

SUSTAINABLE WATER CONSUMPTION UNDER A SOCIAL-PSYCHOLOGICAL POINT OF VIEW: A CROSS-CULTURAL APPROACH

M. Bonnes¹, G. Carrus², P. Passafaro¹, F. Fornara³, V. Corral-Verdugo⁴, G. Moser⁵ and J. Sinha⁶

⁽¹⁾ Sapienza University of Rome, Italy

⁽²⁾ University of Roma Tre, Italy

⁽³⁾ University of Cagliari, Italy

⁽⁴⁾ University of Sonora, Mexico

⁽⁵⁾ University René Descartes-Paris V, France

⁽⁶⁾ Asser Institute of Management Studies, India

Abstract

The concept of Sustainable Development, and issues related to “sustainability”, gained increased relevance within Environmental Psychology, a branch of psychology that studies the relationship between human behavior and the physical environment. Environmental psychological investigation can shed new light on the human dimension of different environmental global changes, such as the depletion of fresh water resources. A psychological research project, focusing on the social-psychological determinants of sustainable water consumption was thus conceived and supported with a 2-years funding by the ICSU (*International Council for Science*) Grants Programme 2004, with the active support of IUPsyS (*International Union of Psychological Science*). The purpose of the project was to identify the major social-psychological processes and factors (at the individual and collective level) orienting perception and behaviors towards the use of fresh water resources among people living in urban areas variously provided with fresh water supply and located in differently industrialized countries, according to different geographical, social and cultural local contexts across and within various countries. Results of the different field studies, conducted within a comparative framework in different towns of the 4 countries considered are presented. Data include a first test of several psychological measurement instruments, and a first assessment of people’s perception and behaviors in specific cases/situations of water scarcity, deficient supply and/or water restrictions (permanent, periodic, or accidental). Thus results allows for hypothesis on the incidence of specific intra-national peculiarities of differently developed countries to be tested in future studies.

Key words: environmental psychology, sustainable development; use of freshwater resources; urban areas; ecological worldviews.

1. INTRODUCTION

1.1. Environmental psychology and sustainable development

The need for pursuing a deeper integration between bio-physical and human-social sciences in addressing environmental issues has been often stressed in order to better facing the environmental “Global Changes” occurring in our biosphere (Bonnes & Bonaiuto, 2002; see also Uzzell, 2000). Taking into account the various bio-physical aspects (i.e. physical, chemical, biological processes) as well as the different human aspects (i.e. social, cultural, economic, and social-psychological) of environmental global changes is becoming increasingly important for a deeper understanding of these problems. The psychological processes at the individual and collective level affecting environmental “Global Changes” are among these human aspects, and they are receiving increasing attention within and outside psychological inquiry (Pawlik, 1991; Levy-Leboyer et al., 1996).

In particular, in the last decades the ecologically considered environment has become increasingly central in the field of Environmental Psychology, a branch of psychology which studies the relationship between human behavior and the physical environment (see Bechtel & Churchman, 2002; Bonnes and Carrus, 2004). An increased attention, within this field of inquiry, has been given in the

last decades to the natural-biological aspects of the physical environment, in addition to the architectural and technological ones, upon which the initial main interests of this psychological research field had converged. Since then, a considerable amount of research has been devoted to the investigation of environmentally-relevant behaviors and their social-psychological determinants (Stern, 2000). In line with the major intergovernmental initiatives, such as the United Nations mandate for Sustainable Development (WCED, 1987), a primary aim of current environmental psychological research has been that of investigating the social psychological and contextual determinants of environmentally friendly or unfriendly behaviors (many of which often occur even out of people's individual awareness). Thus, issues like environmental "awareness", "concern" and "responsibility", occupied an increasing central position in the environmental psychological research agenda of the last 20 years. This gave also rise to the new field of the *Psychology of Sustainable Development* (Bonnes and Bonaiuto, 2002).

1.2. Main research findings of the literature on ecological behaviors

The environmental psychological literature has generally shown that several personal, environmental, and contextual factors can be related to pro-environmental attitudes and actions. Earlier research contributions focused on factors such as general pro-environmental values, environmental awareness, environmental concern and pro-environmental attitudes, and showed how a general concern for the environment is, as said, widely shared in present-day western societies, although difference exists according to social-demographic variables like age, gender, educational level, income, residence, and political orientation (see Dietz et al., 1998; Fransson and Garling, 1999). More recent research highlighted that specific perceptions, attitudes and behaviors regarding the environment still differ from one country to another, and may differently affect individuals' willingness to protect the environment. Such differences appear in fact related to the different environmental conditions, to the state of the natural resources, and to the different societal contexts (i.e. shared beliefs, values, norms, regulations, infrastructures, media communication, opportunities for action, etc.) characterizing the respective countries (see Levy-Leboyer et al., 1996). It seems then necessary to investigate more directly how "global" variables at a personal level (such as value orientations, worldviews, general beliefs and social representations about the environment) may interact with more specific contextual and situational factors that can promote or inhibit individual pro-environmental behaviors (see Bonaiuto et al., 2002; Bonnes and Bonaiuto, 2002; Corraliza and Berenguer, 2000).

