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# Self-interest versus collective action: understanding cross-class environmental perception, knowledge and behavior in Brazil

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*Abstract*

This paper aims to seek evidence of environmentalism among the poor by asking two questions: i) is environmental perception, knowledge and behavior positively influenced by the socioeconomic status and objective environmental conditions of individuals?; ii) Does the nature of behavior (collective versus private) influence pro-environmental actions among the poor? Using novel household-level data representative of two metropolitan regions in the State of São Paulo, Brazil, we measure and describe perceptions and behavior about several environmental issues using the Grade of Membership (GoM) technique and fixed-effect logistic regression. Based on our findings, we argue that past evidence on low levels of pro-environmental behavior in low-income settings may reflect the inability of differentiating private (individual) from public (collective) environmental behavior. We address these limitations by including questions about actual and intended environmental behavior that explicitly differentiates individual from collective actions. This difference is key to understanding how low-income individuals overcome budget constraints, reducing the unitary cost of action.

Key words: Environmental perception, environmental behavior, Brazil, grade of membership, environmentalism.

*Resumen*

*Interés individual versus acción colectiva: entendiendo las interrelaciones entre percepción ambiental, conocimiento y comportamiento en Brasil*

Este trabajo tiene como objetivo buscar evidencia de ecologismo entre la población pobre mediante dos preguntas: i) ¿El estrato socioeconómico y las condiciones objetivas del medio ambiente influencian positivamente la percepción sobre el medio ambiente, el conocimiento y el comportamiento? ii) ¿El tipo de comportamiento (colectivo *versus* individual) influye en acciones pro ambientales entre la población pobre? Usando datos novedosos/recientes de hogares de dos regiones metropolitanas en el estado de São Paulo, Brasil, medimos y describimos percepciones y actitudes comportamentales sobre cuestiones ambientales seleccionadas. Utilizamos técnicas de grados de pertenencia (GOM por sus siglas en inglés) y regresiones logísticas de efectos fijos. Los resultados indican que evidencia pasada de bajos niveles de comportamiento pro ambiental en poblaciones con bajos ingresos resultaría en una incapacidad de diferenciar actitudes privadas (individuales) de públicas (colectivas) en relación con actitudes comportamentales sobre el medio ambiente. Abordamos estas limitaciones mediante la inclusión de preguntas sobre el comportamiento ecológico/ambiental real e ideal que, explícitamente diferencie acciones individuales o colectivas. Esta diferencia es clave para entender cómo los individuos de bajos ingresos pueden superar limitaciones presupuestarias, reduciendo así el costo unitario de una intervención.

*Palabras clave*: Percepción ambiental, comportamiento ambiental , Brasil, grado de pertenencia (GOM), medio ambientalismo.

## Introduction

Since the 1960s, when Rachel Carson's "Silent Spring" (Carson 1962) called people's attention to controversial uses of chemical products and their environmental impact, public opinion has become more sensitive to the relationship between human activities and the natural environment. Questions such as global warming, ecological degradation, and ecosystems resilience became theme of several global conferences promoted by the United Nations. In 1983, the Brundtland Commission gave birth to the concept of "sustainable development"[1], reflecting public recognition of the environment as a key dimension of social development (White and Hunter, 2009).

Responding to the increasing level of public awareness about vulnerability to environmental hazards, questions like the effect of greenhouse gases and climate change on human populations defined an important share of policy agendas during the 1990´s. As a result, studies about the role of the environment for broader social development rapidly increased (Dunlap and Mertig 1995; Inglehart *et al.* 2000; Ester *et al.* 2004). One of the most influential studies about environmentalism was published by Inglehart in 1995 using the World Values Survey. Based on a series of correlational analysis of countries with different levels of socioeconomic development, the author concluded that variation in environmental concern and willingness to engage in conservation was explained by the dichotomy "materialistic versus post-materialistic view" (Inglehart 1995). Other influential study was conducted by Dunlap and Mertig (1995), using the 1992 Health of the Planet Survey. The authors' findings contrast with Inglehart's study, suggesting that concern for environmental quality is actually higher among developing countries. Although cross-national comparisons helped to situate the overall level of awareness in different societies, important differences in specific low-income settings were glassed over. More recent studies tried to fill this gap in the literature, conducting surveys in areas such as China, Brazil, Israel and Africa (Chen *et al.* 2011; Crespo 2003; Drori and Yuchtmann-Yaar 2002; White and Hunter 2009). These studies

[1] The concept of "sustainable development" was coined during the World Commission on Environment and Development (WCED), convened by the United Nations in 1983. The concept is generally used to mean use of natural resources that meets the needs of the present without compromising the ability of future generations to meet their own needs (Charles and Gareth, 1998).

find environmental concern and willingness to pay for environmental conservation among low-income countries, although socioeconomic affluence is still important to reduce the cost of environmental action.

This paper aims to seek evidence of environmentalism among the poor by asking two questions: i) is environmental perception, knowledge and behavior positively influenced by the socioeconomic status and objective environmental conditions of individuals?; ii) Does the nature of behavior (collective versus private) influence pro-environmental actions among the poor? Mapping and measuring environmental values and perceptions is relevant because they express current social knowledge about environmental questions, as well as willingness to engage in behavioral changes in face of environmental problems, as suggested by the empirical literature. This kind of change, however, is not easy since it depends on a large number of social and economic factors that may prevent individuals to engage in environmentally significant behaviors. In this paper we measure and describe perceptions and behavior about several environmental issues using the Grade of Membership (GOM) technique, and discuss how these perceptions can be influenced by the physical characteristics of households and their socioeconomic status. We use a household-level survey representative of two metropolitan regions in the State of São Paulo, Brazil. The questionnaire was designed to be comparable to other important surveys, such as the World Values Survey and a survey conducted by the Brazilian Ministry of the Environment (Simões 2001). We take advantage of the standardized nature of the questionnaires in our two study sites to create multidimensional profiles that link perception to action regarding environmental problems. In addition, we include sociodemographic variables and infrastructural characteristics of the households and neighborhoods to discuss how perceptions and actions are mediated by social status, education and the immediate physical household environment. Because variables used in our profiles are readily available in other surveys, results for other settings can be compared in the future, contributing to a more general understanding of how perceptions and actions are linked and what factors may disrupt this connection.

This study contributes to the literature in two important ways: i) methodologically, by using fuzzy state models to define fuzzy-weighted multidimensional profiles of environmental perception and behavior; and ii) substantively, by providing empirical evidence of perception and behavioral patterns regarding environmental problems in developing settings. The fuzzy set methodology allows us to empirically derive a measure

of individual heterogeneity used to weight the probabilities used in the description of the multidimensional profiles. This measure of individual heterogeneity can also be used in future analysis to estimate regression relationships, adding more variance and increasing the explanatory power of statistical models when the observed variables are categorical (Manton *et al.* 1992). Last but not least, our empirical analysis adds to the growing literature on environmentalism in developing countries (Chen *et al.* 2011; White and Hunter 2009; Drori and Yuchtmann-Yaar 2002). We argue that past evidence on low levels of pro-environmental behavior in low-income settings may reflect the inability of differentiating private (individual) from public (collective) environmental behavior. We address these limitations by including questions about actual and intended environmental behavior that explicitly differentiates individual from collective actions. As it will be seen, this difference is key to understanding how low-income individuals overcome budget constraints, reducing the unitary cost of action.

## The research project

This paper is based on data from the Project *Dinâmica intrametropolitana e vulnerabilidade sócio-demográfica das metrópoles do interior paulista: Campinas e Santos*, conduted by Núcleo de Estudos de População (NEPO/UNICAMP), funded by FAPESP and CNPq research agencies. The survey was conducted in the second half of 2007, with a total of 3 419 households being interviewed (1 823 in Campinas Metropolitan Area and 1 596 in Baixada Santista Metropolitan Area). With seven modules,[2] the questionnaire was designed primarily to elicit information about household level decisions and characteristics, although some questions at the individual level were asked (mainly socio-demographic characteristics of household members).[3] In this study we use the module with information for physical characteristics of the household and its surroundings in addition to questions about environmental attitude, knowledge, perception and behavior of respondents. The reference date of the survey is close to the release of IPCC Report (IPCC, 2007). The report suggested two relevant points: i) global warming is scientifically proved to be happening, and ii)

[2] For detailed information on the project, please refer to the following link: http://www.nepo.unicamp.br/vulnerabilidade/index.php.

[3] The sample was drawn in three stages: first, strata of socioeconomic vulnerability were assigned; second, within each stratum, census tracts were selected proportionally to their size; third, a fixed number of households were selected within each selected census tract. We used the stratum and inverse of the probabity of each household to be selected to estimate our results and adjust for the complex sampling design. For detailed information about the sampling procedures and questionnaire modules, see Cunha *et al*. (2006).

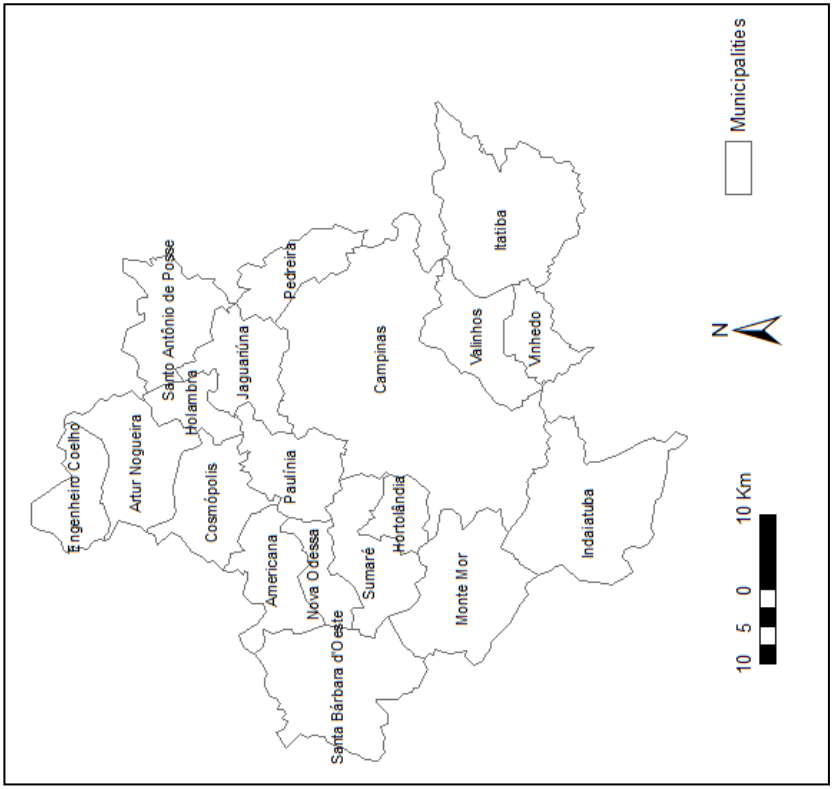
recent global warming is a result of human action. The release of the report and discussions following report´s conclusions may have influenced the results observed in the data, specially the questions regarding environmental knowledge.

