biodiversity, to measure individuals' attitudes towards this scientific object, limit measurement errors associated with reporting of non-attitude and problems due to a lack of information on individuals' considerations? In which ways can validity and reliability of items that involve the representation of biodiversity be assessed? In which ways can, designing items, using words associated with the representation of biodiversity, limit measurement errors found in questions – for example in the Eurobarometer – that include the scientific term?

3.1 Method

In order to compare items composed by terms associated with the representation of biodiversity to items involving the term "biodiversity" (with or without a definition of the concept), an experimental survey was conducted. I constructed two different versions of the questionnaire and handed version A to one half of the sample and version B to the other half. I decided for an experimental study to compare differences between two types of questions, questions using the term biodiversity defined with different forms of objectification of biodiversity (version A) *versus*

questions using only the scientific concept biodiversity – i.e. no definition (version B). The experimental study also allows checking for validity and reliability of survey questions. In particular, as secondary data were used to design survey questions, it allows testing whether respondents of both samples shared the same representations.

As for Joost & Clémence study, data were collected using a paper-based self-completion questionnaire. Printed questionnaires were distributed in selected postal boxes (see sample selection below). Respondents were asked to complete the questionnaire and mail it back.

3.1.1 Target Population and Sample

Several reasons led to choose the same target population than the one of the first study. As mentioned previously, representations of respondents of the first study were used to construct attitudinal items tested in this second study. As various populations often do not share the same representations, both studies had to be done on the same target population. Indeed, the more similar respondents of both studies are, the better fitted indicators should be. Moreover, for mixed-methods, in particular, when one is using a triangulation method (Tashakkori & Teddlie, 1998), the comparison between two measures is made easier when the population is similar. Therefore I decided to choose the same target population and tried to get a similar sample respecting the available budget and time, as much as confidentiality issues. The target population was thus composed by residents of the Canton of Geneva who lived close to the five transects[17] in the sampled municipalities of the first study.

As mentioned previously, this second study was an experiment. I wanted to compare whether two different measures, randomly assigned to two equal groups of individuals, could produce different results. Therefore, to ensure getting enough fulfilled questionnaires, an estimation of the ideal sample size was made (Lohr, 2010). The following paired t test formula was used to calculate the ideal total number of respondents by matched samples:

$$n_{tot} = 2\left(\frac{z_{1-\beta} + z_{1-\alpha/2}}{d}\right)^2$$

The R package "pwr" was used to approximate the ideal number of respondents per group[18].

[17] See target population of the first study on p. 24

[18] To estimate the sample size, the power of the test 1-β was set at .8, a satisfactory value according to Champely (2006). Alpha (α), the error of type I, was set at .05. The value of α/2 was used as a two-sided T test was conducted.

Results showed that, in order to identify small differences (d = 0.2) between the two groups at a significance level of 95% (α = .05) and a power of 80% ($1-\beta$ = .8), the total number of respondents should be approximately 400 (two times 199). For self-completion paper based studies, a response rate of around 20% was expected. Therefore, in order to achieve the ideal number of 400 respondents, the questionnaire was distributed to 2'000 residents of the Canton of Geneva.

The sample was selected through addresses of members of the sample of the first study. In Geneva, one could consider municipalities of residence as clusters (Lohr, 2010). Residents of the same municipality often share more similarities with each other than with residents of other municipalities (see Langel[19], 2013 for income and level of social mix among municipalities; Lohr, 2010). Therefore, I decided to use auxiliary information, as the distribution among municipality of residence in the Greentrace sample, to select the proportion of residents by municipality (see annex 2). The sample selection was based on a geographical criterion with a method called "random route" – i.e. the surveyor followed an itinerary to distribute the questionnaire among household's addresses (Carricano & Poujol, 2009). More precisely, buildings or houses were selected in the different municipalities on the basis of their geographical proximity to the five transects. In order to prevent burdening respondents, addresses of respondents of the first study were avoided.

3.1.2 Fieldwork

A3 envelopes containing one questionnaire (version A or B), a prepaid return-envelope, a cover letter and a small chocolate, were distributed in the selected postal boxes between the 5th and the 15th of January 2015. On each envelope a small-personalized etiquette indicated the appropriate municipality of residence. Ideally, I would have distributed the questionnaires to pre-selected addresses, but this was more difficult than expected. Indeed, most of the buildings in Geneva are closed and a code is required to access the postal boxes. I managed to almost[20] deliver the intended number of questionnaires for each municipality in the selected areas, but had to choose addresses by convenience. I thus delivered the questionnaires in buildings that were: open; had accessible postal boxes; or I asked residents to enter. I delivered the questionnaires to almost every postal box of the accessible buildings.

The value of the size of effect "d" was approximated on the basis of Cohen's typology (1992). Cohen (1992) identified the following size of effects: low (0.2), medium (0.5) and high (0.8). As differences in the design of the two questionnaires (see measurement part below) were quite small, and as both questionnaires intended to measure attitude towards biodiversity, it was decided to set d = 0.2.

[19] Available at http://www.ge.ch/statistique/tel/publications/2013/analyses/communications/an-cs-2013-47.pdf

[20] Postal boxes in the city center (1204) were almost never reachable. I thus distributed these questionnaires in the 1205.

3.2 Hypotheses

On the basis of the results of the first questionnaire, several hypotheses in relation to the research questions are proposed[21]. First of all, I have several hypotheses to answer the following question: In which ways can we assess validity and reliability of items that include the representation of biodiversity to measure attitude towards this latter?

> *First hypothesis: Words used to construct the items of the questionnaire are expected to be part of the respondents' representation of biodiversity:*
>
> - *Respondents are expected to have a similar representation of biodiversity than the one of respondents of Joost & Clémence study.*
> - *Respondents are expected to associate the words given by respondents of the first study with biodiversity.*

This hypothesis is related to the validity of measures. The measures should assess the construct they are designed to assess (Haddock & Maio, 2008). As the words given by the respondents of the first study were used to construct the second questionnaire, these should still represent the same construct "biodiversity". This expectation is based on the process of anchoring. According to SRT, anchoring allows members of the same group to communicate together with the same language (Elejabarrieta, 1996), the objectification of the scientific term. As the sample of the second and the first study should be composed by similar groups of individuals, I expect to find the same representations.

[21] In this section, each hypothesis is followed by a brief presentation of the different analysis tools.

Analytical tools

More precisely, in version B of the questionnaire, the same open-ended question than the one in the first study is asked. Thus I expect to find similar objectifications of biodiversity between both surveys. Answers of the open-ended question of version B were analysed through the statistical software IRAMUTEQ to see whether the same most frequent words appeared and whether the correspondence analysis structured the words into comparable classes.

In version A of the questionnaire, the answers of the open-ended question of the first study are used to construct closed ended-questions. I expect the respondents of the second study to associate these words with biodiversity. Analyses were conducted to see whether respondents associate the words used to design the items with biodiversity. This is a "triangulation" method to check for the mutual validation of qualitative (open-ended answers) and quantitative results (level of association) (Kelle, 2001). Thus to achieve construct validity, I expect respondents to associate the words (between *totally* and *very much*) with biodiversity. I also conducted a PCA to see whether a specific structure could be identified. The main idea was to see whether several words plotted on another dimension. This scenario could reflect potential invalidity of the items designed with these words, as the latter would not measure attitude towards biodiversity.

Second hypothesis: The items designed from the words associated with biodiversity are expected to be homogenous, consistent and to rely to the same latent dimension.

This latter hypothesis is directly related to the items of the questionnaires, which are only composed by representations of biodiversity. This hypothesis helps to answer the question: Are the items designed from the words associated by the respondents with biodiversity reliable and valid?

As the *biodiversity representations* items should be part of the objectification of biodiversity, I expect the latters to be homogenous, consistent and to rely to the same dimension. Indeed, the words are objectification of the concept of biodiversity – concretisations of this abstract object (Elejabarrieta, 1996). They should thus all be relied to this concept. Therefore, as items should all measure a latent predisposition towards biodiversity (Alwin & Krosnick, 1991), respondents should report similar attitudes between the different indicators.

Analytical tools

To test this hypothesis, several principal component analyses were conducted on *biodiversity representations* variables. To check for measurement errors, I had to check that items designed

with the representations of biodiversity taped into the same dimension than attitude towards *biodiversity concept* items (DeVellis, 2012), therefore assessing the reliability of the individual items. A PCA was conducted and indicators of scale reliability were performed on the attitude towards *biodiversity representations* items. To check the reliability of the items, the Cronbach'a alpha was calculated[22]. To see whether these items measured attitude towards biodiversity a second factorial analysis was performed by adding the attitude towards *biodiversity concept* items. In this case, these items were used as indicators of concurrent validity to assess criterion validity but also construct validity of the new items (Capel, 2009; Huteau, 2006).

Whereas the first and second hypotheses are related to validity and reliability of items designed with social representations, the last hypothesis is related to the utility of such methodology. Is this method useful? To which extent can the use of social representation of biodiversity to measure individuals' attitudes towards this scientific object, limit measurement errors associated with reporting of non-attitude and problems due to a lack of information on individuals' considerations?

> *Third hypothesis: Differences between versions A and B are expected to be found in answers to questions about attitude towards biodiversity concept due to the presence of a definition of biodiversity based on individuals' representations in version A of the questionnaire. In particular:*
>
> - *Respondents of version B of the questionnaire are expected to report more non-attitudes.*
> - *The presence of a definition of biodiversity is expected to have a higher influence on respondents with lower "ability".*

This hypothesis is related to *biodiversity concept* items of the questionnaires and the presence or not of a definition of biodiversity. In these parts, the interaction between the scientific term and definition is checked. First of all, it is expected to find differences between answers to questions of the two versions, due to the presence of a definition affecting the respondent's cognitive work. Indeed, according to the first steps of the respondents' cognitive process (Tourangeau et al., 2000), the cognitive works of comprehension of the items and retrieval of relevant information are

[22] The Cronbach's alpha is a reliability coefficient, which measures the internal coherence of a scale. Its values range from 0 to 1. An alpha coefficient <.6 is considered as insufficient, a value between .6 and .7 is considered as pretty bad, a value between .7 and .9 is considered as good/very good. When the value of the coefficient is greater than .9 it shows a redundancy between the items and it is often recommend to drop some items in order to have a value lower than .9 (Carricano & Poujol, 2009).

already partly done by the definition. Therefore, the definition proposed in version A, which should "talk" to the respondents as based on their representations and simplify the task difficulty. As satisficing is a function of task difficulty, respondents are expected to more satisfice in version B of the questionnaire (Krosnick, 1991a; Krosnick, 2002) and report non-attitudes. In this research, the focus is in particular made on one form of satisficing: "mental coin-flipping" (Krosnick, 1991a). I expect to find more random responses in version B of the questionnaire due to satisficing. In terms of errors in attitude measurement, one could say that the results of version A of the questionnaire are expected to be more reliable than the ones of version B. Moreover, as satisficing is also a function of respondents' ability, it is expected that the responses of the more educated should be less affected by the survey characteristics (Blasius & Thiessen, 2012). Therefore it is expected to find fewer differences between the two versions of the questionnaire among more educated respondents.

Analytical tools

To test this hypothesis, respondents of both samples should have similar demographic characteristics. Therefore, I first checked for this criterion. Then, I compared means of answers to attitude/behaviour towards biodiversity concept among versions of questionnaire[23]. When the result of the test was significant, it indicated that means differed among versions, reflecting, as expected by the third hypothesis, differences between the two versions of the questionnaire. For the variables with means differences, a calculation of the size of effect was computed as: The means' differences divided by the sum of the pooled standard deviations[24]. To better understand these differences among versions, bivariate statistics were conducted to see whether specific respondents, in particular those with a lower level of education were more influenced by the definition[25]. The main idea was to compare the results of the Chi-2 among versions. When the Chi-2 was significant in one of the two versions only, it could indicate systematic bias on the basis of respondents' attributes (Blasius & Thiessen, 2012).

To see whether "respondents of version B of the questionnaire answered more randomly", I looked at how the correlations between related items – attitude/behaviour towards biodiversity

[23] Variables with a Skewness >1 or >-1, a Kurtosis >1.5 or >-1.5, or variables for which the Levene t-test was significant at a p-value <.05, were considered as violating conditions of normality for parametric tests (Dancey & Reidy, 2007). For these variables, a non-parametric test of mean comparison "Kruskall-Wallis" was conducted. For the other variables, a student-t test for independent samples to compare means between versions was conducted.

[25] When performing the Chi-2 statistics, I checked whether the criteria to conduct a Chi-2 test – less than 25% of the cells have less than 5 cases; no cells with less than one case (Dancey & Reidy, 2007)–were fulfilled.

concept and attitude/behaviour towards biodiversity representations variables – vary between versions. In this case, the correlational linkage between representation variables and biodiversity concept variables was considered as a way of checking the reliability of the measures, as these variables ought to be related. In addition to that, several principal component analyses were conducted to compare Cronbach's values, considered as reliability criteria (Huteau, 2006), among version of questionnaire.

Fourth hypothesis: The method proposed to design items is expected to be useful

- *Items that involved the SRT approach are expected to be more accurate to predict behaviours.*
- *Items that involved the SRT approach are expected to provide more information on respondents.*

This hypothesis depends on the results of the three first ones. If the items designed with representations of biodiversity show no important problems of validity or reliability, one could ask whether the method proposed in this research is useful? First of all, could less measurement errors be identified with this method? Then did this method bring more information than the standards one that mainly involved the scientific terms?

Items based on *biodiversity representations* should be more reliable and be a better predictor of behaviours (Buijs et al., 2010; Haddock & Maio, 2008) than direct questions on *biodiversity concept* (using the scientific term). As discussed for the third hypothesis, providing representations of biodiversity should simplify the task difficulty (Krosnick, 1988). Therefore respondents are expected to report fewer non-attitudes via satisficing and their answers should be more reliable (Krosnick, 1988) than answers of questions that involved the scientific (potentially complex and vague for the respondents) term.

As mentioned in the theoretical part, social representation's theory uses the concepts of objectification and anchoring. According to SRT, people will anchor their representation differently on the basis of their social background (Clémence, 2001; Elejabarrieta, 1996). As the different types of anchoring, and not only the undifferentiated concept, compose the questionnaire, I expect to find more differences between individual's characteristics.

Analytical tools

In order to compare the attitude towards *biodiversity concept* and *biodiversity representations* variables in the same model, three multiple linear regressions were conducted. First of all, the results of a PCA were used to construct scales combining the different groups of items. The main idea with the regressions was to consider behavioural variables (*biodiversity concept* or *biodiversity representations*) as dependent variables, variables of attitude as independent variables and demographic/familiarity variables as control variables. With the regressions I could compare the signification and beta coefficients of the attitude towards *biodiversity concept* scale to the ones of the attitude towards *biodiversity representations* scale. I could also see whether items that used the SRT approach provided more information on respondents by comparing the significant control variables.