Following a different approach, Cultural theory (e.g., Douglas and Wildavsky, 1984; Steg and Sievers, 2000) tried to explain the relationship between humans and environmental problems according to the different representation of nature, social relations and preferred behavioral strategies held by different groups of people. Various profiles were identified, such as *individualists* (who consider nature as a robust and resilient system, which cannot easily be disturbed), *hierarchists* (who consider nature as a moderately vulnerable system that can be controlled and managed by experts), *egalitarians* (who have a conception of nature as capricious, unpredictable and versatile) and *fatalists* (who have no coherent view on the environmental system as they just take things as they happens).

However, it should also be considered that different kinds of global changes can be characterized by different degrees of direct "sensorial perceptibility" and thus of possible "personal relevance" for the everyday experience of individuals (Graumann and Kruse, 1990). For example, some environmental changes can be almost unrelated (e.g. the greenhouse effect, the depletion of the ozone layer) or only moderately related to people's perceptions and daily activities (e.g. the loss of biodiversity, climate changes, over-population). On the contrary, other environmental global changes are strongly related to people's perception and daily activities. Phenomena like air and water pollution and the depletion of fresh water resources are among these. It thus seems appropriate to take into account these different characteristics of environmental global changes when investigating their possible social psychological determinants.

1.3. Environmental psychological research and water resource management

Environmental and social psychological research dealt with various ecological issues in recent years. Among these issues, an increased attention has been dedicated to the human use and attitudes towards *fresh water resources* (e.g., Corral-Verdugo et al., 2003; Corral-Verdugo et al., 2002; Kantola et al., 1983; Lam, 1999; Van Vugt, 1999). This is indeed one of the top priorities in the current environmental agenda (both for bio-physical and human-social science). Societal contexts and ideological factors can affect the framework on which the links between people and fresh water resources are built up and developed. Ideological dimensions and available information on fresh water (ideological system, collective memory, information, social representations, and underlying values) on the one hand, and on the other, aspects concerning levels of economic, institutional, and technical development which determine the specific conditions of daily access to fresh water, may intervene at both the perceptual and behavioral level. It is important to take into account these potential differentiations, for example through the comparisons of uses, perceptions and attitudes towards freshwater resources in different cultural, geographical, and national contexts. Indeed, most of the existing literature focused prominently on water problems at the specific national or regional level, while less attempts were made to compare different regional contexts within nations, or to compare different nations. Moreover, no measurement instrument of cross-cultural validity has been developed until now to be used for assessing uses, perceptions and attitudes towards freshwater resources, although such kind of instrument could be of help for both theoretical and management purposes.

For these reasons a project for an international and cross-cultural research work, focusing on different national and “local” (intra-national) contexts, concerning the human use and perception of fresh water resources was conceived by our international research team, involving the Sapienza University of Rome (Italy), The University René Descartes-Paris V (France), The University of Sonora (Mexico), and the Assert Institute of Management Studies of Patna (India). The main purpose of the research project was to study the social psychological factors (at the individual and collective level) orienting perceptions and uses of fresh water resources according to different geographical, cultural, social and national contexts. In particular, the research project was meant to focus on the similarities/differences between people living in urban areas characterized by different conditions of water supply and located in more and less industrialized countries. The project also moved up from the consideration that the first step toward this direction had to be that of setting up appropriate measurement instruments of cross-cultural validity. A research proposal with the above mentioned general aims was thus submitted by our international research team, and supported with a 2-years funding by the ICSU (*International Council for Science*) Grants Programme 2004, under the Priority Theme on *Science and Technology for Sustainable Development*, with the active support of IUPsyS (*International Union of Psychological Science*). The research funded, was meant to cover two years (2004-2005), and to consist of four different field studies, to be conducted within a comparative framework, in the following four countries: Italy, France, India and Mexico. In particular, Mirilia Bonnes of the Sapienza University of Rome and Gabriel Moser of the University René Descartes-Paris V were involved in the Project as Principal Investigators. Jai Sinha of the Indian Assert Institute of Management Studies of Patna, and Victor Corral-Verdugo of the Sonora University of Hermosillo, were involved in the Project as coordinators of the two collaborating research groups.