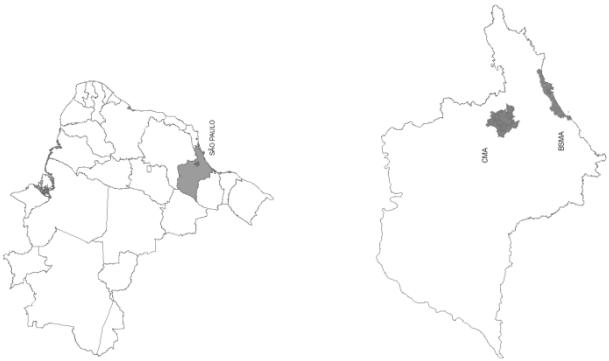
## Research sites

The questionnaires were conducted in two different metropolitan areas of São Paulo hinterland: Campinas and Baixada Santista. The Campinas Metropolitan Area (CMA) was officially established in 2000, comprising 19 municipalities (Figure 1). In 2010, CMA had an estimated population of 2.8 million inhabitants, 97.5 per cent living in urban areas. Campinas alone, the metropolitan center, concentrated 1.1 million of residents. In the last decade, the demographic growth of the suburbs responded to almost the entire population increase observed in CMA. CMA is ranked as the third main economic area in Brazil, after São Paulo and Rio de Janeiro. Air pollution is a special environmental threat for residents of CMA, springing from three main sources: i) a large oil refinery and petrochemical industrial complex in the municipality of Paulinia; ii) heavy car and truck traffic in two of the most important Brazilian roads (Anahnguera and Bandeirantes) crossing the metropolitan area, and iii) the burning of sugar-cane plantations to produce sugar or ethanol.

The Baixada Santista Metropolitan Area (BSMA) was officially recognized in 1996, comprising nine municipalities (Figure 2). In 2010, BSMA had an estimated population of 1.6 million inhabitants, with 99.7 per cent of its residents living in urban areas. Different from CMA, BSMA is a coastal zone contoured in the back by a protected area – Serra do Mar (Mountain Range of the Sea). The topography of BSMA represents a physical barrier to the horizontal expansion of its municipalities and influences the level of environmental vulnerability each municipality is exposed to, depending on their location within the metropolitan area. The flat strip between the Atlantic Ocean and the Serra do Mar is crossed by a large number of water streams and swamps. Due to the intense and unplanned urbanization in the area, translated into low levels of sanitation services, water quality represents an important concern for the residents. This is aggravated by the intense rainfall throughout the year, causing sewer spillovers and clogging of storm drains in some parts of the municipalities.

Figure 1. Campinas Metropolitan Area



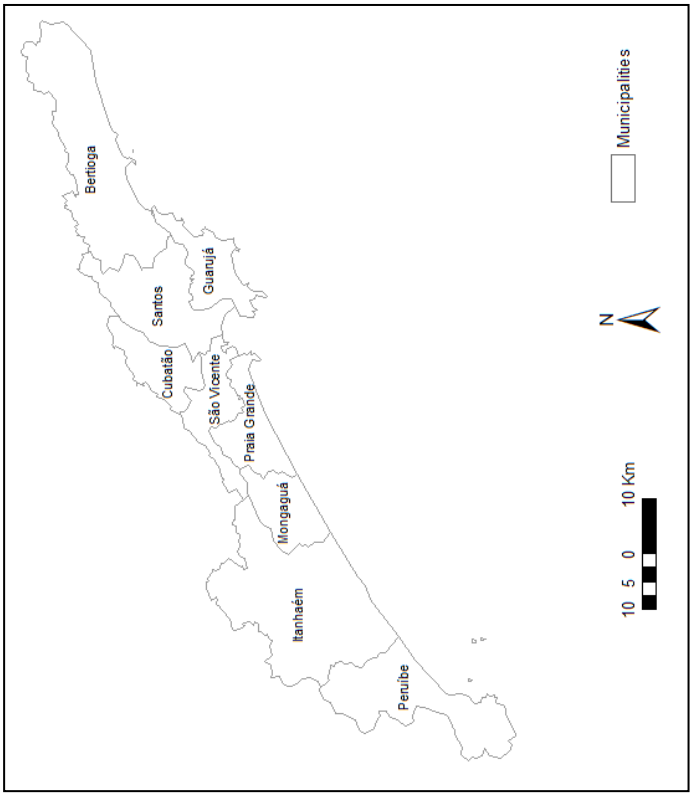




Figure 2. Baixada Santista Metropolitan Area

### Analytical samples and variables

We estimated two separate GOM models, one for each metropolitan area of the state of São Paulo: Campinas Metropolitan Area and Baixada Santista Metropolitan Area. The sample for CMA includes 1,806 households (17 households were excluded due to missing information on selected variables). The sample for the BSMA includes 1,586 households (10 households were excluded due to missing info). For each model we use 29 variables, including tree variables for socioeconomic status and 7 variables for household and neighborhood environment. Further detail about variables used, see Table 1.

## Empirical strategy

In order to create multidimensional profiles of environmental perception and behavior, we selected a wide range of variables representing environmental knowledge, concern and behavior at the household level and applied them to the Grade of Membership (GOM) model (Manton *et al.* 1994). The simultaneous use of these sets of variables helps us to explore non-linear relationships between what is perceived, how perception correlates with behavior and how these relations vary by level of spatial reference. One example of these complex associations is the concept of *environmental projection*. That is, agents tend to see their immediate, local environmental problems as the main environmental issues faced by the country as a whole. At the same time, groups with high levels of environmental concern may engage in different levels of environmentally significant behaviors. In general, these differences are mainly explained by two factors: i) socioeconomic status, which may works as a facilitator or a constraint for a household to take pro-environmental actions, and ii) the ability to overcome budget constraints by engaging in low-cost environmental behaviors, such as collection action (Dunlap and York 2008).

The use of GOM allows us to explore these different patterns of associations across environmental and socio-residential dimensions by producing reference groups of environmental behavior and perception, as well as the intensity that each reference group manifests in each individual. Because the method is based on fuzzy logic, individuals are not assumed to belong to any specific reference group (Manton *et al*., 1994). The individual membership to different reference groups is explicitly estimated by the model and can be interpreted as a *continuous measure* of individual heterogeneity derived from a *discrete* set of indicators.

Table 1. Internal variables used in the delineation of the multidimensional environmental profiles – campinas and baixada santista metropolitan areas, 2007

| |
|---|
| *Environmental Perception* |
| In your opinion, what is the main problem in regards to the environment in Brazil? |
| In your opinion, what is the main problem with the environment in your neighborhood? |
| In your opinion, how serious is global warming? |
| In your opinion, who should/could solve the problem of global warming? |
| In your opinion, who should/could solve the environment problems you mentioned before? |
| *Intended Environmental Behavior* |
| Would you consider separating gargabe or trash for recycling? |
| Would you consider eliminating unecessary waste of water? |
| Would you consider reducing gas and energy consumption? |
| Would you consider working collective with others? |
| Would you consider taking collective action against a company that pollutes the environment? |
| Would you consider contributing to environmental organizations? |
| Would you consider paying more for foods without chemical fertilizers? |
| Would you consider buying more energy efficient household appliances? |
| *Actual Environmental behavior* |
| In the past 12 months, have you avoided throwing toxic products in the trash? |
| In the past 12 months, have you avoided buying a product because of information on the label? |
| In the past 12 months, have you fixed a broken product in order to avoid buying a new one? |
| In the past 12 months, have you decreased the consumption of meat? |
| In the past 12 months, have you stopped buying a product because it harmed the environment? |
| *Residential and Neighborhood Environment* |
| Current municipality of residence |
| Conditions of the street surface |
| Does the street have curb and gutter? |
| Does the street have sidewalks? |
| Does the street have public lightning? |
| Frequency of the water supply |
| Type of sewage drain |
| Frequency of garbage and trash collection |
| *Socioeconomic Status of the Household* |
| Schooling of respondent |
| Deciles of per capita household income |
| Social strata of the household |

Source: Data from Projeto Vulnerabilidade (NEPO/Unicamp)

The "degree of membership" parameter, the truly fuzzy parameter of the model, can be used for different purposes: i) to weight the estimated probabilities of patterns of answers in each reference groups, creating fuzzy-weighted multidimensional profiles, ii) to estimate the multidimensional prevalence of each reference group in a population, and iii) to study regression relationships.

The difference between fuzzy-weighted and crisp reference groups resides on the fact that the latter does not take into account how each individual in a population may manifest profile characteristics at different levels of intensity. By imposing an assignment function to force individuals to belong to one of the profiles, all the heterogeneity is collapsed into a binary pertinence function. The fuzzy-weighted profiles, on the other hand, explicitly use this fuzzy pertinence as weights to create and describe the characteristics of the reference groups. This way, final profiles are a closer representation of how individuals are actually distributed in a specific population (Manton et al. 1994). The multidimensional prevalence using the fuzzy parameter has the same advantage of using it as a weighting factor. Different from crisp prevalence, the fuzzy weighted prevalence must be interpreted as the proportion of the population that has *at least some* manifestation of the reference group.

To estimate the multidimensional profiles, we included 29 variables classified in four dimensions:

1. Environmental perception
2. Behavioral response to environmental problems (intended behavior + actions)
3. Socioeconomic status
4. Residential and neighborhood environment

The detailed wording of variables is described in Table 1.

Using the variables listed in Table 1 for each study site, we started estimating models with different numbers of extreme profiles, from two to six, holding constant the number of variables and observations. The selection of number of clusters (profiles) that best describe that data used was based on the Akaike Information Criterion[4] (AIC). AIC is a largely used measure of goodness of fit and different from the likelihood ratio test, it includes the number of parameters in addition to the final likelihood value to find the best model. The smaller the AIC value the better the model (Manton *et al*., 1994).

[4] We estimate AIC using the following formula: AIC = 2p – 2ln(L)

Results from AIC calculation suggest that the model that best describe the data used, for both study sites, is a model with four extreme profiles.

The characterization of the extreme profiles was based on the estimated fuzzy-weighted conditional probabilities of response to category *l* of variable *j* in the extreme profile *k*, $y_{ijl}$. The estimated probabilities correspond to the product of the degree of membership ($g_{ik}$) and the crisp probabilities ($\lambda_{kjl}$) for the reference groups:

$$E\left(y_{ijl}\right) = \sum_{k}\left(g_{ik} * \lambda_{kjl}\right) \qquad (1)$$

As the above formula suggests, $g_{ik}$ and $\lambda_{kjl}$ are estimated at different levels, the former at the individual while the latter at the category level. We use the value $I_k^{-1}(g_{ik})$ to represent the average value of membership for each K. To preserve the number of K identified with the AIC measure, we use the relative mode of $g_{ik}$ over K to weight each profile. Each estimated probability was then divided by the marginal frequency observed in the population. This ratio, called E/O Ratio, is used to select the categories of each variable that predominates in each extreme profile, *k*. Following the cut point suggested by Sawyer *et al.* (2002), we define a category *l*, of a variable *j*, to be the marker of that profile every time E/O Ratio $\geq 1.2$. This means that the probability that a household, belonging to a fuzzy-weighted extreme profile *k*, answers category *l* of variable *j*, is at least 20 per cent higher than the probability of answer for the same category given by an average household in the entire population (see Tables A and B for the original estimated probabilities).