3.2.1 Measures

Overview questions / items

Seven parts compose each questionnaire (see table 8). The questionnaires begin with two questions on the level of knowledge of biodiversity and respondents' utilisation of the term "biodiversity". The 2nd part of the questionnaires asks three questions on attitudes towards biodiversity (importance, level of preoccupation and level of concern). The scientific term biodiversity is directly in the questions. In the 3rd part several behavioural questions are asked. I opted for various questions on behaviour involving financial support (direct or indirect) and personal action (direct, indirect). There is a difference between the two versions of the questionnaire for these parts. Indeed, whereas, as an introduction of part 2 and 3, version A proposes two definitions of biodiversity on the basis of the representations, version B does not. As mentioned above, the PCA identified five classes from which two were mainly descriptive. One class gathered common words to define biodiversity (i.e. "plante, animal, vert, diversité"). The other class gathered more "scientific" (i.e. "organismes vivants, écosystème, multiple") words to define biodiversity. Thus, I decided to design two definitions of biodiversity depending on their level of "complexity". The main idea behind the presence of a definition or not, is to see whether this latter influenced answers.

The 4th part of the questionnaire differs between both versions. This part is directly linked to the first study and the measured representations. It is intended to verify and check the results of the open-ended question of the first study. In version A, the descriptive results of the first questionnaire are used. More specifically, I used the words that were the most frequently cited by

the respondents[26] and to a lesser extent results of the Principal correspondence analysis in the questions. I ask the respondents to rate the level of concordance between biodiversity and the different terms[27] associated with the representation of biodiversity. In version B of the questionnaire, the open-ended question of the first study is asked again[28].

For the 5th and 6th parts, I designed questions on the basis of the results of the principal correspondence analysis (see table 6). In these parts, which are similar to the 2nd and 3rd parts, the scientific term biodiversity is not included. Instead, the various terms associated with biodiversity are used to design the items. I designed, in the 5th part, seven attitudinal items that ask respondents to rate how much several elements were important for them. In the 6th part, I propose ten scenarios and ask the respondents to rate how much the scenarios correspond to their actual behaviour or thinking.

The last part of the questionnaire is composed by socio-demographic questions, borrowed from the first questionnaire on biodiversity. Versions A and B of the questionnaire are displayed in the annex of this paper.

Table 8

Structure of the Questionnaires

Part	Measure	Version A	Version B
I	Knowledge and utilisation		
II	Attitude towards biodiversity concept	Definition of biodiversity	No definition
III	Behaviour towards biodiversity concept		
IV	Representations	Closed-ended question	Open-ended question
V	Attitude towards biodiversity representations		
VI	Behaviour towards biodiversity representations		
VII	Demographic characterstics		

Note. Each part aimed to catch specific measures. When there is a difference between questions of the two versions of the questionnaire, this difference is presented in version A and version B columns.

[26] (Number of appearance > 15)

[27] Words that were the most frequently cited in the first questionnaire

[28] Usually, as it was done in the first study, open-ended questions are placed in the beginning of questionnaires to limit item non-response. Nonetheless, I decided to position this question after questions on biodiversity for several reasons. First of all, I expect respondents of questionnaire B to be more likely to satisfice. Thus, positioning the open-ended question in the beginning of the questionnaire (to avoid answers being directed by closed-ended questions) could have been problematic. Indeed, when respondents answer to the open-ended question, they do the cognitive work. Thus, they could use the answers they gave for this question to answer to the attitudinal questions on biodiversity. Moreover, as open-ended questions are more cognitively demanding for respondents, it is preferable to begin the questionnaire with easier questions.

As mentioned in the theoretical part, many dimensions of attitude strength can be measured in surveys. For most questions of the questionnaire, I opted for one of the 5 dimensions proposed by Krosnick and Abelson (1992): importance, which is the "degree to which an individual considers an attitude to be personally important to him or her" (Krosnick & Abelson, 1992, p. 179). For every closed-ended question (except demographic questions), the scale is a 5-point-scale with an additional 6th "no opinion" alternative. The presence of a middle alternative and a no opinion option was made on purpose. Indeed, such responses options are preferred by respondents who do not optimize their answer (Krosnick, 1992) and do not do the whole cognitive work. Thus it allows identifying respondents who satisfice.

The variables that were taken into account for the analysis are listed below (see table 9). Table 9 provides information on the constructs being measured, the corresponding variables and their initial answer modalities, and the type of variables used for the analyses.

Table 9

Description of the Variables

Construct	Questions "Variable" (Construct)	Answer modalities	Type I[a]	Type II[a]
Attitude towards biodiversity concept	Q3 "importance of loss of biodiversity" (Concept)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale[b]	3-point scale[c]
	Q4 "preocuppied about loss of biodiversity" (C)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q5 "concerned about protection of biodiversity" (C)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q6 "willing to donate to associations for biodiversity" (C)	1 "certainly not"… 5 "certainly", 6 "no opinion"	5-point scale	3-point scale
Behaviour towards biodiversity concept	Q7 "more taxes for biodiversity" (C)	1 "certainly not"… 5 "certainly", 6 "no opinion"	5-point scale	3-point scale
	Q8 "Importance pers. intervention to protect biodiversity" (C)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q9 "personal intervention to protect biodiversity" (C)	1 "never"… 5 "always", 6 "no opinion"	5-point scale	3-point scale
	Q11 "importance organic food" (Rrepresentations)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q12 "importance of life in harmony with environment" (R)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q13 "importance ecological and respectful products" (R)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
Attitude towards biodiversity representations	Q14 "importance fauna and flora" (R)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q15 "importance of promoting sustainable development" (R)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q16 "importance impact of pollution on nature" (R)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q17 "importance impact of pollution on health" (R)	1"not at all"… 5 "extremely", 6 "no opinion"	5-point scale	3-point scale
	Q18.1 "organic food" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.2 "chemical produces for gardening and cleaning" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.3 "wood: fauna and flora-friendly behaviour" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.4 "wild gardens for animal and vegetal species" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
Behaviour/ thinking towards biodiversity representations	Q18.5 "future well-being and biological diversity" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.6 "green spaces for plants and animals" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.7 "reduce pollution to protect species" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.8 "influence of behaviours on ecosystems" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.9 "diversity of nature and well-being" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
	Q18.10"health and preservation of nature" (R)	1 " not at all "… 2 " totally ", 6 "not concerned"	5-point scale	3-point scale
Representations	Q10 A "representations of biodiversity" (Closed-ended)	1"not at all"… 5 "totally", 6 "don't know"	5-point scale	3-point scale
	Q10 B "representations of biodiversity" (Open-ended)	Open-ended	Nominal	
Knowledge	Q1 "informed about biodiversity" (C)	1 "not at all"…5 "totally"	5-point scale	
	Q2 "use of the term biodiversity" (C)	1 "never"…5 "always"	5-point scale	
Version	Version of questionnaire	1 “A”, 2 “B”	Dichotomous	
Demographic	Age	Open-ended	Numeric	5-point scale
	Gender	1 "Female", 2 "Male"	Dichotomous	
	Citizenship	1 "Swiss", 2 "Other"	Dichotomous	
	Locality	Open-ended	Nominal	
	Number of children	Open-ended	Numeric	
	Living with a spouse	1 "Yes", 2 "No"	Dichotomous	
	Household	Open-ended	Numeric	
	Level of education	1 "Compulsory School" … 5 "University"	5-point scale	Dichotomous[d]
	Professional activity	1 "Yes", 2 "No"	Dichotomous	
	Profession	Open-ended	Nominal	
	Political orientation	1 "strong left"… 7 "strong right"	7-point scale	3-point scale[e]
	Health status	1 "very bad"… 7 "very good"	7-point scale	
	Urban-rural	1 "very urban"… 5 "very rural"	5-point scale	

[a] Type I is the primary metric status of variable used in the analyses and type II the additional one. [b] For most analyses, the variables were recoded into 5-point scale ordinal metric variables (without the 6th answer modalities “no opinion”, “don’t know”, or “not concerned), [c] For bivariate statistics, the variables were recoded into three categories of answers: 1”negative attitude or behaviour”, 2 “neutral attitude or behaviour”, 3 “positive attitude or behaviour”. [d] For bivariate analysis, the level of education variable was recoded into 1”less educated” (Obligatory school; Apprenticeship, Professional school; Maturity) 2 “higher educated” (Higher professional school; University)

3.3 Results

3.3.1 Respondents

Over the 1'983 questionnaires distributed, 497 completed ones came back, which corresponds to a response rate of 25%. The target response rate (20%) was thus completed (see annex 2 for complete distribution of responses by area). Versoix, City center (1202, 1203), Vernier (Les Avanchets, Aïre, Lignon, Châtelaine) were the municipality with the lowest response rates (less than 20% of responses). Chambésy, Veyrier, Thônex, Bellevue, Aire la ville, le Grand-Saconnex were the municipality with the highest response rate (more than 30% of responses). In general, the higher municipalities' socio-economic indicators (median income and type of building) were, the higher the response rate was (see annex 2). This observation goes in the direction of studies on unit non response (see for example, Blasius & Thiessen 2012). Indeed, people with a higher education are more likely to answer studies. This can also be partially observed for this study.

Description of the whole sample

Table 10 provides information on respondents' characteristics. By looking at this table, one could say that most respondents were women, Swiss, lived with a spouse, held a university degree, and had a professional activity. Moreover, the variables *Age, Political orientation,* and *Urban-rural feeling* almost followed a normal distribution, with most respondents having chosen the middle response category or mid-age. Finally, respondents reported having a quite good or very good health status.

Table 10

Characteristics of Respondents of the Second Study: Application of SR Methodology (N = 497)

Variables	N	%	Mean	Std. Deviation
Gender				
Male	219	44.3		
Female	275	55.7		
Citizenship				
Swiss	388	78.1		
Other	104	20.9		
Living with a spouse				
Yes	304	62.3		
No	184	37.7		
Level of education				
Compulsory school	23	4.6		
Apprenticesip/prof.school	122	24.5		
Maturity	49	9.9		
HES	75	15.1		
University/EPFL degree	219	44.9		
Professional activity				
Yes	293	59.6		
No	199	40.4		
Age	491		52.70	17.90
Political orientation[a]	396[29]		3.75	1.50
Urban-rural[b]	484		2.79	1.07
Health Status	486		5.72	1.08

[a] The responses categories are : 1"strong left"… 4"centre" … 7"strong right". [b] The responses categories are : 1 "very urban" … 3"neither urban, nor rural"… 5 "very rural". [c] The responses categories are: 1"very bad"…4"average"…7"very good".

By comparing characteristics of respondents of this survey with those of the first study (who answered to the open-ended question), one can say that both samples were almost alike (see table 11). The only differences were the *Gender* and *Nationality*. Indeed, whereas a majority of women answered the second questionnaire (55.7%), this was not the case for

[29] This low N is probably due to the sensitivity of the question but also to its wording. Indeed, the question asked was "What is your political orientation, if you have one". There was no "No preference" option, unlike Greentrace political orientation question. Thus, some respondents decided not to have a political orientation and did not answer to the question. These respondents are different from the ones who did not want to answer because of the sensitivity of the question. With such wording, the difference between both types of respondents cannot be identified.

Greentrace questionnaire (47.3%). In addition to that, Swiss citizens were more represented in the second study sample than in the first study (respectively 78.1% and 67.7%).

Table 11

Comparison between Characteristics of Respondents of Greentrace (1st) and Application of the SR Methodology (2nd) studies

	Sample size	Women (%)	Swiss (%)	Uni. degree [a] (%)	Mean age	Mean pol. orientation	Mean urban-rural
1st study [b]	300	47.3	67.7	43.1	50.7	3.75	2.77
2nd study	497	55.7	78.1	44.9	52.7	3.75	2.79

[a] Percentage of respondents holding an University degree. [b] Respondents of the open-ended question of the 1st study.

In order to identify specific respondents characteristics, several bivariate analyses between demographic variables were conducted. The results pointed out some differences between male and female respondents. T-test for independent groups were conducted on the basis of gender. Men were older (M = 55, SD = 17.5) than women (M = 51, SD = 18.0), t (489) = -2.261, p = .024. Men also reported being less on the left-wing (M = 3.9, SD = 1.6) than women (M = 3.6, SD = 1.4), t (391) = -2.037, p = .042. Finally women reported having a better health status (M = 5.8, SD = 1.1) than men (M = 5.6, SD = 1.1), t (481) = 2.44, p = .015. Respondents' characteristics also differed according to nationality. Swiss citizens' respondents were older (M = 54, SD = 17.9) than non-Swiss citizens (M = 48, SD = 16.7), t (487) = 3.183, p = .002.

Description of the two different samples

With 52.3 % (N_A = 260) version A and 47.7% (N_B = 237) version B, the two versions of the questionnaire were quite well distributed among respondents. A test of proportion was conducted to check if there were more unit non-responses for version B of the questionnaire. The test was not significant at a p-value lower than .05[30]

Chi-2 tests of independence, to identify differences among respondents' characteristics (*Gender, Citizenship, Living with a spouse,* and *Level of education*) of both versions, were not significant at a p-value lower than .05 (see table 12). These results showed that both samples were independent.

[30] The value of this test was equal to 1.19 meaning that H0= differences of response rate between the two versions, was not rejected.

Table 12

Characteristics of Respondents of Both Versions of the Questionnaire

Variables	Version	
	A (N = 260)	B (N = 237)
Gender		
Male %	46.5	41.9
Female %	53.5	58.1
Citizenship		
Swiss %	78.9	78.8
Other %	21.1	21.2
Living with a spouse		
Yes	65.1	59.2
No	34.9	40.8
Level of education		
Compulsory school	4.7	4.7
Apprenticesip/prof. school	25.8	24.1
Maturity	10.2	9.9
HES	16.8	13.8
University/EPFL degree	42.6	47.4
Professional activity		
Yes	61.3	57.6
No	39.7	42.4

Note. For all A-B comparisons the results of Chi-2 test of independence were above .1.

Mean comparisons for the ordinal metric variables (age, household, number of children, political orientation, health status, urban-rural) also showed that the differences between both samples were not significant (see table 13). Therefore it can be said that respondents of both versions hold similar characteristics allowing the versions to be independent. This allows comparing the distribution of answers among the other variables.

Table 13

Mean and Standard Deviation of Age, Political Orientation, and Urban-rural Feelings among Respondents of both Versions of Questionnaire

	N		Mean		Standard deviation	
Variable	A	B	A	B	A	B
Age	256	235	53.69	51.64	17.69	18.04
Political orientation	204	192	3.82	3.68	1.51	1.48
Health status	255	231	5.70	5.74	1.06	1.11
Urban-rural	257	227	2.72	2.87	1.06	1.08
Household size[a]	257	236	1.72	1.62	1.52	1.45
Number of children	257	236	1.35	1.14	1.22	1.20
Highest level of education	256	232	3.67	3.75	1.37	1.38

Note. For all A-B comparisons the results of student-T tests mean comparison were above .1.
[a] The respondent is not included in the household size.

3.3.2 Distribution of Variables for the whole sample

Descriptive statistics (see table 14) showed that for seven variables more than 2% of respondents answered either the "no opinion" or "do not apply" categories. These variables are *Wild gardens for animal and vegetal species (R)*[31]– 4.8 % of do not apply (24 cases); *Importance of personal intervention to protect biodiversity (C)*[32] – 3.8% of do not know (19 cases); *Avoid the use of chemical produces (R)* – 3.6% of do not apply (18 cases); "preoccupied about loss of biodiversity" (C) – 3.0% of do not know (15 cases); More taxes for biodiversity (C)– 2.8% of do not know (14 cases); "importance of loss of biodiversity" (C) – 2.4% of do not know (12 cases); *Importance of promoting sustainable development (R)* – 2.2% of do not know (11 cases). By looking at the "no opinion" answers, one could say that questions with the highest percentage of no-opinion where the most complex ones. Indeed, in these questions the terms "biodiversity" and "sustainable development" were used.

Table 14 also shows the means of the different recoded 5-point scales variables (the 6th answer – do not know modality – was omitted). The variables are ranged from the lowest mean to the highest. In general, a structure on the basis of the different parts of the questionnaire could be identified. Variables about use (M = 2.3, SD = 0.99) and knowledge (M = 2.71, SD = 0.87) of the term biodiversity were those with the lowest means. Even

[31] (R) = Representations
[32] (C) = Concept

though these means were lower than the others, respondents seemed to be quite informed on the topic of biodiversity without frequently using the term in their conversations. These two questions were followed by questions of part III on behaviour towards biodiversity concept, questions of part II on attitude towards biodiversity concept, and questions of part IV on attitude towards biodiversity representations. The variables with the highest means were those of part V on behaviour towards biodiversity representations.

Table 14

Descriptive Statistics: N Valid, No Answer, No Opinion, Mean and Standard Deviation of the variables

Variable	N valid	NA	NO	*M*	*SD*
Use of the term biodiversity	494	3	0	2.30	0.99
Informed about biodiversity	494	3	0	2.71	0.87
Purchase of organic food (R)	484	8	5	3.05	1.31
More taxes for biodiversity (C)	479	4	14	3.19	1.17
Importance organic food (R)	492	4	1	3.20	1.10
Importance personal intervention to protect biodiversity (C)	474	4	19	3.21	0.98
Preoccupied about loss of biodiversity (C)	479	3	15	3.28	0.96
Willing to donate to associations for biodiversity (C)	483	5	9	3.30	1.16
Concerned about protection of biodiversity (C)	485	4	8	3.35	0.95
Importance ecological and respectful products (R)	493	3	1	3.55	0.91
Importance of life in harmony with the environment (R)	488	5	4	3.59	0.90
Avoid the use of chemical produces (R)	471	8	18	3.59	1.17
Wild gardens for animal and vegetal species (R)	466	7	24	3.70	1.16
Personal intervention to protect biodiversity (C)	489	5	3	3.72	0.81
Importance of loss of biodiversity (C)	483	2	12	3.82	0.95
Importance of promoting sustainable development (R)	483	3	11	3.82	0.93
Importance fauna and flora (R)	495	2	0	3.97	0.88
Health and preservation of nature (R)	487	6	4	3.99	1.04
Importance to consider impact of pollution on health (R)	493	2	2	4.08	0.86
Importance to consider impact of pollution on nature (R)	493	2	2	4.09	0.86
Green spaces for plants and animals (R)	481	7	9	4.18	1.05
Reduce pollution to protect species (R)	485	7	5	4.19	0.88
Diversity of nature and well-being (R)	485	7	5	4.21	0.99
Future well-being and biological diversity (R)	488	6	3	4.29	0.91
Influence of behaviours on ecosystems (R)	488	7	2	4.34	0.91
Wood: fauna and flora-friendly behaviour (R)	482	6	9	4.71	0.55

Note. The variables are ordered from the lowest mean to the highest.

3.3.3 Description of Version A and B Objectification Variables

In this part, the *Objectification of biodiversity* variables of version A (closed-ended question) and version B (open-ended question) are described. This is the only variable, which differed between the two versions. In version A, the question asked was "Lorsque vous entendez le terme biodiversité, dans quelle mesure ces mots ou expressions vous viennent-ils à l'esprit?" and the response format was a five-point scale with answer modalities ranging from "not at all" to "totally" and an additional 6th answer modality "I do not know this term". In version B of the questionnaire, the question asked was "Lorsque vous entendez le terme biodiversité, quels sont les termes ou expressions qui vous viennent à l'esprit?" and the response format was an open-ended one.

Objectifications of biodiversity variable (Version B)

Among the 235 respondents of questionnaire B, 198 answered to the open-ended question. Thus the item non-response was of 15.7% (NA's = 37). The percentage of non-response was quite similar than the one of the open-ended question of Greentrace questionnaire – 14.5 % (NA's = 51) of item non-response.

All in all, the 198 respondents wrote 1'846 words and 483 of these words differed. Thus, a word appeared 3.82 times in average. Two hundreds and sixty-four words appeared only one time in the corpus, which corresponds to 54.7% of the total number of words. Finally, the mean of occurrences showed that a respondent wrote, in average, 9.32 words. By comparing these descriptive results with the ones of Greentrace questionnaire (see table 15), one could say that the main difference between the two was that respondents of the second study wrote a few more words in average (9.32 instead of 7.53).

Table 15

Comparison Between Answers to the Open-ended Question of Greentrace (1st) and Application of the SR Methodology (2nd) studies

	Sample size	Number of words	Mean occurrence by word	Hapax[a] (%)	Mean N of words by respondents
1st study	300	2259	4.36	58.8	7.53
2nd study	198	1846	3.82	54.7	9.32

[a] Words that appeared only once in the corpus.

The most cited words listed here were alike the ones of Greentrace questionnaire: “nature” (N = 85), “animal” (N=40), “espèce” (N = 38), “protection” (N = 33), “environnement” (N = 32), “faune” (N = 30), “respect” (N = 27), “flore” (N = 25), “pollution” (N = 23), “écologie” (N = 22), “bio” (N = 21), “équilibre” (N = 17), “vie” (N = 17), “naturel” (N = 16), “plante” (N = 15), “diversité” (N = 14), “forêt” (N = 13), “écosystème” (N = 12), “vivant” (N = 11), “variété” (N = 11),”santé” (N = 11), “produit” (N = 11), “disparition” (N = 11), “richesse” (N = 10), “planète” (N = 10), “future” (N = 10).

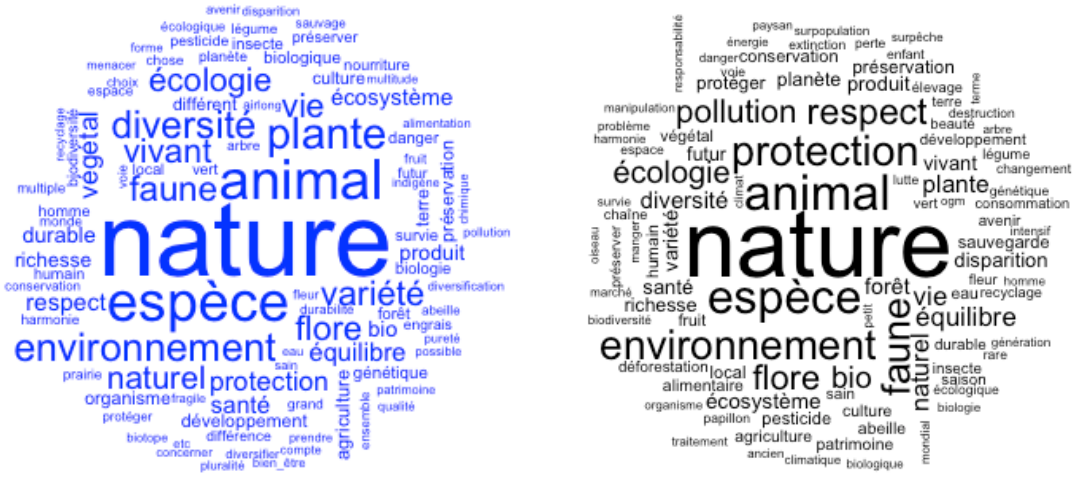

Figure 4. Word clouds 1st and 2nd studies.

A Reinart method classification with double over text segment classification was conducted. Over the 198 text segments, 63.6% (N = 126) were classified. This factorial analysis structured the words into four classes (instead of the five classes of Greentrace questionnaire).

Class 1 (see table 16) contained 30.2% of the UCE. The most active words were "forêt, animal, disparition, pollution, pesticide, plante, terre, insecte, protéger, eau, vert, voie, intensif, espace". These words were quite common terms associated with biodiversity. I decided to name this class *common definition of biodiversity and humans' "bad" influence*

Table 16

Description of the Textual Class 1 (2nd study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Forêt	9	9	100.0	22.45***
Animal	21	34	61.8	22.08***
Disparition	8	8	100.0	19.78***
Pollution	14	20	70.0	17.92***
Pesticide	7	8	87.5	13.33***
Plante	9	12	75.0	12.66***
Terre	5	5	100.0	12.06***
Insecte	4	4	100.0	9.57**
Protéger	5	6	83.3	8.46**
Eau	5	6	83.3	8.46**
Vert	3	3	100.0	7.12**
Voie	3	3	100.0	7.12**
Intensif	3	3	100.0	7.12**
Espace	3	4	75.0	3.94*

Note. Chi-2 statistics (χ^2) indicate the association between the active forms (words) and the class. A significant Chi-2 indicates that the active form is more often associated by the respondents with the words of this class.

[a] Percentage in class (% in class) = Number of times this active form appears in the class (N in class) / Number of times this active form appears in the whole corpus (N total).

*$p < .05$. **$p < .01$. ***$p < .001$.

Class 2 (see table 17) contained 22.6% of the UCE. The most active words "nature, respect, protection, environnement". These words were still quite common but more global than those in class 1. I decided to name this class *general definition of biodiversity associated with humans' action to protect it*.

Table 17

Description of the Textual Class 2 (2nd study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Nature	28	69	40.6	16.34***
Respect	12	20	60.0	14.06***
Protection	13	27	48.1	8.57**
Environnement	12	26	46.1	6.75**

*$p < .05$. **$p < .01$. ***$p < .001$.

Class 3 (see table 18) contained 18.2% of the UCE. The most active words were "flore, faune, conservation, protection, diversité, consommation, richesse". These words, such as flora and fauna, could be considered as more specific scientific terms. A Chi-2 statistic indicated that respondents with an University or EPFL degrees were more likely to write words of this class than respondents with another level of education – $X^2 = 3.97$, $p = .046$, n = 64. I decided to name this class *scientific definition of biodiversity associated with humans' action to protect it*.

Table 18

Description of the Textual Class 3 (2nd study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Flore	20	22	90.9	94.29***
Faune	21	26	80.8	85.80***
Conservation	4	5	80.0	13.30***
Protection	10	27	37.0	8.12**
Diversité	2	3	66.7	4.83*
Consommation	2	3	66.7	4.83*
Richesse	4	9	44.4	4.46*

*$p < .05$. **$p < .01$. ***$p < .001$.

Class 4 (see table 19) contained 25.4% of the words. The most active words were "vie, patrimoine, équilibre, santé, future, beauté, avenir, génération, naturel, planète". These words were quite different than the ones of the other classes. There were more related to human, its health and the future of the planet. A Chi-2 statistic indicated that female respondents were more likely to write words of this class than male respondents – $X^2 = 12.89$, $p = .000$, n = 60. I decided to name this class *humans' health and well-being on planet earth.*

Table 19

Description of the Textual Class 4 (2nd study): Verbal Forms

Active form	N in class	N total	% in class	χ^2
Vie	10	13	76.9	20.31***
Patrimoine	6	6	100.0	18.51***
Équilibre	9	12	75.0	17.22***
Santé	8	10	80.0	17.09***
Futur	8	10	80.0	17.09***
Beauté	5	5	100.0	15.29***
Avenir	5	6	83.3	11.16***
Génération	3	3	100.0	9.03**
Naturel	5	8	62.5	6.21*
Planète	5	9	55.6	4.65*

*$p < .05$. **$p < .01$. ***$p < .001$.

By comparing these classes with the ones found in Greentrace study, one could say that the composition of the classes was quite similar but some differences appeared. First of all, class 4 of this study was quite similar to class 3 of Greentrace study. Both classes contained words associated with health, human being and life. Moreover, for both studies, female respondents were more likely to write words from these classes than men. Class 1 of this study was like class 1 of Greentrace study, which included words such as "plante, animal, arbre". In this study, such as for Greentrace study, differences between classes on the basis of the complexity (scientific) of the terms could be found. Indeed, class 3, which was quite similar to class 4 of Greentrace study – faune, flore, développement durable – also contained quite less common terms than the other classes.

Objectifications of biodiversity variable (version A)

Table 20 summarises the distribution of cases, means and standard deviation of answers of question 10. The words are ordered according to their mean ranging from the lowest to the highest. "Health" (M = 3.54, SD = 1.19), "Organic farming" (M = 3.79, SD = 1.10) and "Sustainable development" (M = 3.92, SD = 1.10) were the words with a mean lower than 4 (very). This indicated that these words came between "moderately"(3) and "very"(4) in respondents' mind when they think of biodiversity. For these words, the standard deviations were higher than the ones of the other words. This could be due to the fact that there was a lower level of agreement on these words between respondents.

Respondents associated between "very"(4) and "totally" (5) the other words or expression with biodiversity. "Animal species" (M = 4.35, SD = 0.80) "Environment" (M = 4.35, SD = 0.85) and "Nature" (M = 4.46, SD = 0.70) are the words with the highest means but also with the lowest standard deviation. Thus respondents were more inclined to represent themselves biodiversity with these words.

Table 20
Descrive Statistics Q10 Version A: N Valid, No Answer, Don't Know, Mean and Standard Deviation of the Words Associated with Biodiversity

Words	N valid	NA	DK	*M*	*SD*
Health	255	5	1	3.54	1.19
Organic farming	252	8	3	3.79	1.10
Sustainable development	248	12	5	3.92	1.10
Ecology	254	6	2	4.11	0.97
Living organisms	250	10	4	4.12	0.99
Ecosystems balance	250	10	4	4.12	1.02
Biological diversity	252	8	3	4.20	0.94
Vegetal species	252	8	1	4.22	0.92
Fauna	254	6	1	4.23	0.90
Plants	254	6	1	4.24	0.93
Flora	253	7	2	4.25	0.90
Animal species	255	5	1	4.35	0.80
Environment	254	6	1	4.35	0.85
Nature	255	5	1	4.46	0.70

Note. The words are ordered from the lowest mean to the highest.