In addition to creating profiles of environmental perception, we also estimate the fuzzy-weighted prevalence of each one of these profiles in the entire population, as follows:

$$P_K = \frac{\sum_{i=1}^{I} g_{ik}}{I} \qquad (2)$$

Where $g_{ik}$ represents the degree of membership of individual *i* to extreme profile *k*. *I* represents the number of observations in the sample (Cassady *et al*., 2001). Multidimensional prevalence of environmental perception is a simple and straightforward way to access current social knowledge about environmental issues among households in a given setting.

Finally, to explore the correlation between vulnerability, social strata and environmental awareness using regression analysis, we created a scalar of environmental vulnerability. The scalar was estimated by using four-point Likert-type questions about potential problems affecting the surrounding areas of the house, varying from very serious to not serious at all. We use the following potential problems: i) contaminated areas, ii) accessibility to other neighborhoods, iii) flooding, iv) torrents/runoffs, v) landslides, vi) difficulty to get to the workplace, vii) lack of leisure/entertainment areas in the surroundings, viii) accessibility to the nearest school, ix) heavy traffic, (x) difficult access to the nearest health post, (xi) lack of green spaces, (xii) problems with water system provision and collection, (xii) problems with garbage collection, (xiv) insects, rats, ticks, crane-flies, (xv) weeds, abandoned lots, and (xvi) problems with the sewage system. To create the scalar, we applied a fixed matrix of $\lambda_{kjl}$ within GoM, attributing $\lambda_{2jl}$=1.000 to the categories "not serious at all" and $\lambda_{1jl}$=1.000 to the categories "very serious" over the 16 questions. With this procedure, the fuzzy partition $g_{i2}$ can be interpreted as the inverse of environmental vulnerability of the households. The scalar created show high level of reliability, with standardized Cronbach's alpha of 0.8848 for CMA and 0.8743 for BSMA. The scalar was then regressed on a dummy variable indicating unawareness about global warming. More details in the result section.

## Results

For the multidimensional profiles we present the results in text and graph format, although detailed results about the probabilities can be found in the appendix section (Tables A and B). Some head-ups: i) the results presented in the graphs are *relative probabilities*, that is, how much higher (lower) are the probabilities of response for specific categories in each profile relative to the average probability in the sample population; ii) the names attributed to the profiles represent a generalization of salient characteristics of each profile; iii) the ideal types created do not necessarily exist in the sample population, but we can estimate the probability of belonging to these ideal types for each multidimensional profile. Results are presented for each metropolitan area separately.

### Campinas metropolitan area

We could classify the respondents from CMA in four main multidimensional environmental profiles: i) "Self-interested Environmental Behavior",

ii) "Environmentally Significant Behavioral Gap", iii) "Environmentally Engaged", and iv) "Environmentally Unengaged".

The "Self-interested Environmental Behavior" profile comprises 36.5 per cent of the CMA residents – the most prevalent profile in the sample. Individuals from this profile reside in the municipalities of Americana, Monte-Mór, Nova Odessa, Paulínia, Santa Barbara D'Oeste, and Valinhos. They live in neighborhoods with high levels of public services and infrastructure, such as paved streets with curb and gutter, general sewage system and continuous garbage collection. They show high level of environmental knowledge, such as considering global warming as a very serious problem and differentiating their local form national environmental issues. Although recognize the importance of individual participation in fighting environmental problems at both local and national levels, their behavior reflects actions that provide a direct increase in their utility, such as elimination of waste of water and reduction of gas/energy consumption. This behavior pattern is consistent with their intentions, since they are more willing to fix products to avoid buying new ones, although are less like to engage in collective actions than the average sample population. These are predominantly middle-class households, with average household income, although respondents have low educational status.

The "Environmentally Significant Behavioral Gap" profile clusters 23.6 per cent of CMA residents, being the second most prevalent. Individuals from this profile reside in Americana, Cosmopolis, Itatiba, Pedreira, and Sumaré, in areas with high levels of public services and infrastructure, as in the previous profile. Different from the previous profile, however, they show lower levels of environmental knowledge; e.g., they don't think global warming is a serious problem and some respondents think nether their neighborhoods nor the country have any environmental issue to be worried about. Among the ones who consider any problem at the national level, deforestation stands out as the most important, and pollution of river, lakes, and beaches as the main local environmental issue. They also tend to transfer responsibility to fight environmental problems to institutions, such as the federal government and international organizations. These are predominantly from middle-class households, with respondents having from five to 11 years of education completed.

The "Environmentally Engaged" profile groups 22.7 per cent of CMA residents, ranking as the second less prevalent. Individuals from this profile reside in Campinas and Indaiatuba, located in neighborhoods with deficient infrastructure, such as paved streets with pot holes and lack of public

lighting in some streets, although are served with good levels of public services, such as garbage collection and general sewage system.[5] Members of this group show high levels of environmental knowledge, by both recognizing global warming as a very serious problem and differentiating local from national environmental issues, identifying deforestation, lack of green spaces, and pollution of rivers as the main local issues while environmental sanitation, air pollution and fire as the major national problems. Similar to the first profile, they consider that both individuals and non-governmental organizations should be the main actors of environmental change.

Usually show alignment in their actual and intended pro-environmental behavior, reporting high levels of participation in both private (individual) and public (collective) behavior to improve the quality of the environment. These are more affluent households, clustering respondents with higher levels of education.

The "Environmental Unengaged" profile clusters 17.3 per cent of CMA residents-last prevalent profile in the metropolitan area. Individuals from this profile reside in Artur Nogueira, Hortolândia, and Indaiatuba, living in neighborhoods with very low levels of both public services and infrastructure. They are characterized by very low levels of environmental knowledge, as they ignore global warming as an environmental problem and project their immediate/local environmental issues as national issues. For instance, they see environmental sanitation and floods as the main environmental problems of Brazil, although these also appear as local problems, consistent with the vulnerable residential areas where their households are located. Maybe because of their vulnerable condition, they attribute problem solving at both scales (local and national) to local/state level government, adding additional evidence of environmental projection. This pattern of environmental knowledge and perception of environmental issues reflect in their unengagement in pro-environmental behaviors, both actual and intended. These are illiterate respondents from low-income households.

Figure 3 shows that the level of environmental knowledge is higher among the environmentally engaged and self-interested profiles, while lower among the other two, especially in the environmentally unengaged profile. When we look at the awareness about local environmental problems, however, the environmentally unengaged profile are the most likely

[5] This apparent contradictory correlation between high SES and low levels of urban infrastructure is not surprising in Campinas, the metropolitan seat, since the most affluent neighborhoods are now located in older settlement areas. It is not rare to find better public infrastructure, mainly newly paved streets and roads, in the new and less affluent neighborhoods as a result of recent urbanization of the suburbs.

to be report at least one problem, what may reflect their more vulnerable social and environmental position in the population.

Figure 3. Relative probabilities of indicators of environmental knowledge-campinas metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Brazil has no problem | -100.0 | -26.9 | 158.2 | 68.8 |
| Neighborhood has no problem | -14.2 | -46.0 | -54.6 | 109.0 |
| Never heard of global warming | -100.0 | -100.0 | 500.5 | -100.0 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Figure 4. Relative probabilities of selected environmental behaviors-campinas metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Repair-use | 25.9 | 25.9 | -52.5 | -21.4 |
| Informed consumption | 87.3 | 87.3 | -100.0 | -100.0 |
| Collective work | -100.0 | 119.7 | -100.0 | 119.7 |
| Collective protest | -100.0 | 112.0 | -100.0 | 112.0 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Figure 4 presents the behavioral patterns of selected variables across profiles. We selected two private (individual) and two public (collective) environmental behavioral indicators to explore differences in behavioral response according to its nature. Repair-use and informed consumption are representative of private behavior, referring to actual actions taken by the respondent in the last 12 months (repair-use = fixed a product to avoid buying a new one; informed consumption = interrupted consumption because of information on the label). Collective work and protest, on the other hand, represent public intended behavior. As expected, the "engaged" and "unengaged" profiles have flipped relative probabilities for all pro-environmental behaviors. In addition, members of the "self-interested" profile are more likely than the average population to engage in private behaviors, but not in publics. Although not entirely shown in Figure 4, members of the "behavioral gap" profile have higher probabilities of being willing to take pro-environmental actions, although their actual behavior does not reflect that. They are actually less likely than the average population to have actually engaged in any significant environmental behavior in the last 12 months, regardless of the private/public nature of the actions.

Figure 5. Relative probabilities of selected characteristics by multidimensional environmental profiles - campinas metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Global warming is very serious | 14.4 | 14.4 | -42.7 | -6.0 |
| Individuals should fight env. issues | 79.9 | 51.7 | -100.0 | -100.0 |
| Highest income | 48.6 | 83.8 | -100.0 | -72.1 |
| Highest educational attainment | -25.6 | 218.9 | -100.0 | -100.0 |
| Paved streets in good condition | 24.6 | 6.5 | -100.0 | 24.6 |
| General sewage system | 18.6 | 18.6 | -85.5 | 17.7 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Figure 5 suggest that among residents of CMA, engagement is correlated to a certain minimum level of socioeconomic status, although environmental knowledge and behavior are not strictly selective of SES, since individuals of similar socioeconomic status and educational background have different levels of knowledge about environmental issues and may engage in different behavioral patterns, as suggested by the probabilities of responding that global warming is a very serious problem among members of "unengaged" and "behavioral gap" profiles. This complex correlation structure between environmental knowledge and behavior along with SES can be seen looking at the two most prevalent profiles in CMA, both from similar SES but with very different behavioral responses.

## Baixada santista metropolitan area

Similarly to CMA, we found four multidimensional environmental profiles in BSMA: i) "Self-interested Environmental Behavior", ii) "Environmentally Engaged", iii) "Environmentally Unengaged", and iv) "Collective Environmental Behavior".

The "Self-interested Environmental Behavior" is the most prevalent, comprising 35.5 per cent of the BSMA residents. Individuals from this profile live in Santos, the metropolitan seat, in neighborhoods with high levels of public services and infrastructure. They differentiate local from national problems, although project air pollution, a largely recognized problem in the metropolitan seat, as an environmental natural issue. Environmental knowledge is high, with individuals recognizing global warming as a very serious problem. Different from the homonymous profile from CMA, however, problem-solving is attributed to institutions at higher levels of influence, such as international organizations and world leaders, although some also recognize individual responsibility in fighting the environmental

issues identified. As for CMA, their behavior is self-oriented, taking actions that directly increase individual utility, such as consumption of organic produce, but not reducing energy and water consumption. In addition, they show willingness to engage in socially desirable behaviors, such as contributing with donations to environmental organizations. These are more affluent households, with highly educated respondents.

The "Environmentally Engaged" profile is the second most prevalent, with 30.8 per cent of BSMA residents. Members of this profile live in the municipalities of Guarujá, Itanhaém, Mongaguá, Praia Grande and São Vicente, in neighborhoods with deficient provision of certain public services, such as water provision and garbage collection discontinuously served. Different from its homonymous profile from CMA, they show low levels of environmental knowledge, by not considering global warming as a serious problem and projecting local problems to the national level, such as pollution of rivers, lakes and beaches, as well as lack of green spaces and flooding. Despite their low level of environmental knowledge, they still recognize that environmental problem-solving must be a joint effort of individuals and institutions. This recognition of the self in the process of environmental change translates into engagement in pro-environmental behavior. These are individuals from middle-class households, but respondents have low level of education (one to for years of education completed).