A PCA with an oblimin rotation[33] and Kaiser criterion was conducted to investigate these differences. Two factors were extracted according to the Eigenvalue criterion[34]. The first factor explained 57.3% of the variance, whereas the second explained 10% of the variance. The correlation coefficient between both factors was of .57. The scores of the different variables on the two factors can be seen below (table 21). Most of the words scored on both factors (factor loadings above .5 were retained). Five words/expressions – "Animal species", "Vegetal species", "Fauna", "Flora", and "Biological diversity" – only scored on the first factor. "Health" and "Sustainable development" only scored on factor 2.

One could say that the level of association with biodiversity could explain the difference between the two factors. Whereas words that scored on factor 2 were those, which were less associated with biodiversity and with a lower level of agreement among respondents, words that scored on factor 1 were those, which more corresponded to biodiversity for the respondents. Therefore I decided to name factor 1 *central core* and 2 *Peripheral elements.*

Table 21

Obliquely Rotated Component Loadings of Words Associated with Biodiversity

Item	Central core	Peripheral elements
Nature	.80	.53
Animal species	.84	
Environment	.67	.79
Biological diversity	.73	
Fauna	.88	
Flora	.88	
Ecology	.66	.74
Living organisms	.84	.53
Vegetal species	.90	
Health		.75
Ecosystems balance	.69	.64
Sustainable development		.85
Organic farming	.51	.81
Plants	.76	.56

Note. Extraction method: Principal component analysis; rotation method: Oblimin with Kaiser normalization.

[33] An oblique factor rotation, oblimin rotation, methods was preferred to an orthogonal factor rotation method. The main reason was that oblimin rotation accounts for correlated factors – i.e. the items intended to measure a same latent dimension (Hair et al., 2010)

[34] Eigenvalue above 1

3.3.4 Respondents' Comments

Before proceeding to the analysis, a final description can be made. The latter is related to comments that respondents left on the questionnaires. Among the 497 respondents, 39 added commentaries on the questionnaire. Most of the comments were positive comments. Several comments could be useful for the analysis and the discussion of the results. First of all, several respondents thanked us for being interested in such an important subject. Then several respondents added comments to explain their answers, most of these comment were related to the fact that they would be ready to spare money for biodiversity or to buy organic food but that they had not enough money for that. Finally, several respondents of version B added remarks as answers to the open-ended question. Interestingly respondents reported being annoyed by the absence of any definition of biodiversity, complexity of the term or/and said that they searched on Google to find more about this topic ("I have never heard about this term [biodiversity]. I had to google it"[35]; "You should have asked about fauna and flora, it much more telling"[36]).

3.3.5 Influence of the Definition of Biodiversity: Differences Among Answers to Versions A and B of the Questionnaire

Mean comparisons were conducted among *biodiversity concept* variables. A difference between means should reflect an influence of the definition proposed in the beginning of questionnaire A. Student tests of mean comparison were computed for most variables except for *Personal intervention to protect biodiversity (C)*. This variable was non-normally distributed, with kurtosis of 1.62[37]. For this variable, a non-parametric test, Kruskall-wallis was conducted.

The only significant difference was between "importance of loss of biodiversity" (C) variable. Respondents of version A reported a more positive attitude (M = 3.93, SD = 0.97) towards biodiversity than respondents of version B (M = 3.70, SD = 0.92), t (481) = 2.573, p = .010. The size of effect was equal to 0.23[38], small but still existent. This question was the first after the definition, indicating a potential influence of this latter.

[35] "Je n'ai jamais entendu ce terme j'ai du aller sur google"
[36] "Vous auriez dû parler de faune et flore, c'est beaucoup plus parlant"
[37] A kurtosis higher than 1.5 indicates normality problems – i.e. the curve of the distribution is sharp (Dancey & Reidy, 2007).
[38] Effect size of the mean differences between answers to both versions of the questionnaire. The latter is calculated as: means' differences divided by the sum of the pooled standard deviations: The size of effect can

To understand the influence of the definition, several additional analyses were conducted. I first looked at the distributions and tried to identify differences in answers on the basis of the level of education. I then conducted several correlations and PCA on the separate versions of the questionnaire. First, the distributions of answers of both versions were compared. Respondents of version A less frequently chose the mid-point of the scale ”important” than respondents of version B – 22.4% (57 cases) reported that the conservation and protection of biodiversity was “important” in version A against 33.2% (76 cases) in version B. Moreover, respondents of version A more often chose the extreme category “extremely important” than those of version B – 32.7% (83 cases) against 21.8% (50 cases). Such results might express the influence of a definition of biodiversity. One could say that respondents were influenced by the definition and chose more positive and extreme categories of answers.

To understand this mechanism better, I tried to see whether specific respondents were more influenced by the definition than others. In order to do so, I compared the distribution of answers of the two versions by level of education (recoded 2-point scale variable). The results are displayed in table 22. A Chi-2 test of independence was computed for both versions. The test was significant for version B only, X^2 (2, N = 225) = 7.157, p = .028. Less educated respondents answered differently than educated ones. As shown in table 22, less educated respondents of version B reported a less positive attitude than more educated respondents. Indeed, whereas 64.0% of higher educated respondents reported that the conservation of biodiversity was very or extremely important, only 50.0% of less educated respondents did. This difference cannot be found in version A of the questionnaire. When a definition was provided, less educated respondents reported a more positive attitude, similar to higher educated respondents. This could reflect an influence of the definition. It is likely that less educated respondents were influenced by the definition and gave a more positive answer. Another explanation could be that the absence of any definition of such a scientific term induced educational effects in answers

take different values. According to Cohen (1992) the different values of the size of effect can indicate a small (d =0.2), a medium (d = 0.5) or a big (d=0.8) effect.

Table 22

Importance of Conservation and Protection of Biodiversity by Version and by Level of Education

		Not or less important	Important	Very or extremly important	N	χ^2
A	Less educated	6.1%	23.2%	70.7%	99	n.s.
	More educated	8.6%	21.9%	69.5%	151	
B	Less educated	7.0%	43.0%	50.0%	86	7.16***
	More educated	10.1%	25.9%	64.0%	139	

Note. 0 (0%) and 1 (16.7%) cells have expected count less than 5. The Chi-2 statistic indicates whether distributions of answers among respondents with different levels of education significantly differed or not.
***$p < .001$.

In order to see whether a definition might increase the reliability of the data, correlations coefficients were performed between the *Importance of loss of biodiversity (C)* variable[39] and the other attitudes towards biodiversity representations variables.

A way of assessing reliability of the items was to compare correlation coefficients keeping in mind that both concept (C) and representations (R) variables ought to measure attitude towards biodiversity. In general, correlations coefficients seemed to be higher in version A of the questionnaire (see table 23). By looking at the coefficients, one can see that only two pairs of coefficients significantly differed between version A and B. These are between *Importance of loss of biodiversity (C) – Importance of life in harmony with the environment (R),* and *Importance to consider impact of pollution on health (R)*. When a definition was provided these correlations coefficients were higher than without any definition.

[39] The focus is here made on this single attitude towards biodiversity concept variable on the basis of the results of the student-t test of mean comparisons.

Table 23

Correlation Coefficient Values (Spearman's rho) between Biodiversity Concept (C) Variable and Biodiversity Representations (R) Variables by Version of Questionnaire

	Importance of loss of biodiversity (C)	
	A	B
Importance organic food (R)	.51	.40
Importance of life in harmony with the environment (R)	.55*	.42*
importance ecological and respectful products (R)	.53	.44
Importance fauna and flora (R)	.62	.54
Importance of promoting sustainable development (R)	.50	.55
Importance to consider impact of pollution on nature (R)	.57	.51
Importance to consider impact of pollution on health (R)	.52*	.39*

Note. Each correlation coefficient was significant at a p-value <.001.
Fisher T-tests for two independent sample were computed between the correlations coefficients of the two versions of the questionnaire. A significant p-value indicates that the two correlation coefficients differed.
*$p < .05$. **$p < .01$. ***$p < .001$.

3.3.6 Reliability of Biodiversity Representation Items and Simplification of Data

The aim of this part is to test the reliability of the items based on representations of biodiversity but also choose dependent and independent variables for regressions.

To simplify the comprehension of the analyses, the following groups of items are named:

- **Attitude towards biodiversity concept (C)** items: *Importance of loss of biodiversity* (C), *Preoccupied about loss of biodiversity* (C) and *Concerned about protection of biodiversity* (C).
- **Behaviour towards biodiversity concept (C)** items: *Willing to donate to associations for biodiversity (C), More taxes for biodiversity (C)*, *Importance of personal intervention to protect biodiversity (C)* and *Personal intervention to protect biodiversity (C)*.
- **Attitude towards biodiversity representations (R)** items: *Importance of organic food (R)*, *Importance of life in harmony with the environment (R)*, *Importance ecological and respectful products (R)*, *Importance fauna and flora (R)*, *Importance of promoting sustainable development (R)*, *Importance to consider impact of pollution on nature (R)*, and *Importance to consider impact of pollution on health (R)*.
- **Behaviour towards biodiversity representations (R)** items: *Purchase of organic food (R), Avoid the use of chemical produces (R)*, *Wood: fauna and flora-friendly behaviour (R)*, *Wild gardens for animal and vegetal species (R)*, *Future well-being*

and biological diversity (R), Green spaces for plants and animals (R), *Reduce pollution to protect species (R)*, *Influence of behaviours on ecosystems (R)*, *Diversity of nature and well-being (R)*, *Health and preservation of nature (R)*.

Reliability of "attitude towards biodiversity representations" items

This first analysis was done on the **attitude towards biodiversity representations** items (see table 24). The first step of the actual analysis consisted in the Cronbach's alpha reliability check, which resulted in a Cronbach's alpha of .910. This value would not improve by dropping any item, so the variables' list was kept intact. After the internal consistency check, I proceeded to run a factor analysis on all of the items. The Bartlett test of sphericity[40] was significant at a p-value <0.001, X^2 (21) = 2067.70, p = .000, indicating that the correlation matrix had significant correlations among at least some of the variables. In addition to that, the KMO[41] measure of sampling adequacy was of .90, which is very high (even too high). A PCA was computed on the data. In order to decide on the number of factors to extract the Kaiser criterion – i.e. only factors with an eigenvalue above 1 are kept in the analysis – was chosen. Only one factor was extracted. The model explained 65.7% of the variance of the whole sample, which was satisfactory and even quite high (Hair & al, 2010).

As shown in table 24, by comparing the items on the basis of their scores, one could say that the factor better fitted items related to nature, environment and potentially biodiversity. On the contrary, items related to the individual and its health had lower scores. These results helped to see that the items based on representations scored on the same dimension.

Table 24

Factor Loadings of Attitude Towards Biodiversity Representation Items

Item	Attitude (R)
Importance ecological and respectful products (R)	.86
Importance to consider impact of pollution on nature (R)	.85
Importance of promoting sustainable development (R)	.83
Importance fauna and flora (R)	.82
Importance of life in harmony with the environment (R)	.81
Importance to consider impact of pollution on health (R)	.74
Importance of organic food (R)	.74

Note. Extraction method: Principal component analysis

[40] In order to produce representative factors, the variables should be sufficiently intercorrelated. A way of assessing this measure is to conduct a Bartlett test, which examines the entire correlation matrix.
[41] KMO measure of sampling adequacy gives an index between 0 and 1 (1= the variable is perfectly predicted by the other variables). Its value should be above .60 (Hair et al. 2010).

"Attitude towards biodiversity concept" and "biodiversity representations" items as independent variables

Another factor analysis was computed by combining the **attitude towards biodiversity concept** items and the **attitude towards biodiversity representations** items together (see table 25). The aim of this factorial analysis was to first verify that the factor identified above was related to attitude towards biodiversity and then to see whether both groups of items could be simultaneously used in a regression as independent variables. In this case, both orthogonal and oblique rotations methods[42] were tested. Two factors were extracted. The first factor explained 61.4% of the variance, whether the second factor explained 10.0% of the variance. On the basis of the oblimin rotation, a correlation of .64 between both factors was identified and each items had a factor loading above .5 on both factors. This showed that, theoretically, **attitude towards biodiversity concept** items and **attitude towards biodiversity representations** items were quite similar and seemed to rely to the same latent dimension. In order to simplify the analysis for the regression, results of the varimax rotation are displayed. As shown in table 25, **attitude towards biodiversity representation** items had higher scores on the first factor. *Importance ecological and respectful products (R)* was the item with the highest score and *Importance fauna and flora (R)* with the lowest score. The latter also had a score higher than .5 on the second factor. "Attitude towards biodiversity" items scored on the second factor. This analysis helped to construct two independent variables for the regression, one based on biodiversity representations, the other on biodiversity concept (see p. 73).

As mentioned previously, PCA with **attitude towards biodiversity concept** items were also conducted on the two versions of the questionnaire separately. This was the case for this PCA, as it included attitude towards biodiversity items. For both versions, the Cronbach's alpha was very high (.94 for version A and .92 for version B) and one factor was extracted. Whereas this factor explained 64.3% of the variance in version A, 58.4% of the variance was explained by this factor in version B.

[42] The oblique factor rotation method, oblimin rotation, accounts for correlated factors, whereas the orthogonal factor rotation method, varimax, does not. The orthogonal rotation method is often better to simplify the factor matrix (Hair et al., 2010).

Table 25

Orthogonally Rotated Component Loadings of Attitude Towards Biodiversity Concept and Representations Items

Item	Attitude (R)[a]	Attitude (C)[b]
Importance ecological and respectful products (R)	**.82**	.31
Importance organic food (R)	**.76**	
Importance of life in harmony with the environment (R)	**.74**	.33
Importance to consider impact of pollution on nature (R)	**.74**	.39
Importance to consider impact of pollution on health (R)	**.74**	
Importance of promoting sustainable development (R)	**.72**	.39
Importance fauna and flora (R)	**.63**	**.55**
Preoccupied about loss of biodiversity (C)		**.88**
Concerned about protection of biodiversity (C)	.32	**.84**
Importance of loss of biodiversity (C)	.35	**.82**

Note. saturations <.3 are not displayed ; saturation >.5 are in bold (Dancey & Reidy, 2007). Extraction method: Principal Component Analysis. Rotation method: varimax with Kaiser normalization.
[a] Attitude towards biodiversity representation dimension. [b] Attitude towards biodiversity concept dimension.

Simplification of "behaviours towards biodiversity representations items"

I then shifted to behavioural items to construct dependent variables, sufficiently different from the independent variables, for regressions. Before going further, I first wanted to see whether social representation items scored on a single factor or not.

A principal component analysis with an oblimin rotation[43] was conducted on the **behaviour towards biodiversity representations** items (see table 26). Two dimensions were extracted with a KMO of .89. The 1st dimension explained 47.0% of the variance and the 2nd 10.4%. The correlation coefficient between both factors was of .56. The PCA separated the factors into two groups. The first factor, named *Global health-related behaviours/thinking towards nature*, better fitted items based on health, well-being, and global behaviours[44]. The second factor, named *Lifestyle and every-day behaviours to protect species,* better fitted items based on day-to-day behaviours[45].

[43] The oblique factor rotation, oblimin rotation, method was chosen as the items intended to measure a same latent dimension, here, behaviour towards biodiversity representations (Hair et al., 2010).
[44] The behavioural dimension of these items could be questioned. Indeed, most items that scored on this factor started with the term "I think that". Therefore, for the analysis, two points are considered. First of all, the fact that the formulation of the items, and not only the terms, could have influenced the structure of the factorial analysis. Then the fact that these items were more about what the respondents think and less about behaviours.
[45] *Wood: fauna and flora-friendly behaviour (R)* item, scored on both factors with almost the same factor loading – .497 and .489. Therefore, for the regression this variable was excluded of the analysis.

Table 26

Obliquely Rotated Component Loadings of Behaviour-scenarios Towards Biodiversity Representations Items

Item	Health-nature[a]	Lifestyle-species[b]
Diversity of nature and well-being (R)	**.87**	.43
Health and preservation of nature (R)	**.82**	.42
Future well-being and biological diversity (R)	**.81**	**.61**
Influence of behaviours on ecosystems (R)	**.80**	.46
Green spaces for plants and animals (R)	**.71**	.42
Wood: fauna and flora-friendly behaviour (R)	.50	.49
Avoid the use of chemical produces (R)	.33	**.84**
Purchase of organic food (R)	.45	**.71**
Reduce pollution to protect species (R)	.49	**.71**
Wild gardens for animal and vegetal species (R)	.47	**.61**

Note. saturations <.3 are not displayed ; saturation >.5 are in bold (Dancey & Reidy, 2007). Extraction method: Principal Component Analysis. Rotation method: oblimin with Kaiser normalization.
[a]Global health-related behaviours/ thinking towards nature. [b] Lifestyle and everyday behaviours to protect species.

"Behaviours towards biodiversity representations" items as dependent variables

On the basis of the results of the last PCA (see table 26), two additional factor analyses with varimax rotation were conducted to construct **behaviour towards biodiversity representations** dependent variables for the regressions. For the first one, items that scored on the first factor *Global health-related behaviours/thinking towards nature* were included in a PCA with the attitudinal variables (see table 27).

The KMO was equal to .944. Three factors were extracted and explained respectively 54.1%, 9.2% and 6.8% of the variance. As expected, the varimax rotation separated the **attitude towards biodiversity concept** (third factor), **attitude towards biodiversity representations** (first factor) and **behaviour towards biodiversity representations: global health-related behaviours/thinking towards nature** (second factor) items.

This PCA, included **attitude towards biodiversity concept** items, therefore a factor analysis was also conducted on the two versions of the questionnaire separately. For both versions, the Cronbach's alpha was very high (.95 for version A and .93 for version B). Three factors were extracted. Whereas these factors explained 73.2% of the variance in version A, 66.8% of the variance was explained in version B.

Table 27

Orthogonally Rotated Component Loadings of Attitudinal Items and Health, Global Behaviours/thinking towards nature

Item	Attitude (R)[a]	Behaviour (R)[b]	Attitude (C)[c]
Importance ecological and respectful products (R)	**.83**		
Importance of life in harmony with the environment (R)	**.76**		
Importance organic food (R)	**.75**		
Importance of promoting sustainable development (R)	**.67**	.32	.32
Importance to consider impact of pollution on nature (R)	**.67**	.40	.32
Importance fauna and flora (R)	**.61**		**.50**
Importance to consider impact of pollution on health (R)	**.59**	**.54**	
Diversity of nature and well-being (R)		**.81**	
Health and preservation of nature (R)		**.77**	
Influence of behaviours on ecosystems (R)		**.73**	
Future well-being and biological diversity (R)		**.71**	
Green spaces for plants and animals (R)		**.65**	
Preoccupied about loss of biodiversity (C)			**.84**
Concerned about protection of biodiversity (C)	.32		**.79**
Importance of loss of biodiversity (C)	.33		**.78**

Note. saturations <.3 are not displayed ; saturation >.5 are in bold (Dancey & Reidy, 2007). Extraction Method: Principal Component Analysis. Rotation method: varimax with Kaiser normalization.
[a] Attitude towards biodiversity representation dimension. [b] Behaviour towards biodiversity representations : global health-related behaviours/thinking towards nature. [c] Attitude towards biodiversity concept dimension.

Another PCA was conducted where *Lifestyle and everyday behaviours to protect species* items were included with the attitudinal variables (see table 28). The KMO was equal to .925. Three factors were extracted and explained respectively 50.5%, 7.7% and 6.9% of the variance. The first factor gathered **attitude towards biodiversity representations** items and *Purchase of organic food (R)* item. The second factor gathered **attitude towards biodiversity concept** items and *Importance fauna and flora (R)* item. The third factor gathered **behaviour towards biodiversity representations: lifestyle and everyday behaviours to protect species**.

This PCA, included **attitude towards biodiversity concept** items, therefore a PCA was also conducted on the two versions of the questionnaire separately. For both versions, the Cronbach's alpha was very high (.94 for version A and .90 for version B). Three factors were extracted. Whereas these factors explained 69.9% of the variance in version A, 61.9% of the variance was explained in version B.

Table 28

Orthogonally Rotated Component Loadings of Attitudinal Items and Specific Health-nature Behaviour Towards Biodiversity Representations Items

Item	Attitude (R)[a]	Attitude (C)[b]	Behaviour (R)[c]
Importance organic food (R)	**.85**		
Importance ecological and respectful products (R)	**.77**	.33	
Purchase of organic food (R)	**.71**		
Importance of life in harmony with the environment (R)	**.68**	.37	
Importance to consider impact of pollution on health (R)	**.66**		
Importance of promoting sustainable development (R)	**.61**	.46	
Importance to consider impact of pollution on nature (R)	**.61**	.49	
Preoccupied about loss of biodiversity (C)		**.84**	
Concerned about protection of biodiversity (C)		**.81**	
Importance of loss of biodiversity (C)		**.80**	
Importance fauna and flora (R)	**.52**	**.59**	
Wood: fauna and flora-friendly behaviour (R)	.30		**.74**
Reduce pollution to protect species (R)	.42		**.67**
Avoid the use of chemical produces (R)			**.62**
Wild gardens for animal and vegetal species (R)		.42	**.53**

Note. saturations <.3 are not displayed ; saturation >.5 are in bold (Dancey & Reidy, 2007). Extraction Method: Principal Component Analysis. Rotation method: varimax with Kaiser normalization.
[a] Attitude towards biodiversity representation dimension. [b] Attitude towards biodiversity concept dimension. [c] Behaviour towards biodiversity representations : Lifestyle and everyday behaviours to protect species.

"Behaviours towards biodiversity concept" items as dependent variable

Finally, the **behaviour towards biodiversity concept** items were combined in a factorial analysis with the "attitudinal" items (**attitude towards biodiversity concept and representations**) (see table 29). The KMO was of .947. Two factors were extracted. The first factor explained 55.4% of the variance, and the second factor 8.2%. The biodiversity concept items scored on the first factor, whereas the biodiversity representations items and *Personal intervention to protect biodiversity (C)* item scored on the second factor. Therefore, attitudinal variables and behavioural variables were not separated. This was problematic, as I wanted to conduct a regression with **behaviours towards biodiversity concept items** as dependent variable. In order to address this issue, I decided to change the minimum eigenvalue from 1 to .8[46], although this can be criticized, as it addresses peripheral elements. It occurred, by reducing the eigenvalue criterion, that a third dimension, which explained 5.7% of the

[46] This modification was made on Jolliffe's (1972, cited in Field et al., 2012) suggestion to lower the minimum eigenvalue, since the Kaiser's criteria appeared too strict.

variance, was extracted. This factor was named *Indirect actions: willingness to give money to protect biodiversity* as it gathered **behaviour towards biodiversity concept** items *Willing to donate to associations for biodiversity (C)* and *More taxes for biodiversity (C)*. These two items were chosen as dependent variables for the regression.

This PCA, included **attitude towards biodiversity concept** items, therefore a PCA was also conducted on the two versions of the questionnaire separately. For both versions, the Cronbach's alpha was very high (.94 for version A and .93 for version B). Three factors were extracted for both versions. Whereas these factors explained 66.6% of the variance in version A, 62.9% of the variance was explained in version B.

Table 29

Orthogonally Rotated Component Loadings of Attitudinal Items and Behaviour Towards Biodiversity Concept Items

Item	Attitude (R)[a]	Attitude & Behaviours (C)[b]	Indirect action (C)[c]
Importance ecological and respectful products (R)	**.81**		
Importance of organic food (R)	**.74**		.31
Importance of life in harmony with the environment (R)	**.73**	.34	
Importance to consider impact of pollution on health (R)	**.70**	.33	
Importance to consider impact of pollution on nature (R)	**.68**	.48	
Importance of promoting sustainable development (R)	**.68**	.39	
Importance fauna and flora (R)	**.60**	**.57**	
Personal intervention to protect biodiversity (C)	**.58**		.37
Preoccupied about loss of biodiversity (C)		**.81**	.30
Importance of loss of biodiversity (C)	.33	**.81**	
Concerned about protection of biodiversity (C)	.32	**.72**	.41
Importance of personal intervention (C)	.40	**.50**	.46
Willing to donate to associations for biodiversity (C)			**.79**
More taxes for biodiversity (C)			**.76**

Note. Saturations <.3 are not displayed ; saturation >.5 are in bold (Dancey & Reidy, 2007). Extraction Method : Principal Component Analysis. Rotation method : varimax with Kaiser normalization.

[a] Attitude towards biodiversity representation dimension, direct actions/attittudes to protect biodiversity. [b] Attitude and behaviours towards biodiversity concept dimension. [c] Indirect actions : willingness to give money to protect biodiverstiy (C).

3.3.7 Predictive Value of Biodiversity Concept (C) and Biodiversity Representations (R) Variables

In order to compare the **attitude towards biodiversity concept** and **attitude towards biodiversity representations** variables in the same model, several multiple linear regressions were conducted. The main idea with the regressions was to consider behavioural variables (biodiversity concept or its representations) as dependent variables, variables of attitude as independent variables and demographic/familiarity variables as control variables (see table 30). The results of the principal component analyses were used to construct scales to group the items.

Variables used for the regressions

For each regression, two principal independent variables were used (see table 30 for descriptive statistics):

- **Attitude towards biodiversity concept** renamed **AttBio (C)** was constructed as the mean of the following items: *Importance of loss of biodiversity (C), Preoccupied about loss of biodiversity (C),* and *Concerned about protection of biodiversity (C).*
- **Attitude towards biodiversity representations** renamed **AttBio (R)** was constructed as the mean of the following items: *Importance of organic food (R)*, *Importance of life in harmony with the environment (R)*, *Importance ecological and respectful products (R)*, *Importance fauna and flora (R)*, *Importance of promoting sustainable development (R)*, *Importance to consider impact of pollution on nature (R)*, and *Importance to consider impact of pollution on health (R).*

To check the results and identify differences among individuals, three groups of control variables were used:

- Familiarity variables: *Informed about biodiversity, Use of the term biodiversity*
- Demographic variables: *Age, Gender, Level of education, Political orientation, Health status,* and *Urban-rural feeling*
- *Version of questionnaire*

As mentioned above, I decided to consider behavioural variables as dependent variables. On the basis of the PCA results, several scales were constructed (see table 30 for descriptive statistics):

- A **Behaviour towards biodiversity concept: indirect action: willingness to give money to protect biodiversity** dependent variable renamed **BeBio (C)** was constructed as the mean of the following items: *Willing to donate to associations for biodiversity (C)* and *More taxes for biodiversity (C)*. A preliminary regression was conducted to check for non-normality or heteroscedasticity of the dependent variables. There were some problems as the constant was not significant in the model (*p-value* = .41). Therefore, it was decided to compute a square root transformation[47] on BeBio(C). This latter was named **BeBio2 (C)**.
- A **Behaviour towards biodiversity representations: global health-related behaviours/thinking towards nature** dependent variable renamed **BeHealth (R)** was constructed as means of the items: *Future well-being and biological diversity (R)*, *Green spaces for plants and animals (R)*, *Influence of behaviours on ecosystems (R)*, *Diversity of nature and well-being (R)* and *Health and preservation of nature (R)*.
- A **Behaviour towards biodiversity representations: Lifestyle and everyday behaviours to protect species** dependent variable renamed **BeLifestyle (R)** was computed as means of the items: *Wood: fauna and flora-friendly behaviour (R), Reduce pollution to protect species (R), Avoid the use of chemical produces (R),* and *Wild gardens for animal and vegetal species (R).*

Table 30

Descriptive Statistics: Independent and Dependent Variables

	N Valid	Missing	Mean	Std. Deviation	Skewness	Kurtosis
AttBio (C)	488	9	3.48	0.87	-0.29	-0.19
AttBio (R)	495	2	3.75	0.56	-0.46	-0.11
BeBio (C)	491	6	3.24	1.01	-0.189	-0.475
BeBio2 (C)[a]	491	6	1.78	0.30	-0.630	0.137
BeHealth (R)[b]	492	5	4.19	0.80	-1.34	-1.75
BeLifestyle (R)	490	7	4.05	0.68	-0.63	-0.05

[a]BeBio2 (C) is the square root transformation of BeBio (C). [b] The skewness and kurtosis values are high, but it was decided to keep this variable in the analysis.

[47] A square root transformation was chosen because it did less affect the skewness and kurtosis of the variable than log or inversed transformation.

Explaining "behaviours towards biodiversity concept" with "attitudes towards biodiversity concept" and "biodiversity representations"

For this first regression, a multiple linear regression was performed between **attitude towards biodiversity concept** *AttBio (C),* **attitude towards biodiversity representations** *AttBio (R)* (independent variable) and **behaviour towards biodiversity concept: indirect action: willingness to give money to protect biodiversity** *BeBio2 (C)* (transformed dependent variable), with the control variables *Age, Gender, Level of education, Political orientation, Health status, Urban-rural feeling,* and *Version*.

The final model was significant $F(11, 368) = 22.82$, $p < .001$ and explained 40.6% of the variance. Thirty-three point seven percent of the variance was explained by *AttBio (C)*. The inclusion of *AttBio (R)* and the control variables respectively added 2.4% and 4.5 % of variance explained[48].