The "Environmentally Unengaged" profile is the second less prevalent, with 18 per cent of BSMA residents. It's members live in Cubatão, Peruíbe, and São Vicente, in neighborhoods with deficient public infrastructure, such as discontinuous garbage collection, septic tank instead of general sewage system and streets with potholes. As with its homonymous profile from CMA, individuals from this profile show very low levels of environmental knowledge, such as believing both Brazil and their neighborhoods have no environmental problems. Because of lack of recognition of environmental problems, they hold public institutions responsible for eventual environmental issues and show no engagement in any of the environmental behaviors listed in Table 1. These are socioeconomic disadvantaged households, with respondents having very low levels of education (mainly illiterates or up to four years of education completed).

The "Collective Environmental Behavior" profile is the least prevalent, comprising 15.8 per cent of BSMA residents. Its members live in Bertioga, Cubatão, Guarujá and Itanhaém, in neighborhoods with deficient public services and infrastructure. As with the previous profile, they project their

local problems into the national level, such as environmental sanitation (in the beach cities) and deforestation (mainly in Cubatão). Consider global warming a very serious problem and hold institutions responsible for problem-solving. In terms of behavior, they consider taking environmental significant actions for non-luxury goods, such as acting collectively to reduce individual cost of action, but avoiding high-cost actions, such as recycling and consumption of organic food. These are households from low social strata, with individuals having low level of education.

Figure 6. Relative probabilities of selected environmental behaviors - baixada santista metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Organic consumption | -100.0 | 42.2 | -21.3 | 16.1 |
| Water use management | -3.3 | 0.8 | 0.3 | 0.8 |
| Collective work | -100.0 | 36.0 | 36.0 | 20.8 |
| Donation to environmental orgs. | -100.0 | 32.5 | 9.1 | 32.5 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Again, similarly to what we found across CMA profiles, the "Unengaged" and "Engaged" profiles show flipped patterns of relative probabilities. While individuals from the "Environmentally Unengaged" profile have an overall general probability of engaging in pro-environmental actions, the opposite holds for individuals from the "Environmentally Engaged" profile. Among individuals from the "Collective Environmental Behavior" profile public actions are more likely than private actions. For instance, they are more likely to accept working collective with others, while less like to buy organic produce than the average population. Although they are also more likely to contribute to environmental organizations, as the "Engaged" and "Self-interest" groups, the likelihood is much lower.

This is explained by their lower socioeconomic status. In addition, the question is not clear about what kind of contribution the person would be willing to provide; thus, they may be interpreting it as donation of time instead of money. Finally, the "Self-interested Environmental Behavior" profile show the smallest probability, among the profiles of being willing to engage in collective work, as expected.

If we turn our attention to indicators of environmental knowledge, we generally see that the "Unengaged" profile has a much higher probability than the average population to be unaware of environmental issues in the country and the neighborhood, as well as global warming. This pattern is reversed by the others, except for the "Engaged" groups (Figure 7). This

graph reveals two interesting points: i) the level of environmental knowledge is sensitive to the spatial reference; ii) socioeconomic background is not a pre-requisite of environmental knowledge. The first point can be illustrated by looking at how the likelihood of being unaware of environmental issues decrease among individuals in the "unengaged" profile as we move from general questions (such as global warming) to local questions (such as problems in the neighborhood). The second point becomes clear when we compare the predicted probabilities between the "Unengaged" and "Collective Behavior" profiles. Individuals from these two profiles belong to socioeconomic disadvantaged households, although the individuals from the latter are as likely as the "Self-interested" members to be aware of environmental problems across all spatial scales (global, national and local).

Figure 7. Relative probabilities of indicators of environmental knowledge - baixada santista metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Brazil has no problem | 204.3 | 37.0 | -100.0 | -100.0 |
| Neighborhood has no problem | 55.9 | 8.5 | -40.0 | -18.8 |
| Never heard of global warming | 663.2 | -100.0 | -100.0 | -100.0 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Figure 8 helps us to further explore these non-linear relations between SES, perception, knowledge and behavior. We see, in general, that both groups, "Unengaged" and "Collective Behavior" have a lower probability to belong to socioeconomic affluent households than the other profiles, although they show different levels of environmental knowledge.

Figure 8. Relative probabilities of selected characteristics by multidimensional environmental profiles - baixada santista metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Global warming is very serious | -100.0 | 11.1 | 15.8 | 20.2 |
| Individuals should fight env. issues | -65.2 | 29.1 | -47.4 | 31.7 |
| Highest income | -76.4 | -100.0 | -100.0 | 172.9 |
| Highest educational attainment | -62.7 | 15.2 | -74.8 | 51.5 |
| Paved streets in good condition | -27.4 | 25.9 | -100.0 | 45.1 |
| General sewage system | 8.1 | 19.1 | -81.5 | 22.0 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

For instance, while the members of the "Environmentally Unengaged" profile have 100 per cent lower likelihood to recognize global warming as a very serious environmental issue, members of the "Collective Environmental Behavior" profile are 15.8 per cent more likely to do so. Combined with information from Figure 7, comparison between these two profiles also suggest that even with similar SES background, some groups are more likely than others to engage in pro-environmental action, finding alternative ways to reduce the cost of action by pursuing collective initiatives that help fight environmental problems. Again, as suggested by Figure 5 among residents of CMA, socioeconomic status is not a pre-requisite for environmental awareness or pro-environmental behavior.

## Environmentalism and environmental vulnerability

Results from profile descriptions and predicted probabilities of pertinence to ideal types suggest that socioeconomic status and household physical characteristics are not a pre-requisite for environmentalism (Guedes and Carmo, 2012). Inglenhart's hypothesis of environmentalism of the poor, however, suggests that individuals in low-income settings increase their environmental concern as a response to objective problems. When environmental threats are ceased, concern should decline or disappear. From the previous analysis we cannot say if vulnerability to environmental hazards is an underlying cause of this association between socioeconomic status and environmentalism among less affluent households.

According to Inglehart's "objective problems" hypothesis, we should see a positive correlation between environmental vulnerability and high levels of environmental concern/knowledge among socioeconomically disadvantaged households.[6] Similarly, the "post-materialistic values" hypothesis predicts high levels of environmental concern/knowledge among more affluent households, *regardless of* their level of environmental vulnerability. Figures 9 and 10 show relative probabilities of living in households with different levels of environmental vulnerability across profiles. As suggested by Figure 9, residents of low SES households in CMA with high levels of environmental hazards are the less likely to be aware of or concerned with environmental problems, as revealed by the probabilities of the "Environmentally Unengaged" profile. Figure 10 suggests mixing results. On the one hand, individuals from the "Collective Beha-

[6] Inglenhart's (1995) "Objective Problems Subjective Values" was actually developed to explain environmental concern, not environmental knowledge. We proxy concern here by the knowledge about global warming. Reader should be aware of the difference in construct and its heuristic implications.

vior" profile show high level of environmental awareness, being also poor and living in households with high levels of environmental vulnerability, in tandem with the "objective problems" argument. At the same time, profiles with similar levels of vulnerability show different levels of engagement, such as the profiles "Environmentally Unengaged" and "Environmentally Engaged".

Figure 9. Relative probabilities of household's environmental vulnerability - campinas metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Highest vulnerability | -94.9 | -75.7 | 289.3 | -56.8 |
| High vulnerability | 13.1 | -82.1 | -100.0 | 52.7 |
| Low vulnerability | 39.3 | 75.5 | -100.0 | 111.2 |
| Lowest vulnerability | 47.5 | 94.0 | -100.0 | -100.0 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

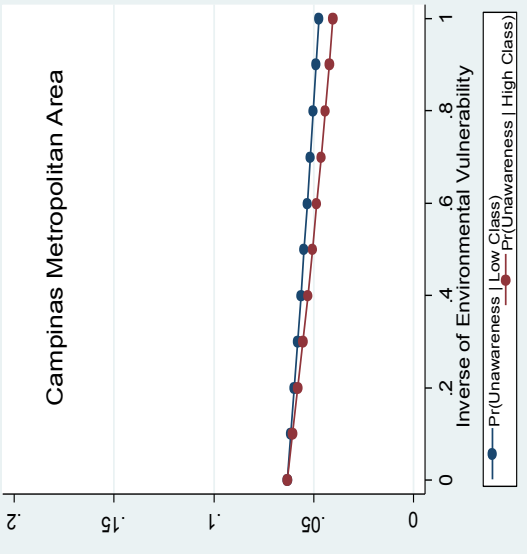
Figure 10. Relative probabilities of household's environmental vulnerability - baixada santista metropolitan area

| Indicator | Self-interested | Engaged | Unengaged | Behavioral gap |
|---|---|---|---|---|
| Highest vulnerability | -55.6 | -7.7 | 199.9 | -97.5 |
| High vulnerability | 110.6 | 101.4 | -100.0 | -58.0 |
| Low vulnerability | -55.4 | -94.2 | -100.0 | 156.2 |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Motivated by the findings from Figures 9 and 10, we regress the vulnerability scale on a proxy for knowledge about global warming (dummy). The logit model uses the environmental vulnerability scalar along with an interactive term of the scalar with a dummy for household from low social stratum. The model includes other control variables, such as age, education, time living in the city and education of respondent (see Table C for regression results). Figure 11 shows the predicted probability of being unaware of the existence of global warming according to the level of environmental vulnerability a household is exposed to. The probabilities take into consideration the interactive effect of social strata on environmental knowledge. Results challenge Inglehart's argument about vulnerable households showing concern about the environment because they are the more likely to be threatened by environmental hazards.

Figure 11: Predicted Probability of Unawareness about Global Warming by Level of Environmental Vulnerability




Source: Projeto Vulnerabilidade (NEPO/Unicamp)

Table C. Correlation between environmental vulnerability and awareness about global warming (fixed-effect logit regression – 0 = heard of gw / 1 = hasn't heard of global warming)

| Variables | CMA | BSMA |
|---|---|---|
| Inverse of Environmental Vulnerability Scalar | -3.096*** | 0.463 |
| | (0.759) | (0.585) |
| Low social stratum | -3.107*** | -0.164 |
| | (1.066) | (0.591) |
| EVS x Social Stratum | 2.622** | -1.823** |
| | (1.243) | (0.773) |
| Age | 0.0386*** | 0.0176*** |
| | (0.0101) | (0.00636) |
| Male | -0.378 | -0.0257 |
| | (0.236) | (0.210) |
| Native | -0.122 | -0.0232 |
| | (0.353) | (0.255) |
| Illiterate (base) | | |
| 1 to 4 years | -0.640** | -1.754*** |
| | (0.273) | (0.370) |
| 5 to 8 years | -1.250*** | -2.213*** |
| | (0.420) | (0.383) |
| 9 to 11 years | -2.537*** | -2.855*** |
| | (0.711) | (0.425) |
| 12+ years | -2.830*** | -4.596*** |
| | (1.066) | (1.072) |
| Constant | -0.522 | -0.138 |
| | (0.790) | (0.629) |
| Observations | 1 806 | 1 586 |

Robust standard errors in parentheses.
*** p < 0.01, ** p < 0.05, * p < 0.1
Source: Projeto Vulnerabilidade (NEPO/Unicamp).