The regression analysis (see table 31) showed a significant increase of willingness to give money to protect biodiversity *BeBio (C)* with more positive attitude towards biodiversity concept *AttBio (C)*. When including the variable attitudes towards biodiversity representations *AttBio (R)*, the beta coefficient of *AttBio (C)* was still significant but dropped from .58 to .43. In the final model, *AttBio (C)* and *AttBio (R)* coefficients were still significant. The beta coefficient of *AttBio (C)* was higher than the one of *AttBio (R)* (ß = .40, $p < .001$ against ß = .15, $p < .05$), meaning that attitude towards biodiversity concept item seemed to more predict willingness to give money to protect biodiversity than attitude towards biodiversity representations items.

Several control variables were also significant even though the beta coefficients were small. Women (ß = -.11, $p < .001$) were more willing to give money to protect biodiversity than men. Moreover, the more left-wing respondents were (ß = -.10, $p < .05$) and the more rural respondents felt (ß = .10, $p < .05$), the more they were willing to give money to protect biodiversity.

[48] The Durbin-Watson statistic for independence of errors, multicolinearity indicators, residual plots identified no specific problems.

Table 31

Summary of Hierarchical Regression Analysis for Variables Predicting Willingness to Donate to Protect Biodiversity (N = 379)

	Variable	*B*	*SE (B)*	β	Δ R^2
Step 1					.34***
	AttBio (C)	.201	.015	.581***	
Step 2					.02***
	AttBio (C)	.149	.02	.431***	
	AttBio (R)	.084	.023	.214***	
Step 3					.04***
	AttBio (C)	.137	.021	.395***	
	AttBio (R)	.057	.023	.145*	
	Age	.000	.001	.012	
	Gender	-.063	.024	-.106**	
	Political orientation	-.019	.009	-.098*	
	Level of Education	.011	.009	.052	
	Health	.001	.012	.004	
	Urban-rural	.029	.012	.103*	
	Informed	.022	.017	.062	
	Use of biodiversity	.017	.015	.056	
	Version	.031	.025	.053	

Note. Total F (11, 368) for step 3 = 22.82***, Adjusted R^2 = .39
* $p < .05$, ** $p < .01$, *** $p < .001$

Explaining "global health-related behaviours" with attitudes towards "biodiversity concept" and "biodiversity representations"

A second multiple linear regression was performed between **attitude towards biodiversity concept** *AttBio (C),* **attitude towards biodiversity representations** *AttBio (R)* (independent variable) and **behaviour towards biodiversity: global health-related behaviours/thinking towards nature** *BeHealth (R)* (dependent variable) with the control variables *Age, Gender, Level of Education, Political orientation, Health status, Urban-rural feeling* and *Version*.

The general model was significant $F(11,371) = 39.96$, $p < .001$ and explained 54.2% of the variance. Forty-five point nine percent of the variance was explained by *AttBio (R)*. The inclusion of *AttBio (C)* and the control variables respectively added 4.1% and 4.2% of variance explained[49].

The regression analysis (see table 32) showed a significant increase of positive health related human-nature behaviors with more positive attitude towards biodiversity

[49] The Durbin-Watson statistic for independence of errors, multicolinearity indicators, residual plots identified no specific problems.

representations *AttBio (R)*. When including the variable attitude towards biodiversity concept *AttBio (C)*, the beta coefficient of *AttBio (R)* was still significant but dropped from .68 to .49. In the final model, *AttBio (C)* and *AttBio (R)* coefficients were significant. The beta coefficient of *AttBio (R)* was higher than the one of *AttBio (C)* (ß = .41, $p < .001$ against ß = .28, $p < .01$), meaning that *AttBio (R)* seemed to more predict positive health-related behaviors towards nature than AttBio (C).

Here again, women tended to have more positive behaviors than men (ß = -.11, $p < .001$). Moreover, the more rural respondents felt, the more they reported positive behaviors (ß = .07, $p < .05$) even if the coefficient was really small. Finally, in this case, the variable version was significant (ß = .10, $p < .001$) meaning that respondents of version B of the questionnaire tended to report more positive health-related human-nature behaviors than those of version A. As the version of the questionnaire could have moderated the relationship between attitudes and behaviors, another regression was performed to check for this effect. This latter included the standardized interactions factors AttBio(R)xVersion and AttBio(C)xVersion. None of the interaction factor was significant meaning that there was no significant interaction effect of the version of the questionnaire.

Table 32

Summary of Hierarchical Regression Analysis for Variables Predicting Global Health-Related Human-nature Behaviours/Thinkings (N = 382)

Variable		*B*	*SE (B)*	β	Δ R^2
Step 1					.46***
	AttBio (R)	.716	.040	.678***	
Step 2					.04***
	AttBio (R)	.512	.053	.485***	
	AttBio (C)	.258	.047	.278***	
Step 3					.04***
	AttBio (R)	.435	.054	.412***	
	AttBio (C)	.261	.049	.280***	
	Age	.002	.002	.043	
	Gender	-.176	.057	-.111***	
	Political orientation	-.026	.020	-.049	
	Level of Education	-.016	.021	-.027	
	Health	.055	.029	.072	
	Urban-rural	.056	.028	.074*	
	Informed	.025	.040	.026	
	Use of biodiversity	.020	.035	.025	
	Version	.159	.058	.101**	

Note. Total F (11, 371) for step 3 = 39.96***, Adjusted R^2 = .53.
* $p < .05$, ** $p < .01$, *** $p < .001$

Explaining everyday actions to protect species with attitudes towards biodiversity concept and biodiversity representations

A second multiple linear regression was performed between **attitude towards biodiversity concept** *AttBio (C),* **attitude towards biodiversity representations** *AttBio (R)* (independent variable) and **behaviour towards biodiversity: lifestyle and everyday behaviours to protect species** *BeLifestyle (R)* with the control variables *Age, Gender, Level of Education, Political orientation, Health status, Urban-rural feeling* and *Version*.

The general model was significant $F(11,370) = 24.75$, $p < .001$ and explained 42.4% of the variance. Thirty-five point two percent of the variance was explained only by *AttBio (R).* The inclusion of *AttBio (C)* and the control variables respectively added 2% and 5.2% of variance explained[50].

The regression analysis (see table 33) showed a significant increase of everyday actions to protect species with more positive attitude towards representations of biodiversity *AttBio (R)*. When including the variable attitude towards concept of biodiversity *AttBio (C)*, the beta coefficient was still significant but dropped from .59 to .46. In the final model, *AttBio (C)* and *AttBio (R)* coefficients were significant. The beta coefficient of *AttBio (R)* was higher than the one of *AttBio (C)* (ß = .41, $p < .001$ against ß = .15, $p < .01$).

For this regression, the significant control variables were not the same than for the other regressions. First of all, the older respondents were, the more they conducted every day actions to protect species (ß = .12, $p < .01$). To a lesser extent, the more left-wing respondents were, the more they conducted every day actions to protect species (ß = -.09, $p < .05$). Finally, the better respondents health status was, the more they conducted every day actions to protect species (ß = .11, $p < .01$).

[50] The Durbin-Watson statistic for independence of errors, multicolinearity indicators, residual plots identified no specific problems.

Table 33

Summary of Hierarchical Regression Analysis for Variables Predicting Everyday Actions to Protect Species (N = 381)

Variable		*B*	*SE (B)*	β	Δ R^2
Step 1					.35***
	AttBio (R)	.534	.037	.593***	
Step 2					.02***
	AttBio (R)	.412	.051	.458***	
	AttBio (C)	.155	.045	.195***	
Step 3					.05***
	AttBio (R)	.367	.051	.408***	
	AttBio (C)	.117	.046	.148**	
	Age	.004	.002	.115**	
	Gender	-.036	.054	-.027	
	Political orientation	-.042	.019	-.094*	
	Level of Education	.013	.02	.026	
	Health	.07	.027	.109**	
	Urban-rural	.049	.027	.076	
	Informed	.071	.038	.088	
	Use of biodiversity	.031	.033	.047	
	Version	.011	.055	.009	

Note. Total F (11, 370) for step 3 = 24.75***, Adjusted R^2 = .41.
* $p < .05$, ** $p < .01$, *** $p < .001$

On the basis of the results of the three regressions, one could say that indicators of attitude towards concept of biodiversity and indicators of attitude towards representations of biodiversity predicted several environmental behaviours. Whereas indicators of attitude towards biodiversity concept better predicted willingness to pay to protect biodiversity, indicators of attitude towards representations of biodiversity better predicted positive health-related human-nature actions and everyday positive actions to protect species. By comparing the three regressions, one could say that *AttBio (R)* seemed to explain a more important part of the variance than *AttBio (C)*. Indeed, *AttBio (C)* explained 33.7% of the variance of the first regression, whether *AttBio (R)* explained respectively 45.9% and 35.3% of the variance of the second and third regressions.

The stepwise method allowed seeing that both indicators *AttBio (C)* an *AttBio (R)* explained an important common part of the variance. Nonetheless, the fact that both indicators were always still significant in the final models showed that they both managed to explain behaviours. Several control variables were also significant to predict behaviours. Indeed, women tended to report more positive health-related human-nature thinking or

willingness to give money to protect for biodiversity than men. Nonetheless, as showed by the third regression, women actual everyday behaviour to protect species did not significantly differ from men's. These observations also applied on rural respondents (in comparison to urban ones). The first regression also showed that left-wing respondents were more ready to pay taxes or to donate to protect biodiversity. The second regression, similarly to results of mean comparisons among version, showed that respondents of version B tended to report more positive health-related human-nature behaviours than respondents of version A. Finally, the third regression showed that older respondents and respondents with a better health status, reported doing more everyday actions to protect species.

4. Discussion

The findings raise several points. First of all, the use of social representation of biodiversity items to measure individual's attitudes towards this scientific term did not appear to violate validity or reliability criteria. Second, the use of more common terms seemed to affect errors associated with the measure of attitude in several ways. Finally, items designed on the basis of representations of biodiversity seemed to bring additional information on respondents' considerations.

4.1 Validity and Reliability of the Items

The validity and reliability of items based on representations of biodiversity was assessed trough several ways. Results went in the direction of the first hypothesis – *Words used to construct the items of the questionnaire are expected to be part of the respondents' representation of biodiversity* – and to a lesser extent of the second hypothesis – *The items designed from the words associated with biodiversity are expected to be homogenous, consistent and to rely to the same latent dimension*. Words used to construct the items of the questionnaire seemed to be part of the respondents' representation of biodiversity.

As shown by the results of this study, biodiversity could be considered as an object of social representation. An object of social representation is the result of the transformation of scientific information during its diffusion, where "informative thinking" – abstract concept and use of an expert vocabulary – is changed into "common mode of thinking" – typical everyday thinking and use of all forms of vocabulary (Moscovici & Hewston, 1984, p. 564). This study showed that this "unfamiliar" topic seemed to be quite salient within the common knowledge (Elejabarrieta, 1996) as respondents reported being quite informed on the topic without using the term biodiversity very often.

Then, as shown by analyses on the open-ended question in version B of the questionnaire, respondents' structure of representation (Abric, 1984) was very similar between both studies,

partially assessing the construct validity of the measures (Capel 2009; Huteau, 2006). Indeed, the same central core (nature, animal species and plants) and similar peripheral elements composed both studies. Moreover, I found similar objectifications – i.e. same most frequent words and similar cluster based on: the complexity of terms, human-nature relationship and well-being– and anchoring– women were again found to more associate words relied to health and well-being than men – with biodiversity (Clémence, 2001; Elejabarrieta, 1996).

Moreover, analyses on the closed-ended triangulated question of version A (Kelle, 2001), showed that respondents associated the words, which were identified in the first study, with biodiversity. The results also indicated that although several terms were commonly accepted to refer to biodiversity – such as nature, plants and animal species – and probably part of the central core of the representation of biodiversity, other terms such as health, organic food and sustainable development were more differentially associated with biodiversity by the respondents and are probably part of the peripheral structure of the representation (Abric, 1984). These results allowed partially assessing validity of the items as they relied to "biodiversity" for the respondents. Nonetheless, the validity of the items designed with the terms "organic food, sustainable development and health" could be discussed, as these terms were not part of the central core of the representation of all respondents. These results were expected as the samples of the first Greentrace and second study almost had the same composition in term of respondents' socio-demographic characteristics. Indeed, members of the same groups, as a result of the anchoring process, often share the same representations and communicate with the same language (Elejabarrieta, 1996).

Several principal component analyses showed that the attitudinal items designed from the words associated with biodiversity seemed to be homogenous, consistent and relates to the same latent dimension (DeVellis, 2012). A PCA conducted between the attitude towards *biodiversity representations* items showed that these items related to one dimension, probably attitude towards SR of biodiversity partially assessing the reliability of these items. Another PCA, conducted between the attitude towards *biodiversity representations* items and the attitude towards *biodiversity concept* items showed that both parts seemed to relate to similar dimensions. Nonetheless, further analyses showed that two dimensions could have been extracted: one for the representation, the other for biodiversity. This could reflect the fact that questions designed with more common terms did not exactly measure the same attitude, "unobserved predisposition towards an object" (Alwin & Krosnick, 1991, p. 139) than items designed with the scientific term.

4.2 Differences between Versions and Measurement Errors

Second, the presence of more common terms as objectification of biodiversity seemed to influence measurement errors. Results went in the direction of the third hypothesis – *Differences between versions A and B are expected to be found in answers to questions about attitude towards "biodiversity", due to the presence of a definition of biodiversity based on individuals' representations in version A of the questionnaire*. Indeed, differences between versions A and B were found in answers to the question "How much is the protection and conservation of biodiversity important to you?". This attitude towards *biodiversity concept* question was asked directly after the definition of biodiversity in version A of the questionnaire, thus differences between the two versions were probably partially due to the definition. When a definition based on representations of biodiversity was provided, respondents tended to report a more positive attitude[51].

By investigating this mean difference, an interaction between task difficulty and respondents' ability was found. Whereas no difference on the basis of the level of education were found in answers to version A of the questionnaire, differences were found in answers to version B. Less educated respondents more often seemed to be influenced by the definition and reported a more positive attitude (Blasius & Thiessen, 2012; Krosnick, 2002). This might indicate the fact that the absence of any definition of the scientific term biodiversity increased the task difficulty for less educated respondents, in particular the comprehension and retrieval of information, thus leading to more reporting of non-attitudes.

Finally, several indicators of reliability (correlations, Cronbach's alphas, and PCA) showed that the definition seems not to decrease the reliability of answers. Moreover, answers to the *Importance of protection of biodiversity (C)* variable might be considered as more reliable when a definition was provided. Indeed, the correlation coefficients, Cronbach's alphas, and variances explained were in many cases higher for answers to this item in version A of the questionnaire.