Actually, the figure suggests that more affluent households' awareness declines at a faster pace than less affluent households when environmental vulnerability increases. This holds for both study area.

Although the general trend of environmental hazard leading to higher levels of concern, net of household affluence, the relation is highly non-linear with socioeconomic status. Part of this intriguing result may be related to the endogeneity between spatial selectivity of households by SES (Guedes and Carmo, 2012).

That is, in both metropolitan areas the history of settlement allowed more affluent individuals to select places where objective environmental

threats were less prominent (Hogan *et al*. 2001). These individuals, therefore, would be more "sensitive" to changes in objective conditions.

## Concluding remarks

In recent decades the increase in extreme events along with scientific evidence of the anthropogenic effect on environmental change has put environmental questions in the core of public agenda worldwide. During the 1980's and 1990's, many surveys about environmental concern, behavior, and attitude were conducted in developed countries to understand how people perceive changes in the environment, what is their current knowledge, and how they solve tradeoffs between conservation of nature and economic development. Fewer efforts were done to analyze patterns of environmentalism in developing settings until very recently.

Cross-national studies suggested that individuals from developed countries show a higher level of environmental concern than their counterparts from low-income settings, giving birth to the "post-materialist values versus objective problems" hypotheses (Inglehart 1995). Although the Inglehart's argument recognizes the existence of environmentalism among the poor in face of objective environmental threats, it suggests that environmental concern and awareness should cease when problems were solved or immediate threats were not felt or perceived. Our results suggest that although residents of more affluent and less vulnerable areas have high levels of environmental knowledge and engage in pro-environmental behaviors, as suggested by Inglenhart, some less affluent households engage in environmental significant behavior through collective actions. We believe that the use of collective action as a channel to express environmental concern may represent a way to reduce the cost of actions. In addition, we found households with similar levels of vulnerability to environmental hazards with different levels of awareness and engagement in pro-environmental behaviors. Similar trends have been supported by empirical studies in low-income settings worldwide (Chen *et al.,* 2011; White and Hunter, 2009).

Although our results suggest some level of environmentalism among the poor, socioeconomic inequalities still plays a key role in explaining variation in the level of perception and behavior. We found that, for both study areas, a minimum level of socioeconomic level is necessary to trigger pro-environmental engagement. These complex relations between awareness, behavior, vulnerability and affluence is a likely combination of different forces: i) extreme events are becoming more common and frequent, exposing individuals of different social backgrounds to similar

levels of hazards; ii) because of this, and due to increasing scientific evidence of anthropogenic change in the environment, especially related to climate change, public discussion of environmental change has become more salient for the general population, and iii) some slow changes in the quality of the environment due to the current model of industrial development are just now being felt by the general population and making more visible the different levels of social vulnerability. Increasing awareness is one first step, motivating individuals to engage in pro-environmental behavior the second, but transforming micro-scale actions into empowered social groups able to influence decisions about sustainable development is the ultimate cause studies about environmental change should focus (Abramson, 1997).

Finally, environmentalism is such a complex concept to be reduced to some metrics related to environmental hazard and socioeconomic gradients. It depends on both micro-level and macro-level factors, such as governance schemes, norms regulating public and community control over resources, and political say of the local (Gelissen, 2007; Hamilton *et al*., 2010). This is just one of the many ways to tackle environmental attitude, concern, and behavior in low developing settings. The more empirical evidence on non-linear relations between affluence, hazards, and environmentalism abound, the more important become research designs that incorporate interdisciplinary, multi-scale, multi-site, and multi-method approaches (Axxin and Pearce, 2007).

Table A. CMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Residential and Neighborhood Environment" - Campinas Metropolitan Area, 2007

| *Residential and neighborhood environment* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1jl}$ (Ratio E/O) | Profile 2 $\lambda_{2jl}$ (Ratio E/O) | Profile 3 $\lambda_{3jl}$ (Ratio E/O) | Profile 4 $\lambda_{4jl}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| 1. Current municipality of residence | | | | | | |
| Americana | 152 | 0.084 | 0.121 (1.4) | 0.000 (0.0) | 0.000 (0.0) | 0.176 (2.1) |
| Artur Nogueira | 13 | 0.007 | 0.000 (0.0) | 0.000 (0.0) | 0.041 (5.7) | 0.000 (0.0) |
| Campinas | 1035 | 0.573 | 0.531 (0.9) | 0.884 (1.5) | 0.535 (0.9) | 0.396 (0.7) |
| Cosmopolis | 25 | 0.014 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.059 (4.3) |
| Hortolandia | 134 | 0.074 | 0.000 (0.0) | 0.000 (0.0) | 0.373 (5.0) | 0.000 (0.0) |
| Indaiatuba | 52 | 0.029 | 0.000 (0.0) | 0.087 (3.0) | 0.052 (1.8) | 0.000 (0.0) |
| Itatiba | 59 | 0.033 | 0.031 (0.9) | 0.029 (0.9) | 0.000 (0.0) | 0.063 (1.9) |
| Monte Mor | 14 | 0.008 | 0.021 (2.7) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Nova Odessa | 28 | 0.016 | 0.043 (2.8) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Paulinia | 13 | 0.007 | 0.020 (2.8) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Pedreira | 14 | 0.008 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.033 (4.3) |
| Barbara D'Oeste | 74 | 0.041 | 0.116 (2.8) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Sumare | 152 | 0.084 | 0.053 (0.6) | 0.000 (0.0) | 0.000 (0.0) | 0.274 (3.3) |
| Valinhos | 41 | 0.023 | 0.063 (2.8) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| 2. Conditions of the street surface | | | | | | |
| Paved in good condition | 1 450 | 0.803 | 1.000 (1.2) | 0.855 (1.1) | 0.000 (0.0) | 1.000 (1.2) |
| Paved with pot holes | 59 | 0.033 | 0.000 (0.0) | 0.145 (4.4) | 0.000 (0.0) | 0.000 (0.0) |
| Not paved - regular surface | 170 | 0.094 | 0.000 (0.0) | 0.000 (0.0) | 0.575 (6.1) | 0.000 (0.0) |
| Not paved - irregular surface | 127 | 0.070 | 0.000 (0.0) | 0.000 (0.0) | 0.425 (6.0) | 0.000 (0.0) |
| 3. Does the street have curb and gutter? | | | | | | |
| No | 297 | 0.164 | 0.000 (0.0) | 0.000 (0.0) | 1.000 (6.1) | 0.000 (0.0) |
| Yes | 1509 | 0.836 | 1.000 (1.2) | 1.000 (1.2) | 0.000 (0.0) | 1.000 (1.2) |
| 4. Does the street have sidewalks? | | | | | | |
| No | 275 | 0.152 | 0.000 (0.0) | 0.000 (0.0) | 1.000 (6.6) | 0.000 (0.0) |
| Yes | 1 531 | 0.848 | 1.000 (1.2) | 1.000 (1.2) | 0.000 (0.0) | 1.000 (1.2) |
| 5. Does the street have public lighting? | | | | | | |
| No | 17 | 0.009 | 0.000 (0.0) | 0.012 (1.3) | 0.039 (4.1) | 0.000 (0.0) |
| Yes | 1789 | 0.991 | 1.000 (1.0) | 0.989 (1.0) | 0.961 (1.0) | 1.000 (1.0) |
| 6. What's the frequency of the water supply? | | | | | | |
| Continuous - the whole day | 1600 | 0.886 | 0.897 (1.0) | 0.992 (1.1) | 0.815 (0.9) | 0.818 (0.9) |
| Some hours per day | 119 | 0.066 | 0.103 (1.6) | 0.000 (0.0) | 0.078 (1.2) | 0.063 (1.0) |
| Discontinuous | 60 | 0.033 | 0.000 (0.0) | 0.000 (0.0) | 0.031 (0.9) | 0.119 (3.6) |
| Missing | 27 | 0.015 | 0.000 (0.0) | 0.008 (0.5) | 0.076 (5.1) | 0.000 (0.0) |
| 7. Type of sewage drain | | | | | | |
| General sewage system | 1523 | 0.843 | 1.000 (1.2) | 1.000 (1.2) | 0.123 (0.1) | 0.992 (1.2) |
| Septic tank | 224 | 0.124 | 0.000 (0.0) | 0.000 (0.0) | 0.701 (5.7) | 0.000 (0.0) |
| Simple cesspools | 28 | 0.016 | 0.000 (0.0) | 0.000 (0.0) | 0.078 (5.0) | 0.008 (0.5) |
| Throw into rivers / missing | 31 | 0.017 | 0.000 (0.0) | 0.000 (0.0) | 0.098 (5.7) | 0.000 (0.0) |
| 8. Frequency of garbage and trash collection | | | | | | |
| Discontinuous | 1179 | 0.653 | 0.493 (0.8) | 0.294 (0.5) | 0.983 (1.5) | 1.000 (1.5) |
| Daily | 602 | 0.333 | 0.495 (1.5) | 0.676 (2.0) | 0.000 (0.0) | 0.000 (0.0) |
| Missing | 25 | 0.014 | 0.012 (0.9) | 0.029 (2.1) | 0.017 (1.2) | 0.000 (0.0) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table A. CMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Socioeconomic Status of the Household" - Campinas Metropolitan Area, 2007

| *Socioeconomic status of the household* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1jl}$ (Ratio E/O) | Profile 2 $\lambda_{2jl}$ (Ratio E/O) | Profile 3 $\lambda_{3jl}$ (Ratio E/O) | Profile 4 $\lambda_{4jl}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| 1. Schooling of respondent | | | | | | |
| Illiterate | 144 | 0.080 | 0.072 (0.9) | 0.000 (0.0) | 0.261 (3.3) | 0.036 (0.5) |
| 1 to 4 years | 542 | 0.300 | 0.376 (1.3) | 0.103 (0.3) | 0.450 (1.5) | 0.262 (0.9) |
| 5 to 8 years | 473 | 0.262 | 0.228 (0.9) | 0.145 (0.6) | 0.289 (1.1) | 0.403 (1.5) |
| 9 to 11 years | 446 | 0.247 | 0.241 (1.0) | 0.397 (1.6) | 0.000 (0.0) | 0.299 (1.2) |
| 12 years and more | 201 | 0.111 | 0.083 (0.7) | 0.355 (3.2) | 0.000 (0.0) | 0.000 (0.0) |
| 2. Deciles of per capita household income | | | | | | |
| First | 166 | 0.092 | 0.000 (0.0) | 0.000 (0.0) | 0.153 (1.7) | 0.260 (2.8) |
| Second | 155 | 0.086 | 0.033 (0.4) | 0.000 (0.0) | 0.228 (2.7) | 0.127 (1.5) |
| Third | 152 | 0.084 | 0.071 (0.8) | 0.000 (0.0) | 0.145 (1.7) | 0.137 (1.6) |
| Forth | 208 | 0.115 | 0.104 (0.9) | 0.035 (0.3) | 0.272 (2.4) | 0.085 (0.7) |
| Fifth | 157 | 0.087 | 0.128 (1.5) | 0.045 (0.5) | 0.105 (1.2) | 0.060 (0.7) |
| Sixth | 185 | 0.102 | 0.141 (1.4) | 0.071 (0.7) | 0.047 (0.5) | 0.127 (1.2) |
| Seventh | 209 | 0.116 | 0.175 (1.5) | 0.086 (0.7) | 0.051 (0.4) | 0.122 (1.1) |
| Eighth | 199 | 0.110 | 0.209 (1.9) | 0.126 (1.1) | 0.000 (0.0) | 0.056 (0.5) |
| Ninth | 170 | 0.094 | 0.140 (1.5) | 0.173 (1.8) | 0.000 (0.0) | 0.026 (0.3) |
| Tenth | 205 | 0.114 | 0.000 (0.0) | 0.465 (4.1) | 0.000 (0.0) | 0.000 (0.0) |
| 3. Social class of the household | | | | | | |
| Classes D and E | 443 | 0.245 | 0.110 (0.4) | 0.000 (0.0) | 0.766 (3.1) | 0.245 (1.0) |
| Class C | 894 | 0.495 | 0.679 (1.4) | 0.217 (0.4) | 0.234 (0.5) | 0.755 (1.5) |
| Class B | 432 | 0.239 | 0.211 (0.9) | 0.693 (2.9) | 0.000 (0.0) | 0.000 (0.0) |
| Class A | 37 | 0.020 | 0.000 (0.0) | 0.090 (4.4) | 0.000 (0.0) | 0.000 (0.0) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table A. CMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kjl}$) of variables for each household level profile, and (E/O) ratios. Dimension "Environmental Perception" - Campinas Metropolitan Area, 2007