Such results could be criticized and have to be carefully considered for several reasons. First of all, one could not know if differences in measurement errors between the two versions were due to the presence of more common terms or only to the presence of a definition. It is

[51] By positive attitude (or behaviour), I mean the highest answer modalities of the questions (see recoding p. 50).

likely that these differences were mostly due to the definition and not to the presence of biodiversity objectifications terms in this definition. To investigate this element, one could conduct further experimental studies to compare influences of various definitions (scientific definition, definition based on representations and no definition) on answers.

The conclusions based on satisficing theory are also unclear. Indeed as mentioned above, differences were found in answers to the question that directly followed the definition. By investigating these differences, several indicators showed that the presence of a definition might have slightly reduced measurement errors. Nonetheless, these indicators of reliability might be biased. Because these indicators were attitude towards *biodiversity representation* items, it is not surprising to find higher correlations between these items and the attitude towards *biodiversity concept* item, which was introduced with a definition based on representations.

To conclude this part, one could say that, in any case, the definition influenced respondents who reported a more positive opinion. Nonetheless, one could not know whether this influence leads respondents to report less non-attitudes therefore increasing the reliability of their answers, or forces respondents, in particular those who were more likely to be influenced (less educated respondents), to choose a more socially desirable positive answer.

4.3 Value of a Method Based on Social Representation Theory

Third, the method proposed to design items seemed to be useful in several ways. Results went in the direction of the fourth hypothesis – *The method proposed to design items is expected to be useful*. In general, the more concrete the question was, the more positive the attitude was. Indeed, for the questions on attitude and action towards common terms associated with the representation of biodiversity, respondents reported more positive attitudes and behaviours than for the questions with the scientific term biodiversity. Even though one could not know whether this is better than less extreme answers that reflect people in their natural state of 'ignorance', one could argue that such wording leads respondents to feel more concerned by such environmental issues. Such results may inform the diffusion of knowledge process within the PUS perspective and lead to ask several questions: Does knowledge really lead to more positive attitudes or behaviour, as argued by the deficit model? Or, do these

observations reflect that people report more positive attitudes and behaviours when the thematic and questions asked are based on their "own", better-known, language?

On the basis of the results of the regressions, one could say that indicators of attitude towards representations of biodiversity seemed to predict environmental behaviours in a reliable way, even sometimes better than indicators of attitude towards biodiversity concept. Whereas indicators of attitude towards *biodiversity concept* better predicted willingness to give money to protect biodiversity, indicators of attitude towards *biodiversity representations* better predicted positive health-related behaviours/thinking towards nature and everyday positive actions to protect species. Thus, indicators based on social representations seemed to be better predictors of concrete direct behaviours, whether indicators based on the scientific concept biodiversity seemed to be better predictor of indirect intention of actions, such as the willingness to give money to protect biodiversity. One could ask if scientific terms lead individuals to leave biodiversity management to professionals (associations or/and the confederation) while common terms are more associated with individuals' direct responsibilities and actions?

Finally, the results showed that indicators of attitude towards representations of biodiversity brought information to predict environmental behaviours but also to understand anchoring of biodiversity among the social groups. Indicators based on representations seemed to provide information on respondents' cognitive work and considerations to form their opinion (Krosnick, 2002). A comparison between results of the first regression, willingness to give money to protect biodiversity, with results of the second (global health-related behaviours/thinking towards nature), and third (everyday actions to protect species) regressions showed several interesting elements. Whether the first regression was used to predict behaviour towards *biodiversity concept*, the second and third regressions were used to predict behaviours towards *biodiversity representations*. The second and third regressions seemed to provide a more complete information on respondents. For example, women were more likely to report positive health-related behaviours towards nature or willingness to pay for biodiversity than men. Nonetheless, as showed by the third regression, women's actual everyday behaviour did not significantly differ from men's one. This could mean that women report more positive intention of actions or past-behaviours, as part of the behavioural component of attitudes, while they did not adopt more positive concrete behaviours (Deschamps & Beauvois, 1996). The same observation was made on rural respondents. Another comparison showed that left-wing respondents were more ready to give money to

protect biodiversity and were more likely to adopt everyday behaviours to protect species. Nonetheless, they did not report more positive health-related thinking. Finally, regressions based on representations not only provided more specific information on respondents (Krosnick, 2002) but also provided additional information. For example, the third regression showed that older respondents with a better health status were more likely to adopt everyday positive actions to protect the environment.

To sum up this discussion, one could say that respondents' cognitive work (Tourangeau et al., 2000) was influenced by the presence of a definition when associated with the question and more common terms as representations of biodiversity. This influence is potentially due to the nature of the complex scientific object biodiversity. Individuals are more unlikely to have preconsolidated opinion in memory on biodiversity, thus they have to follow carefully each of the four cognitive steps of the cognitive process – comprehension, retrieval, judgement, answer (Krosnick, 2002; Tourangeau et al., 2000). As comprehension of the item goes through linking term to more common concepts, providing a definition should simplify the cognitive process and task difficulty. This was reflected by the results of this study. Nonetheless, results were unclear regarding to the nature of these changes and several questions can be asked: Did more common terms change respondents' comprehension of the items who therefore reported more positive attitudes towards environment? Were respondents influenced by the definition in such a way that they were more likely to skip the response process? Or did more common terms reduce the task difficulty by simplifying the comprehension and retrieval of the items, therefore leading to less reporting of non-attitudes and measurement errors?

Conclusions and Further Studies

In the face of global climate change, understanding public attitudes towards environmental issues is critical to designing effective policy. This dissertation by investigating public attitudes towards an environmental issue such as biodiversity shows that collaboration between social representation's and questionnaire design's methodologists and theorists is useful for survey research. Measurement of attitudes can lead to several errors, in particular due to the way respondents answer to survey questions. Sometimes respondents do not have the ability or find the task too difficult to optimize their answers. Therefore they will report non-attitudes that will affect the quality of a survey. In this research, I focused on complex or unfamiliar scientific words in questions that can lead to such errors. As social representation perspective also deals with such terms by looking at the circulation of knowledge from the scientific sphere to the common world and how, through the processes of objectification and anchoring, these scientific terms are represented into more common terms, I decided to use their methodology.

This methodology, based on statistical factorial analyses, allowed structuring the words that respondents associate with biodiversity into classes. This analysis was conducted on answers to an open-ended question of Greentrace questionnaire (Joost & Clémence, 2013). This latter allowed identifying more common terms associated with the representation of biodiversity. I then designed items with these terms. As such a method was quite new, I had to test its reliability, validity, but also usefulness. Therefore, an experimental survey on a similar sample to the one of Joost & Clémence was conducted. Results showed that items based on representations seemed not only to be valid and reliable, but also to bring more information on respondents.

In this research, it was proposed to test a way of integrating social representation theories into questionnaire design theory. According to the results of this study, from a methodological point of view, the use of social representation of a scientific topic, instead of the scientific

term, can be beneficial for the quality of survey questions. In addition to these quality issues, the results also inform on attitudes and representations of the quite unstudied topic of biodiversity. In particular, one could say that the use of more common terms in survey questions leads respondents to report more positive attitudes and behaviour than when the scientific term is used. The more concrete and simple the items were, the more respondents' reported positive attitude and behaviour. To sum up, one could say that this study shows that people have opinion on scientific topics, feel concerned about biodiversity and can support policies when their "own" language and representations of biodiversity, is used.

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4.4 Appendix

Annex 1

Distribution of the Sample of the 2nd Study on the Basis of the 1st Study Distribution by Municipality

	Questionnaires distributed (N)		
Municipality	$N_{1st\ study}$	$N_{1st\ study}/N_{total}$ (%)	$N_{2nd\ study}$
Aïre	11	1.2	24
Aire la ville	8	0.8	16
Bellevue	14	1.5	30
Bernex	1	0.1	
Carouge	20	2.1	42
Chambesy	18	1.9	38
Chatelaine	9	1.0	19
Chêne-Bougeries	34	3.6	87(72)[52]
Chêne-Bourg	53	5.6	112
Cointrin	7	0.7	15
Cologny	7	0.7	0(15)
Conches	4	0.4	
Genève-ville			
1201	50	5.3	106
1202	88	9.3	186
1203	55	5.8	116
1204	17	1.8	36
1205	133	14.0	280
1206	83	8.8	176
1207	76	8.0	160
1208	26	2.7	54
1209	16	1.7	34
Genthod	10	1.1	21
La Plaine	1	0.1	
Le Grand Saconnex	34	3.6	72
Le Lignon	27	2.9	57
Les Acacias	5	0.5	11
Les Avanchets	18	1.9	38
Meyrin	35	3.7	74
Russin	3	0.3	
Thônex	53	5.6	112
Versoix	5	0.5	11
Vessy	7	0.7	15
Veyrier	18	1.9	38
Total	947	100.0	1983

[52] I combined Cologny and Chêne-Bougeries together (87 questionnaires were distributed in Chêne-Bougeries instead of 72 in Chêne-Bougeries and 15 in Cologny).

Annex 2

Response Rate (n/N) and Socio-economic Indicators by Municipality

Area	N	n	Response rate n/N (%)	Type of building[a]	Range income by habitant[b]
Versoix	11	0	.0	B-H	38
Ville : 1203	116	18	15.5	B	43
Vernier :Les Avanchets	38	6	15.8	B	45
Ville : 1202	186	31	16.7	B	43
Vernier : Aïre-Lignon-Châtelaine	100	17	17.0	B-H	45
Ville : 1207	160	33	20.6	B	43
Ville : 1200, 1201	106	22	20.8	B	43
Carouge-Les Accacias	53	12	22.6	B	39
Ville : 1206	176	40	22.7	B	43
Chêne-Bourg	112	26	23.2	B	41
Ville : 1205	319	74	23.4	B	43
Chêne-Bougeries	87	23	26.4	H-B	36
Ville : 1209	34	9	26.5	B	43
Meyrin : Cointrin	15	4	26.7	B	40
Ville : 1208	54	15	27.8	B	43
Genthod	21	6	28.6	H	13
Meyrin	74	22	29.7	B	40
Le Grand Saconnex	72	22	30.6	H	34
Aire la ville	16	6	37.5	H	1
Bellevue	30	12	40.0	H	24
Thônex	112	47	42.0	B	37
Vessy-Veyrier	53	24	45.3	H	21
Chambésy	38	19	50.0	H	27
Total	1983	488			
Missings		9			

[a] Made on observations during questionnaires' distribution (H = Houses; B = Buildings). [b] Range annual median income by habitant (OFS, 2011). Values range from the highest median income (1) to the lowest. (see http://www.ge.ch/statistique/municipalities/welcome.asp)

A

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N° QUESTIONNAIRE : 1 | | | |

Votre avis sur la Nature!

Une étude sur l'opinion des romands sur la biodiversité

Dans le cadre d'une étude menée à l'Université de Lausanne, nous nous intéressons à l'opinion des habitants de la région lémanique sur les questions liées à l'environnement. Nous vous serions très reconnaissants de nous accorder une dizaine de minutes pour répondre à ce questionnaire, ce qui nous apporterait une aide précieuse pour notre recherche.

Nous nous intéressons à votre opinion personnelle, et donc il n'y a pas de bonnes, ni de mauvaises réponses. Nous aimerions que vos réponses soient les plus spontanées possibles. S'il vous plait, **n'indiquez pas vos noms et prénoms sur le questionnaire.** De plus, nous vous assurons que les réponses que vous nous donnerez seront analysées et utilisées de façon confidentielle, uniquement dans le cadre de cette étude.

N'hésitez pas à vous adresser à nous si vous avez des questions ou des commentaires!

Merci d'avance pour votre participation et nous vous souhaitons une bonne année 2015 !

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A

Consignes

Merci de répondre au questionnaire, voici quelques consignes et remarques :

Chaque partie du questionnaire est séparée par une bande grise.
Il est important de répondre aux diverses questions dans l'ordre proposé par le questionnaire.
Pour chaque question, veuillez cocher ⊗ la case qui correspond le mieux à votre opinion.
Les consignes et remarques sont en italique.
Les questions sont en gras.
Les modalités de réponse sont en caractères normaux.
Après avoir rempli le questionnaire, mettez-le dans l'enveloppe affranchie disponible avec le questionnaire et n'oubliez pas de poster l'enveloppe.

Partie I

Q1. En général, dans quelle mesure vous sentez-vous informé(e) sur les questions liées à la biodiversité?

Je me sens…

Pas du tout informé(e)	Un peu informé(e)	Moyennement informé(e)	Très informé(e)	Complétement informé(e)
O1	O2	O3	O4	O5

Q2. À quel point utilisez-vous le terme biodiversité dans vos conversations ?

J'utilise le terme biodiversité…

Jamais	Rarement	Parfois	Assez souvent	Très souvent
O1	O2	O3	O4	O5

Partie II

Nous allons maintenant vous proposer une définition de la biodiversité.

> **Définition**: La biodiversité correspond à la diversité des organismes vivants. Elle s'apprécie notamment en considérant la diversité des écosystèmes ainsi que des espèces animales et végétales. En d'autres termes, la biodiversité correspond à la diversité biologique que l'on peut trouver dans la nature (p.ex. les plantes, animaux, arbres, insectes etc.).

En vous basant sur la définition proposée ci-dessus, veuillez répondre aux questions suivantes :

Q3. Dans quelle mesure le phénomène de perte de la biodiversité est-il important pour vous?

Pour moi, le phénomène de perte de la biodiversité est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

A

Q4. À quel point êtes-vous préoccupé(e) par la perte de la biodiversité?

Je suis …

Pas du tout préoccupé(e)	Un peu préoccupé(e)	Préoccupé(e)	Très préoccupé(e)	Extrêmement préoccupé(e)	Pas d'avis
O1	O2	O3	O4	O5	O6

Q5. À quel point vous sentez-vous concerné(e) par la conservation et la protection de la biodiversité?

Je me sens…

Pas du tout concerné(e)	Un peu concerné(e)	Concerné(e)	Très concerné(e)	Extrêmement concerné(e)	Pas d'avis
O1	O2	O3	O4	O5	O6

Partie III

En ayant toujours la définition de la biodiversité en tête, veuillez-répondre aux questions suivantes :

Q6. Dans quelle mesure accepteriez-vous de faire un don à une organisation (comme ProNatura ou le WWF) pour promouvoir la biodiversité dans la région lémanique ?

J'accepterais…

Sûrement pas	Probablement pas	Peut-être	Probablement	Sûrement	Pas d'avis
O1	O2	O3	O4	O5	O6

Q7. Dans quelle mesure accepteriez-vous de payer plus d'impôt afin de protéger et conserver la biodiversité en Suisse?

J'accepterais…

Sûrement pas	Probablement pas	Peut-être	Probablement	Sûrement	Pas d'avis
O1	O2	O3	O4	O5	O6

Q8. Comment évaluez-vous l'importance d'intervenir personnellement en faveur de la conservation et la protection de la biodiversité?