| *Environmental percetion* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1jl}$ (Ratio E/O) | Profile 2 $\lambda_{2jl}$ (Ratio E/O) | Profile 3 $\lambda_{3jl}$ (Ratio E/O) | Profile 4 $\lambda_{4jl}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| 1. In your opinion, what is the main problem in regards to the environment in Brazil? | | | | | | |
| Environmental sanitation | 125 | 0.069 | 0.000 (0.0) | 0.229 (3.3) | 0.107 (1.5) | 0.000 (0.0) |
| Pollution of rivers, lakes, beaches | 393 | 0.218 | 0.349 (1.6) | 0.175 (0.8) | 0.132 (0.6) | 0.111 (0.5) |
| Air pollution | 283 | 0.157 | 0.165 (1.1) | 0.363 (2.3) | 0.096 (0.6) | 0.000 (0.0) |
| Deforestation | 685 | 0.379 | 0.404 (1.1) | 0.000 (0.0) | 0.263 (0.7) | 0.775 (2.0) |
| Lack of green spaces | 19 | 0.011 | 0.000 (0.0) | 0.047 (4.5) | 0.000 (0.0) | 0.000 (0.0) |
| Floods | 74 | 0.041 | 0.082 (2.0) | 0.000 (0.0) | 0.063 (1.5) | 0.000 (0.0) |
| Fire | 105 | 0.058 | 0.000 (0.0) | 0.136 (2.3) | 0.165 (2.8) | 0.000 (0.0) |
| Other / No problems | 122 | 0.068 | 0.000 (0.0) | 0.049 (0.7) | 0.174 (2.6) | 0.114 (1.7) |
| 2. In your opinion, what is the main problem with the environment in your neighborhood? | | | | | | |
| Environmental sanitation | 311 | 0.172 | 0.000 (0.0) | 0.129 (0.7) | 0.685 (4.0) | 0.099 (0.6) |
| Pollution of rivers, lakes, beaches | 99 | 0.055 | 0.000 (0.0) | 0.089 (1.6) | 0.000 (0.0) | 0.149 (2.7) |
| Air pollution | 507 | 0.281 | 0.496 (1.8) | 0.313 (1.1) | 0.161 (0.6) | 0.000 (0.0) |
| Deforestation | 39 | 0.022 | 0.000 (0.0) | 0.036 (1.7) | 0.044 (2.0) | 0.025 (1.2) |
| Lack of green spaces | 61 | 0.034 | 0.000 (0.0) | 0.153 (4.5) | 0.000 (0.0) | 0.000 (0.0) |
| Fire | 347 | 0.192 | 0.294 (1.5) | 0.148 (0.8) | 0.000 (0.0) | 0.216 (1.1) |
| Other / No problems | 442 | 0.245 | 0.210 (0.9) | 0.132 (0.5) | 0.111 (0.5) | 0.512 (2.1) |
| 3. In your opinion, how serious is global warming? | | | | | | |
| Very serious | 1 579 | 0.874 | 1.000 (1.1) | 1.000 (1.1) | 0.501 (0.6) | 0.822 (0.9) |
| Slightly serious | 95 | 0.053 | 0.000 (0.0) | 0.000 (0.0) | 0.098 (1.9) | 0.152 (2.9) |
| Not serious | 16 | 0.009 | 0.000 (0.0) | 0.000 (0.0) | 0.015 (1.7) | 0.026 (2.9) |
| Doesn't know about GW/Missing | 116 | 0.064 | 0.000 (0.0) | 0.000 (0.0) | 0.386 (6.0) | 0.000 (0.0) |
| 4. In your opinion, who should/could solve the problem of global warming? | | | | | | |
| Each one of us | 1026 | 0.568 | 0.995 (1.8) | 0.854 (1.5) | 0.000 (0.0) | 0.023 (0.0) |
| Local government | 67 | 0.037 | 0.000 (0.0) | 0.000 (0.0) | 0.226 (6.1) | 0.000 (0.0) |
| State government | 78 | 0.043 | 0.000 (0.0) | 0.020 (0.5) | 0.136 (3.1) | 0.067 (1.6) |
| Federal government | 285 | 0.158 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.658 (4.2) |
| International organizations | 19 | 0.011 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.045 (4.3) |
| Ecological entities/organizations | 14 | 0.008 | 0.005 (0.6) | 0.014 (1.8) | 0.009 (1.2) | 0.005 (0.6) |
| World leaders | 96 | 0.053 | 0.000 (0.0) | 0.111 (2.1) | 0.165 (3.1) | 0.000 (0.0) |
| Enterpreneurs | 15 | 0.008 | 0.000 (0.0) | 0.000 (0.0) | 0.009 (1.1) | 0.029 (3.5) |
| Others | 74 | 0.041 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.174 (4.2) |
| GW is not serious / never heard of GW | 132 | 0.073 | 0.000 (0.0) | 0.000 (0.0) | 0.456 (6.2) | 0.000 (0.0) |
| 5. In your opinion, who should/could solve the environmental problems indicated by the population? | | | | | | |
| Each one of us | 1 004 | 0.556 | 1.000 (1.8) | 0.843 (1.5) | 0.000 (0.0) | 0.000 (0.0) |
| Local government | 101 | 0.056 | 0.000 (0.0) | 0.004 (0.1) | 0.334 (6.0) | 0.000 (0.0) |
| State government | 118 | 0.065 | 0.000 (0.0) | 0.020 (0.3) | 0.271 (4.1) | 0.065 (1.0) |
| Federal government | 374 | 0.207 | 0.000 (0.0) | 0.000 (0.0) | 0.179 (0.9) | 0.731 (3.5) |
| International organizations | 19 | 0.011 | 0.000 (0.0) | 0.037 (3.5) | 0.012 (1.1) | 0.000 (0.0) |
| Ecological entities/organizations | 16 | 0.009 | 0.000 (0.0) | 0.039 (4.4) | 0.000 (0.0) | 0.000 (0.0) |
| World leaders | 57 | 0.032 | 0.000 (0.0) | 0.056 (1.8) | 0.110 (3.5) | 0.000 (0.0) |
| Enterpreneurs | 15 | 0.008 | 0.000 (0.0) | 0.000 (0.0) | 0.017 (2.0) | 0.022 (2.6) |
| Others | 102 | 0.056 | 0.000 (0.0) | 0.000 (0.0) | 0.078 (1.4) | 0.182 (3.2) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table A. CMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Environmental Behavior" - Campinas Metropolitan Area, 2007

| *Environmental behavior* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1jl}$ (Ratio E/O) | Profile 2 $\lambda_{2jl}$ (Ratio E/O) | Profile 3 $\lambda_{3jl}$ (Ratio E/O) | Profile 4 $\lambda_{4jl}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| | | | *Intended behavior* | | | |
| 1. Would you consider separating garbage or trash for recycling? | | | | | | |
| No | 142 | 0.079 | 0.103 (1.3) | 0.000 (0.0) | 0.237 (3.0) | 0.000 (0.0) |
| Yes | 1664 | 0.921 | 0.897 (1.0) | 1.000 (1.1) | 0.764 (0.8) | 1.000 (1.1) |
| 2. Would you consider eliminating unecessary waste of water? | | | | | | |
| No | 33 | 0.018 | 0.000 (0.0) | 0.000 (0.0) | 0.105 (5.7) | 0.000 (0.0) |
| Yes | 1773 | 0.982 | 1.000 (1.0) | 1.000 (1.0) | 0.895 (0.9) | 1.000 (1.0) |
| 3. Would you consider reducing gas and energy consumption? | | | | | | |
| No | 47 | 0.026 | 0.000 (0.0) | 0.000 (0.0) | 0.150 (5.8) | 0.000 (0.0) |
| Yes | 1759 | 0.974 | 1.000 (1.0) | 1.000 (1.0) | 0.850 (0.9) | 1.000 (1.0) |
| 4. Would you consider working collectively with others? | | | | | | |
| No | 984 | 0.545 | 1.000 (1.8) | 0.000 (0.0) | 1.000 (1.8) | 0.000 (0.0) |
| Yes | 822 | 0.455 | 0.000 (0.0) | 1.000 (2.2) | 0.000 (0.0) | 1.000 (2.2) |
| 5. Would you consider taking collective action against a company that pollutes? | | | | | | |
| No | 954 | 0.528 | 1.000 (1.9) | 0.000 (0.0) | 1.000 (1.9) | 0.000 (0.0) |
| Yes | 852 | 0.472 | 0.000 (0.0) | 1.000 (2.1) | 0.000 (0.0) | 1.000 (2.1) |
| 6. Would you consider contributing with/to environmental organizations? | | | | | | |
| No | 1050 | 0.581 | 1.000 (1.7) | 0.000 (0.0) | 1.000 (1.7) | 0.000 (0.0) |
| Yes | 756 | 0.419 | 0.000 (0.0) | 1.000 (2.4) | 0.000 (0.0) | 1.000 (2.4) |
| 7. Would you consider paying more for foods without chemical products? | | | | | | |
| No | 1092 | 0.605 | 1.000 (1.7) | 0.000 (0.0) | 1.000 (1.7) | 0.000 (0.0) |
| Yes | 714 | 0.395 | 0.000 (0.0) | 1.000 (2.5) | 0.000 (0.0) | 1.000 (2.5) |
| 8. Would you consider buying more energy efficient household appliances? | | | | | | |
| No | 168 | 0.093 | 0.000 (0.0) | 0.000 (0.0) | 0.532 (5.7) | 0.000 (0.0) |
| Yes | 1638 | 0.907 | 1.000 (1.1) | 1.000 (1.1) | 0.469 (0.5) | 1.000 (1.1) |
| *Actual behavior* | | | | | | |
| 1. In the past 12 months have you avoided throwing toxic products in the trash? | | | | | | |
| No | 692 | 0.383 | 0.708 (1.8) | 0.000 (0.0) | 0.797 (2.1) | 0.000 (0.0) |
| Yes | 1114 | 0.617 | 0.292 (0.5) | 1.000 (1.6) | 0.203 (0.3) | 1.000 (1.6) |
| 2. In the past 12 months have you avoided buying a product because of information written on the label? | | | | | | |
| No | 842 | 0.466 | 0.000 (0.0) | 0.000 (0.0) | 1.000 (2.1) | 1.000 (2.1) |
| Yes | 964 | 0.534 | 1.000 (1.9) | 1.000 (1.9) | 0.000 (0.0) | 0.000 (0.0) |
| 3. In the past 12 months have you fixed a broken product in order to avoid buying a new one? | | | | | | |
| No | 372 | 0.206 | 0.000 (0.0) | 0.000 (0.0) | 0.623 (3.0) | 0.376 (1.6) |
| Yes | 1434 | 0.794 | 1.000 (1.3) | 1.000 (1.3) | 0.378 (0.5) | 0.624 (0.8) |
| 4. In the past 12 months have you decreased the consumption of meat for health reasons? | | | | | | |
| No | 920 | 0.509 | 0.552 (1.1) | 0.000 (0.0) | 0.776 (1.5) | 0.727 (1.4) |
| Yes | 886 | 0.491 | 0.448 (0.9) | 1.000 (2.0) | 0.224 (0.5) | 0.273 (0.6) |
| 5. In the past 12 months have you stopped buying a product because you thought it harmed the environment? | | | | | | |
| No | 1225 | 0.678 | 0.740 (1.1) | 0.000 (0.0) | 1.000 (1.5) | 1.000 (1.5) |
| Yes | 581 | 0.322 | 0.260 (0.8) | 1.000 (3.1) | 0.000 (0.0) | 0.000 (0.0) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table B. BSMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Residential and Neighborhood Environment" - Baixada Santista Metropolitan Area, 2007