Pour moi, intervenir personnellement en faveur de la conservation et la protection de la biodiversité est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

A

Q9. Dans quelle mesure diriez-vous que vous faites personnellement des efforts (p. ex utiliser des produits respectueux de l'environnement, faire attention à la surpêche des poissons, etc.) pour protéger la biodiversité?

Je fais des efforts…

Jamais	Rarement	Parfois	La plupart du temps	Tout le temps	Pas d'avis
O1	O2	O3	O4	O5	O6

Partie IV

Q10. Nous allons maintenant vous proposer divers mots et expressions. Lorsque vous entendez le terme biodiversité, dans quelle mesure ces mots ou expressions vous viennent-ils à l'esprit ?
Pour chaque ligne, cochez la case qui correspond le mieux à votre opinion.

…me vient à l'esprit.	Pas du tout	Un peu	Moyennement	Beaucoup	Totalement	Je ne connais pas ce terme
1. La nature	O1	O2	O3	O4	O5	O6
2. Les espèces animales	O1	O2	O3	O4	O5	O6
3. L'environnement	O1	O2	O3	O4	O5	O6
4. La diversité biologique	O1	O2	O3	O4	O5	O6
5. La faune	O1	O2	O3	O4	O5	O6
6. La flore	O1	O2	O3	O4	O5	O6
7. L'écologie	O1	O2	O3	O4	O5	O6
8. Les organismes vivants	O1	O2	O3	O4	O5	O6
9. Les espèces végétales	O1	O2	O3	O4	O5	O6
10. La santé	O1	O2	O3	O4	O5	O6
11. L'équilibre des écosystèmes	O1	O2	O3	O4	O5	O6
12. Le développement durable	O1	O2	O3	O4	O5	O6
13. L'agriculture biologique	O1	O2	O3	O4	O5	O6
14. Les plantes	O1	O2	O3	O4	O5	O6

Partie V

Q11. Dans quelle mesure le fait de consommer de la nourriture provenant de l'agriculture biologique est important pour vous?

Pour moi, consommer de la nourriture provenant de l'agriculture biologique est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

A

Q12. Dans quelle mesure le fait de mener une vie en harmonie avec l'environnement est important pour vous?

Pour moi, mener une vie en harmonie avec l'environnement est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q13. Dans quelle mesure le fait d'utiliser des produits écologiques et respectueux de l'environnement est important pour vous?

Pour moi, utiliser des produits écologiques et respectueux de l'environnement est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q14. Dans quelle mesure le fait de préserver la faune et la flore est important pour vous ?

Pour moi, préserver la faune et la flore est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q15. Dans quelle mesure le fait de promouvoir le développement durable est important pour vous ?

Pour moi, promouvoir le développement durable est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q16. Dans quelle mesure le fait de considérer l'impact de la pollution sur la nature est important pour vous ?

Pour moi, considérer l'impact de la pollution sur la nature est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q17. À quel point considérez-vous que sauvegarder l'environnement est important pour votre santé et votre bien-être?

Pour moi, sauvegarder l'environnement est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

A

Q18. Nous allons maintenant vous présenter différentes situations de la vie quotidienne.
Veuillez indiquer dans quelle mesure ces différentes situations vous correspondent.

Cela me correspond…	Pas du tout	Un peu	Moyennement	Beaucoup	Tout à fait	Pas concerné
1. En entrant dans un magasin d'alimentation, je me dirige souvent vers le rayon des produits biologiques.	O1	O2	O3	O4	O5	O6
2. Lorsque je jardine ou je fais le ménage, j'évite d'utiliser des produits chimiques qui peuvent nuire à l'environnement.	O1	O2	O3	O4	O5	O6
3. Lorsque je vais en forêt, j'ai un comportement respectueux de la faune et de la flore.	O1	O2	O3	O4	O5	O6
4. Je pense qu'il est important de laisser les jardins à "l'état sauvage" pour permettre aux insectes et aux plantes sauvages de s'y développer.	O1	O2	O3	O4	O5	O6
5. Je pense que le bien-être futur de l'être humain passe par la préservation de la diversité biologique.	O1	O2	O3	O4	O5	O6
6. Je pense qu'il faut aménager des "espaces verts" dans le canton de Genève pour préserver les plantes et les animaux.	O1	O2	O3	O4	O5	O6
7. Pour ne pas nuire à certaines espèces animales et végétale, j'essaie de polluer le moins possible.	O1	O2	O3	O4	O5	O6
8. Je pense que la plupart de nos comportements ont une influence directe sur l'équilibre des écosystèmes.	O1	O2	O3	O4	O5	O6
9. Je pense que, plus la nature est diversifiée en espèces, meilleure est le bien-être de l'être humain.	O1	O2	O3	O4	O5	O6
10. Je pense que ma santé dépend directement du degré de préservation de la nature.	O1	O2	O3	O4	O5	O6

A

Partie VI

Q19. Quel est votre âge ? _____

Q20. Quel est votre sexe ? O1 Féminin O2 Masculin

Q21. Quelle est votre nationalité ? O1 Suisse O2 Autre: _____

Q22. Quel est le code postal (NPA) de votre localité ? 1 2 __ __

Q23. Combien d'enfants avez-vous? (les vôtres, adoptés, de votre partenaire) : _____

Q24. Habitez-vous avec un(e) conjoint(e) ou partenaire ? O1 Oui O2 Non

Q25. Avec combien de personnes vivez-vous en ménage commun ? _____ personnes

Q26. Quel est votre plus haut niveau de formation ? :

Ecole obligatoire	O1
Apprentissage, École professionnelle	O2
Maturité	O3
Haute école Professionnelle	O4
Université, EPF	O5
Autre:	O6

Q27. Avez-vous une activité professionnelle ? O1 Oui O2 Non

Q28. Si oui, quelle est votre activité professionnelle ? _____

A

Q29. Quelle est votre orientation politique, si vous en avez une ?

Très à gauche	Assez à gauche	Un peu à gauche	Au centre	Un peu à droite	Assez à droite	Très à droite
O1	O2	O3	O4	O5	O6	O7

Q30. Si vous deviez décrire votre état de santé, diriez-vous qu'il est :

Très mauvais	Mauvais	Assez mauvais	Moyen	Assez bon	Bon	Très bon
O1	O2	O3	O4	O5	O6	O7

Q31. Vous sentez-vous…

Très cidatin(e)	Assez citadin(e)	Ni citadin(e), ni campagnard(e)	Assez campagnard(e)	Très campagnard(e)
O1	O2	O3	O4	O5

Merci Beaucoup de votre collaboration !
N'oubliez pas de renvoyer le questionnaire à l'adresse suivante :

UNIL–ISS
Léïla Eisner
Bâtiment Géopolis
1015 Lausanne

B

UNIL | Université de Lausanne

N° QUESTIONNAIRE : 2 | | | |

Une étude sur l'opinion des romands sur la biodiversité

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Léïla Eisner
Assistante étudiante
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CH-1015 Lausanne
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B

Consignes

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Les questions sont en gras.
Les modalités de réponse sont en caractères normaux.
Après avoir rempli le questionnaire, mettez-le dans l'enveloppe affranchie disponible avec le questionnaire et n'oubliez pas de poster l'enveloppe.

Partie I

Q1. En général, dans quelle mesure vous sentez-vous informé(e) sur les questions liées à la biodiversité?

Je me sens…

Pas du tout informé(e)	Un peu informé(e)	Moyennement informé(e)	Très informé(e)	Complétement informé(e)
O1	O2	O3	O4	O5

Q2. À quel point utilisez-vous le terme biodiversité dans vos conversations ?

J'utilise le terme biodiversité…

Jamais	Rarement	Parfois	Assez souvent	Très souvent
O1	O2	O3	O4	O5

Partie II

Q3. Dans quelle mesure le phénomène de perte de la biodiversité est-il important pour vous?

Pour moi, le phénomène de perte de la biodiversité est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q4. À quel point êtes-vous préoccupé(e) par la perte de la biodiversité?

Je suis …

Pas du tout préoccupé(e)	Un peu préoccupé(e)	Préoccupé(e)	Très préoccupé(e)	Extrêmement préoccupé(e)	Pas d'avis
O1	O2	O3	O4	O5	O6

B

Q5. À quel point vous sentez-vous concerné(e) par la conservation et la protection de la biodiversité?

Je me sens…

Pas du tout concerné(e)	Un peu concerné(e)	Concerné(e)	Très concerné(e)	Extrêmement concerné(e)	Pas d'avis
O1	O2	O3	O4	O5	O6

Partie III

Q6. Dans quelle mesure accepteriez-vous de faire un don à une organisation (comme ProNatura ou le WWF) pour promouvoir la biodiversité dans la région lémanique ?

J'accepterais…

Sûrement pas	Probablement pas	Peut-être	Probablement	Sûrement	Pas d'avis
O1	O2	O3	O4	O5	O6

Q7. Dans quelle mesure accepteriez-vous de payer plus d'impôt afin de protéger et conserver la biodiversité en Suisse?

J'accepterais…

Sûrement pas	Probablement pas	Peut-être	Probablement	Sûrement	Pas d'avis
O1	O2	O3	O4	O5	O6

Q8. Comment évaluez-vous l'importance d'intervenir personnellement en faveur de la conservation et la protection de la biodiversité?

Pour moi, intervenir personnellement en faveur de la conservation et la protection de la biodiversité est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q9. Dans quelle mesure diriez-vous que vous faites personnellement des efforts (p.ex utiliser des produits respectueux de l'environnement, faire attention à la surpêche des poissons, etc.) pour protéger la biodiversité?

Je fais des efforts…

Jamais	Rarement	Parfois	La plupart du temps	Tout le temps	Pas d'avis
O1	O2	O3	O4	O5	O6

B

Partie IV

Q10. Lorsque vous entendez le terme biodiversité, quels sont les mots ou les expressions qui vous viennent immédiatement à l'esprit ?

Notez ci-dessous ces mots et expressions.

_____

_____

_____

_____

_____

Partie V

Q11. Dans quelle mesure le fait de consommer de la nourriture provenant de l'agriculture biologique est important pour vous?

Pour moi, consommer de la nourriture provenant de l'agriculture biologique est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q12. Dans quelle mesure le fait de mener une vie en harmonie avec l'environnement est important pour vous?

Pour moi, mener une vie en harmonie avec l'environnement est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q13. Dans quelle mesure le fait d'utiliser des produits écologiques et respectueux de l'environnement est important pour vous?

Pour moi, utiliser des produits écologiques et respectueux de l'environnement est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

B

Q14. Dans quelle mesure le fait de préserver la faune et la flore est important pour vous ?

Pour moi, préserver la faune et la flore est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q15. Dans quelle mesure le fait de promouvoir le développement durable est important pour vous ?

Pour moi, promouvoir le développement durable est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q16. Dans quelle mesure le fait de considérer l'impact de la pollution sur la nature est important pour vous ?

Pour moi, considérer l'impact de la pollution sur la nature est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

Q17. À quel point considérez-vous que sauvegarder l'environnement est important pour votre santé et votre bien-être?

Pour moi, sauvegarder l'environnement est…

Pas du tout important	Un peu important	Important	Très important	Extrêmement important	Pas d'avis
O1	O2	O3	O4	O5	O6

B

Q18. Nous allons maintenant vous présenter différentes situations de la vie quotidienne.

Veuillez indiquer dans quelle mesure ces différentes situations vous correspondent.

Cela me correspond…	Pas du tout	Un peu	Moyennement	Beaucoup	Tout à fait	Pas concerné
1. En entrant dans un magasin d'alimentation, je me dirige souvent vers le rayon des produits biologiques.	O1	O2	O3	O4	O5	O6
2. Lorsque je jardine ou je fais le ménage, j'évite d'utiliser des produits chimiques qui peuvent nuire à l'environnement.	O1	O2	O3	O4	O5	O6
3. Lorsque je vais en forêt, j'ai un comportement respectueux de la faune et de la flore.	O1	O2	O3	O4	O5	O6
4. Je pense qu'il est important de laisser les jardins à "l'état sauvage" pour permettre aux insectes et aux plantes sauvages de s'y développer.	O1	O2	O3	O4	O5	O6
5. Je pense que le bien-être futur de l'être humain passe par la préservation de la diversité biologique.	O1	O2	O3	O4	O5	O6
6. Je pense qu'il faut aménager des "espaces verts" dans le canton de Genève pour préserver les plantes et les animaux.	O1	O2	O3	O4	O5	O6
7. Pour ne pas nuire à certaines espèces animales et végétale, j'essaie de polluer le moins possible.	O1	O2	O3	O4	O5	O6
8. Je pense que la plupart de nos comportements ont une influence directe sur l'équilibre des écosystèmes.	O1	O2	O3	O4	O5	O6
9. Je pense que, plus la nature est diversifiée en espèces, meilleure est le bien-être de l'être humain.	O1	O2	O3	O4	O5	O6
10. Je pense que ma santé dépend directement du degré de préservation de la nature.	O1	O2	O3	O4	O5	O6

B

Partie VI

Q19. Quel est votre âge ? _____

Q20. Quel est votre sexe ? O1 Féminin O2 Masculin

Q21. Quelle est votre nationalité ? O1 Suisse O2 Autre: _____

Q22. Quel est le code postal (NPA) de votre localité ? 1 2 ___ ___

Q23. Combien d'enfants avez-vous? (les vôtres, adoptés, de votre partenaire) : _____

Q24. Habitez-vous avec un(e) conjoint(e) ou partenaire ? O1 Oui O2 Non

Q25. Avec combien de personnes vivez-vous en ménage commun ? _____ personnes

Q26. Quel est votre plus haut niveau de formation ? :

Ecole obligatoire	O1
Apprentissage, École professionnelle	O2
Maturité	O3
Haute école Professionnelle	O4
Université, EPF	O5
Autre:	O6

Q27. Avez-vous une activité professionnelle ? O1 Oui O2 Non

Q28. Si oui, quelle est votre activité professionnelle ? _____

B

Q29. Quelle est votre orientation politique, si vous en avez une ?

Très à gauche	Assez à gauche	Un peu à gauche	Au centre	Un peu à droite	Assez à droite	Très à droite
O1	O2	O3	O4	O5	O6	O7

Q30. Si vous deviez décrire votre état de santé, diriez-vous qu'il est :

Très mauvais	Mauvais	Assez mauvais	Moyen	Assez bon	Bon	Très bon
O1	O2	O3	O4	O5	O6	O7

Q31. Vous sentez-vous…

Très cidatin(e)	Assez citadin(e)	Ni citadin(e), ni campagnard(e)	Assez campagnard(e)	Très campagnard(e)
O1	O2	O3	O4	O5

Merci Beaucoup de votre collaboration !

N'oubliez pas de renvoyer le questionnaire à l'adresse suivante :

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