| *Residential and neighborhood environment* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1il}$ (Ratio E/O) | Profile 2 $\lambda_{2il}$ (Ratio E/O) | Profile 3 $\lambda_{3il}$ (Ratio E/O) | Profile 4 $\lambda_{4il}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| 1. Current municipality of residence | | | | | | |
| Bertioga | 32 | 0.020 | 0.000 (0.0) | 0.000 (0.0) | 0.132 (**6.6**) | 0.000 (0.0) |
| Cubatao | 79 | 0.050 | 0.097 (**2.0**) | 0.000 (0.0) | 0.125 (**2.5**) | 0.039 (0.8) |
| Guaruja | 241 | 0.152 | 0.000 (0.0) | 0.216 (**1.4**) | 0.616 (**4.1**) | 0.000 (0.0) |
| Itanhaem | 58 | 0.037 | 0.011 (0.3) | 0.072 (**2.0**) | 0.077 (**2.1**) | 0.000 (0.0) |
| Mongagua | 56 | 0.035 | 0.035 (1.0) | 0.092 (**2.6**) | 0.000 (0.0) | 0.000 (0.0) |
| Peruibe | 39 | 0.025 | 0.143 (**5.8**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Praia Grande | 230 | 0.145 | 0.132 (0.9) | 0.357 (**2.5**) | 0.000 (0.0) | 0.000 (0.0) |
| Santos | 516 | 0.325 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.875 (**2.7**) |
| Sao Vicente | 335 | 0.211 | 0.581 (**2.8**) | 0.263 (**1.2**) | 0.050 (0.2) | 0.087 (0.4) |
| 2. Conditions of the street surface | | | | | | |
| Paved in good condition | 1093 | 0.689 | 0.500 (0.7) | 0.868 (**1.3**) | 0.000 (0.0) | 1.000 (**1.5**) |
| Paved with pot holes | 193 | 0.122 | 0.500 (**4.1**) | 0.132 (1.1) | 0.000 (0.0) | 0.000 (0.0) |
| Not paved - regular surface | 122 | 0.077 | 0.000 (0.0) | 0.000 (0.0) | 0.419 (**5.5**) | 0.000 (0.0) |
| Not paved - irregular surface | 178 | 0.112 | 0.000 (0.0) | 0.000 (0.0) | 0.581 (**5.2**) | 0.000 (0.0) |
| 3. Does the street have curb and gutter? | | | | | | |
| No | 300 | 0.189 | 0.000 (0.0) | 0.000 (0.0) | 1.000 (**5.3**) | 0.000 (0.0) |
| Yes | 1286 | 0.811 | 1.000 (**1.2**) | 1.000 (**1.2**) | 0.000 (0.0) | 1.000 (**1.2**) |
| 4. Does the street have sidewalks? | | | | | | |
| No | 299 | 0.189 | 0.000 (0.0) | 0.000 (0.0) | 1.000 (**5.3**) | 0.000 (0.0) |
| Yes | 1287 | 0.811 | 1.000 (**1.2**) | 1.000 (**1.2**) | 0.000 (0.0) | 1.000 (**1.2**) |
| 5. Does the street have public lighting? | | | | | | |
| No | 61 | 0.038 | 0.000 (0.0) | 0.000 (0.0) | 0.243 (**6.3**) | 0.000 (0.0) |
| Yes | 1525 | 0.962 | 1.000 (1.0) | 1.000 (1.0) | 0.757 (0.8) | 1.000 (1.0) |
| 6. What's the frequency of the water supply? | | | | | | |
| Continuous - the whole day | 1469 | 0.926 | 0.973 (1.1) | 0.957 (1.0) | 0.648 (0.7) | 1.000 (1.0) |
| Some hours per day | 36 | 0.023 | 0.000 (0.0) | 0.043 (**1.9**) | 0.060 (**2.6**) | 0.000 (0.0) |
| Discontinuous | 50 | 0.032 | 0.027 (0.9) | 0.000 (0.0) | 0.169 (**5.3**) | 0.000 (0.0) |
| Missing | 31 | 0.020 | 0.000 (0.0) | 0.000 (0.0) | 0.123 (**6.3**) | 0.000 (0.0) |
| 7. Type of sewage drain | | | | | | |
| General sewage system | 1300 | 0.820 | 0.886 (1.1) | 0.976 (**1.2**) | 0.151 (0.2) | 1.000 (**1.2**) |
| Septic tank | 66 | 0.042 | 0.114 (**2.7**) | 0.024 (0.6) | 0.086 (**2.1**) | 0.000 (0.0) |
| Simple cesspools | 44 | 0.028 | 0.000 (0.0) | 0.000 (0.0) | 0.167 (**6.0**) | 0.000 (0.0) |
| Throw into rivers / missing | 176 | 0.111 | 0.000 (0.0) | 0.000 (0.0) | 0.596 (**5.4**) | 0.000 (0.0) |
| 8. Frequency of garbage and trash collection | | | | | | |
| Discontinuous | 769 | 0.485 | 0.829 (**1.7**) | 1.000 (**2.1**) | 0.623 (**1.3**) | 0.000 (0.0) |
| Daily | 728 | 0.459 | 0.171 (0.4) | 0.000 (0.0) | 0.000 (0.0) | 1.000 (**2.2**) |
| Missing | 89 | 0.056 | 0.000 (0.0) | 0.000 (0.0) | 0.377 (**6.7**) | 0.000 (0.0) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table B. BSMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Socioeconomic Status of the Household" - Baixada Santista Metropolitan Area, 2007

| *Socioeconomic status of the household* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1il}$ (Ratio E/O) | Profile 2 $\lambda_{2il}$ (Ratio E/O) | Profile 3 $\lambda_{3il}$ (Ratio E/O) | Profile 4 $\lambda_{4il}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| 1. Schooling of respondent | | | | | | |
| Illiterate | 52 | 0.033 | 0.152 (**4.6**) | 0.000 (0.0) | 0.036 (1.1) | 0.000 (0.0) |
| 1 to 4 years | 339 | 0.214 | 0.447 (**2.1**) | 0.286 (**1.3**) | 0.280 (**1.3**) | 0.000 (0.0) |
| 5 to 8 years | 475 | 0.299 | 0.277 (0.9) | 0.330 (1.1) | 0.600 (**2.0**) | 0.145 (0.5) |
| 9 to 11 years | 528 | 0.333 | 0.124 (0.4) | 0.384 (**1.2**) | 0.084 (0.3) | 0.504 (**1.5**) |
| 12 years and more | 192 | 0.121 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.351 (**2.9**) |
| 2. Deciles of per capita household income | | | | | | |
| First | 136 | 0.086 | 0.097 (1.1) | 0.138 (**1.6**) | 0.158 (**1.8**) | 0.000 (0.0) |
| Second | 141 | 0.089 | 0.151 (**1.7**) | 0.080 (0.9) | 0.225 (**2.5**) | 0.000 (0.0) |
| Third | 130 | 0.082 | 0.116 (**1.4**) | 0.065 (0.8) | 0.244 (**3.0**) | 0.000 (0.0) |
| Forth | 151 | 0.095 | 0.186 (**2.0**) | 0.097 (1.0) | 0.200 (**2.1**) | 0.000 (0.0) |
| Fifth | 148 | 0.093 | 0.176 (**1.9**) | 0.160 (**1.7**) | 0.088 (0.9) | 0.000 (0.0) |
| Sixth | 124 | 0.078 | 0.148 (**1.9**) | 0.143 (**1.8**) | 0.054 (0.7) | 0.000 (0.0) |
| Seventh | 152 | 0.096 | 0.060 (0.6) | 0.165 (**1.7**) | 0.002 (0.0) | 0.096 (1.0) |
| Eighth | 157 | 0.099 | 0.035 (0.4) | 0.153 (**1.5**) | 0.030 (0.3) | 0.116 (**1.2**) |
| Ninth | 212 | 0.134 | 0.032 (0.2) | 0.000 (0.0) | 0.000 (0.0) | 0.365 (**2.7**) |
| Tenth | 235 | 0.148 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.423 (**2.9**) |
| 3. Social class of the household | | | | | | |
| Classes D and E | 337 | 0.212 | 0.442 (**2.1**) | 0.137 (0.6) | 0.553 (**2.6**) | 0.000 (0.0) |
| Class C | 750 | 0.473 | 0.558 (**1.2**) | 0.863 (**1.8**) | 0.447 (0.9) | 0.103 (0.2) |
| Class B | 450 | 0.284 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.810 (**2.9**) |
| Class A | 49 | 0.031 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.087 (**2.8**) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table B. BSMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Environmental Perception" - Baixada Santista Metropolitan Area, 2007

| *Environmental percetion* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1il}$ (Ratio E/O) | Profile 2 $\lambda_{2il}$ (Ratio E/O) | Profile 3 $\lambda_{3il}$ (Ratio E/O) | Profile 4 $\lambda_{4il}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| 1. In your opinion, what is the main problem in regards to the environment in Brazil? | | | | | | |
| Environmental sanitation | 94 | 0.059 | 0.000 (0.0) | 0.030 (0.5) | 0.174 (**2.9**) | 0.068 (**1.2**) |
| Pollution of rivers, lakes, beaches | 246 | 0.155 | 0.000 (0.0) | 0.256 (**1.7**) | 0.119 (0.8) | 0.165 (1.1) |
| Air pollution | 222 | 0.140 | 0.084 (0.6) | 0.175 (**1.2**) | 0.051 (0.4) | 0.177 (**1.3**) |
| Deforestation | 457 | 0.288 | 0.000 (0.0) | 0.224 (0.8) | 0.502 (**1.7**) | 0.427 (**1.5**) |
| Lack of green spaces | 30 | 0.019 | 0.000 (0.0) | 0.047 (**2.5**) | 0.029 (**1.5**) | 0.000 (0.0) |
| Floods | 51 | 0.032 | 0.000 (0.0) | 0.073 (**2.3**) | 0.011 (0.3) | 0.022 (0.7) |
| Fire | 132 | 0.083 | 0.000 (0.0) | 0.053 (0.6) | 0.114 (**1.4**) | 0.140 (**1.7**) |
| Other / No problems | 164 | 0.103 | 0.315 (**3.0**) | 0.142 (**1.4**) | 0.000 (0.0) | 0.000 (0.0) |
| Missing | 190 | 0.120 | 0.601 (**5.0**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| 2. In your opinion, what is the main problem with the environment in your neighborhood? | | | | | | |
| Environmental sanitation | 174 | 0.110 | 0.000 (0.0) | 0.000 (0.0) | 0.465 (**4.2**) | 0.105 (1.0) |
| Pollution of rivers, lakes, beaches | 340 | 0.214 | 0.000 (0.0) | 0.169 (0.8) | 0.265 (**1.2**) | 0.342 (**1.6**) |
| Air pollution | 129 | 0.081 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.230 (**2.8**) |
| Deforestation | 36 | 0.023 | 0.000 (0.0) | 0.019 (0.8) | 0.050 (**2.2**) | 0.025 (1.1) |
| Lack of green spaces | 88 | 0.055 | 0.000 (0.0) | 0.180 (**3.2**) | 0.000 (0.0) | 0.000 (0.0) |
| Floods | 115 | 0.073 | 0.000 (0.0) | 0.235 (**3.2**) | 0.000 (0.0) | 0.000 (0.0) |
| Other / No problems | 581 | 0.366 | 0.571 (**1.6**) | 0.397 (1.1) | 0.220 (0.6) | 0.297 (0.8) |
| Missing | 123 | 0.078 | 0.429 (**5.5**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| 3. In your opinion, how serious is global warming? | | | | | | |
| Very serious | 1319 | 0.832 | 0.000 (0.0) | 0.924 (1.1) | 0.963 (**1.2**) | 1.000 (**1.2**) |
| Slightly serious | 73 | 0.046 | 0.096 (**2.1**) | 0.076 (**1.6**) | 0.037 (0.8) | 0.000 (0.0) |
| Not serious | 25 | 0.016 | 0.090 (**5.7**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Doesn't know about GW/Missing | 169 | 0.107 | 0.813 (**7.6**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| 4. In your opinion, who should/could solve the problem of global warming? | | | | | | |
| Each one of us | 721 | 0.455 | 0.000 (0.0) | 0.701 (**1.5**) | 0.187 (0.4) | 0.526 (**1.2**) |
| Local government | 82 | 0.052 | 0.000 (0.0) | 0.155 (**3.0**) | 0.023 (0.4) | 0.000 (0.0) |
| State government | 20 | 0.013 | 0.011 (0.8) | 0.007 (0.5) | 0.042 (**3.3**) | 0.006 (0.5) |
| Federal government | 247 | 0.156 | 0.085 (0.5) | 0.056 (0.4) | 0.474 (**3.0**) | 0.163 (1.0) |
| International organizations | 24 | 0.015 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.042 (**2.8**) |
| Ecological entities/organizations | 19 | 0.012 | 0.000 (0.0) | 0.025 (**2.1**) | 0.005 (0.4) | 0.010 (0.8) |
| World leaders | 127 | 0.080 | 0.000 (0.0) | 0.000 (0.0) | 0.085 (1.1) | 0.184 (**2.3**) |
| Enterpreneurs | 69 | 0.044 | 0.000 (0.0) | 0.000 (0.0) | 0.125 (**2.9**) | 0.069 (**1.6**) |
| Others | 63 | 0.040 | 0.133 (**3.3**) | 0.034 (0.8) | 0.037 (0.9) | 0.000 (0.0) |
| GW is not serious / never heard of GW | 194 | 0.122 | 0.761 (**6.2**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Missing | 20 | 0.013 | 0.011 (0.8) | 0.022 (**1.8**) | 0.024 (**1.9**) | 0.000 (0.0) |
| 5. In your opinion, who should/could solve the environmental problems indicated by the population? | | | | | | |
| Each one of us | 480 | 0.303 | 0.105 (0.3) | 0.391 (**1.3**) | 0.159 (0.5) | 0.399 (**1.3**) |
| Local government | 463 | 0.292 | 0.412 (**1.4**) | 0.308 (1.1) | 0.483 (**1.7**) | 0.130 (0.4) |
| State government | 55 | 0.035 | 0.011 (0.3) | 0.041 (**1.2**) | 0.059 (**1.7**) | 0.031 (0.9) |
| Federal government | 305 | 0.192 | 0.075 (0.4) | 0.131 (0.7) | 0.242 (**1.3**) | 0.285 (**1.5**) |
| International organizations | 18 | 0.011 | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) | 0.032 (**2.8**) |
| Ecological entities/organizations | 24 | 0.015 | 0.000 (0.0) | 0.035 (**2.3**) | 0.000 (0.0) | 0.012 (0.8) |
| World leaders | 78 | 0.049 | 0.000 (0.0) | 0.052 (1.1) | 0.000 (0.0) | 0.094 (**1.9**) |
| Enterpreneurs | 31 | 0.020 | 0.000 (0.0) | 0.043 (**2.2**) | 0.000 (0.0) | 0.018 (0.9) |
| Others | 132 | 0.083 | 0.397 (**4.8**) | 0.000 (0.0) | 0.058 (0.7) | 0.000 (0.0) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

Table B. BSMA. Absolute frequency, marginal probabilities, estimated probabilities ($\lambda_{kil}$) of variables for each household level profile, and (E/O) ratios. Dimension "Environmental Behavior" - Baixada Santista Metropolitan Area, 2007

| *Environmental behavior* | Absolute Frequency | Observed Probability | Profile 1 $\lambda_{1il}$ (Ratio E/O) | Profile 2 $\lambda_{2il}$ (Ratio E/O) | Profile 3 $\lambda_{3il}$ (Ratio E/O) | Profile 4 $\lambda_{4il}$ (Ratio E/O) |
|---|---|---|---|---|---|---|
| *Intended behavior* | | | | | | |
| 1. Would you consider separating garbage or trash for recycling? | | | | | | |
| No | 112 | 0.071 | 0.384 (**5.4**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Yes | 1474 | 0.929 | 0.616 (0.7) | 1.000 (1.1) | 1.000 (1.1) | 1.000 (1.1) |
| 2. Would you consider eliminating unecessary waste of water? | | | | | | |
| No | 13 | 0.008 | 0.041 (**5.0**) | 0.000 (0.0) | 0.005 (0.7) | 0.000 (0.0) |
| Yes | 1573 | 0.992 | 0.959 (1.0) | 1.000 (1.0) | 0.995 (1.0) | 1.000 (1.0) |
| 3. Would you consider reducing gas and energy consumption? | | | | | | |
| No | 20 | 0.013 | 0.070 (**5.6**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Yes | 1566 | 0.987 | 0.930 (0.9) | 1.000 (1.0) | 1.000 (1.0) | 1.000 (1.0) |
| 4. Would you consider working collectively with others? | | | | | | |
| No | 420 | 0.265 | 1.000 (**3.8**) | 0.000 (0.0) | 0.000 (0.0) | 0.112 (0.4) |
| Yes | 1166 | 0.735 | 0.000 (0.0) | 1.000 (**1.4**) | 1.000 (**1.4**) | 0.888 (**1.2**) |
| 5. Would you consider taking collective action against a company that pollutes? | | | | | | |
| No | 343 | 0.216 | 1.000 (**4.6**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Yes | 1243 | 0.784 | 0.000 (0.0) | 1.000 (**1.3**) | 1.000 (**1.3**) | 1.000 (**1.3**) |
| 6. Would you consider contributing with/to environmental organizations? | | | | | | |
| No | 389 | 0.245 | 1.000 (**4.1**) | 0.000 (0.0) | 0.177 (0.7) | 0.000 (0.0) |
| Yes | 1197 | 0.755 | 0.000 (0.0) | 1.000 (**1.3**) | 0.823 (1.1) | 1.000 (**1.3**) |
| 7. Would you consider paying more for foods without chemical products? | | | | | | |
| No | 697 | 0.439 | 1.000 (**2.3**) | 0.203 (0.5) | 0.559 (**1.3**) | 0.350 (0.8) |
| Yes | 889 | 0.561 | 0.000 (0.0) | 0.797 (**1.4**) | 0.441 (0.8) | 0.651 (**1.2**) |
| 8. Would you consider buying more energy efficient household appliances? | | | | | | |
| No | 65 | 0.041 | 0.229 (**5.6**) | 0.000 (0.0) | 0.000 (0.0) | 0.000 (0.0) |
| Yes | 1521 | 0.959 | 0.771 (0.8) | 1.000 (1.0) | 1.000 (1.0) | 1.000 (1.0) |
| *Actual behavior* | | | | | | |
| 1. In the past 12 months have you avoided throwing toxic products in the trash? | | | | | | |
| No | 386 | 0.243 | 0.602 (**2.5**) | 0.000 (0.0) | 1.000 (**4.1**) | 0.000 (0.0) |
| Yes | 1200 | 0.757 | 0.398 (0.5) | 1.000 (**1.3**) | 0.000 (0.0) | 1.000 (**1.3**) |
| 2. In the past 12 months have you avoided buying a product because of information written on the label? | | | | | | |
| No | 668 | 0.421 | 1.000 (**2.4**) | 0.000 (0.0) | 1.000 (**2.4**) | 0.152 (0.4) |
| Yes | 918 | 0.579 | 0.000 (0.0) | 1.000 (**1.7**) | 0.000 (0.0) | 0.848 (**1.5**) |
| 3. In the past 12 months have you fixed a broken product in order to avoid buying a new one? | | | | | | |
| No | 396 | 0.250 | 0.392 (**1.6**) | 0.124 (0.5) | 0.561 (**2.2**) | 0.148 (0.6) |
| Yes | 1190 | 0.750 | 0.608 (0.8) | 0.876 (**1.2**) | 0.439 (0.6) | 0.852 (1.1) |
| 4. In the past 12 months have you decreased the consumption of meat for health reasons? | | | | | | |
| No | 882 | 0.556 | 0.613 (1.1) | 0.416 (0.7) | 1.000 (**1.8**) | 0.453 (0.8) |
| Yes | 704 | 0.444 | 0.387 (0.9) | 0.584 (**1.3**) | 0.000 (0.0) | 0.547 (**1.2**) |
| 5. In the past 12 months have you stopped buying a product because you thought it harmed the environment? | | | | | | |
| No | 751 | 0.474 | 1.000 (**2.1**) | 0.000 (0.0) | 1.000 (**2.1**) | 0.240 (0.5) |
| Yes | 835 | 0.526 | 0.000 (0.0) | 1.000 (**1.9**) | 0.000 (0.0) | 0.761 (**1.4**) |

Source: Data from Projeto Vulnerability (NEPO/Unicamp).

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