2. OBJECTIVES

2.1. An international research project on water perceptions, representations and behaviors: general aims

The main aim of the project was, as said, to identify the major social-psychological and environmental factors affecting the daily use of freshwater resources among residents of urban

settlements characterized by different conditions of water supply, and to build up corresponding appropriate measurement instruments. A preliminary exploration of the potential similarities and differences in perceptions and behaviors concerning fresh water in different countries of the world was also among the objectives of this research project. These aims were pursued by comparing specific cases and situations of water availability/restrictions (e.g., permanent, periodic, or accidental), across different physical-geographical, socio-cultural, and situational conditions in the various cities considered, across the four countries involved. The research project was articulated in two main phases: a first qualitative exploratory phase, in which preliminary data were gathered by means of descriptive methods and non-structured or semi-structured instruments (phase 1), and a second quantitative phase in which the preliminary results of phase 1 were used to design and conduct a quantitative research (phase 2). In each of the country involved in the project, both phases have been conducted considering at least two specific urban sites, contrasting for water supply conditions, as local case-studies. The case-studies have been selected by the four national research groups, according to the corresponding “typicality” concerning fresh water supply (abundance, bad conditions of water supply, bad quality water, a.s.o.) or restrictions (permanent, periodic or accidental) of the geographical contexts. The choice of the sites was also meant to cover contrasting geographical, climatic, cultural and access condition (e.g., more or less favorable). For both phases, the chosen sites were the following: the cities of Rome and Cagliari in Italy; the cities of Paris and Brest in France; the cities of New Delhi and Patna in India; the cities of Monterey, Hermosillo and La Victoria in Mexico.

2.2. Phase 1: objectives and methods

The first phase of the project took place in 2004 and was dedicated to an exploratory qualitative investigation of urban residents’ perception of quality, quantity, access, management, sources, pool extension, and actual daily use of domestic water resources. The studies were carried out by means of individual interviews and focus groups, following a common data collection plan (e.g., sites to be chosen, sample characteristics, and so forth) and a common interview track. Within each country, the methodology was adjusted in a way judged as more appropriate to the specific context considered. The interview track was also adjusted to the specific characteristic of the different national contexts, and was focused on different topics (e.g., habitual use of domestic freshwater; opinions about freshwater quantity, quality, access and management; perceptions about other people uses of freshwater; personal commitment to save freshwater; orientations towards general environmental issues). Within each country, a criterion of maximum heterogeneity (for gender, age, income level, education level, residence, availability of water) was adopted in recruiting participants. On the overall, about 200 urban residents participated to individual or group interviews or to focus group, in the four countries. More specific details concerning the methods and results of the studies conducted in phase 1 are contained within single reports from the research group of each country, and are available on request. A rich material was gathered through this first phase, which was then content analyzed and shared among all the research groups. The material gathered in phase 1 was then used to set up a structured measuring instrument (i.e., a self-report *paper-and-pencil* questionnaire) which became the major tool for the second quantitative phase of the project, carried out during year 2005.

2.3. Phase 2: objectives and methods

The major aims of the studies conducted in phase 2 were:

- 1) Identifying meaningful constructs and variables for the study of water related issues.
- 2) Building up a set of psychometric instruments for the measurement of these constructs (i.e. general and specific perceptions, attitudes and behaviors concerning fresh water resources; general environmental worldviews, etc.);
- 3) Assessing the structural dimension, reliability and validity of the abovementioned measurement instruments;

4) Testing construct validity and discriminative power of the instruments, through the assessment of the divergences/similarities in perceptions, attitudes and behaviors towards freshwater resources across the different geographical contexts considered.

The main varieties of arguments that emerged during phase 1 in participants' spontaneous discourses about fresh water were used to set up various sets of statements (items), which were assembled in a paper-and-pencil questionnaire, investigating different aspects of water use, perception of water issues, and attitudes/beliefs towards global changes problems in general. The master version of the questionnaire was elaborated in English and then translated in four languages (Italian, French, Hindi, Spanish). Copies of them are available from the authors on request. Studies conducted in phase 2 were repeated on the same geographical sites chosen for study 1. The questionnaires were administered during July – September 2005 to 759 participants across the 4 nations involved in the project. Age of participants ranged between 18 and 84 years old; average age was 39 years old; males were the 49% and females 51 %. Table 1 shows the distribution of participants across the four countries.

Table 1: Distribution of participants across the towns and nations considered

Countries & locations		n	%
France	Paris	126	17
	Brest	70	9
Italy	Rome	127	17
	Cagliari	121	16
India	New Delhi	76	10,0
	Patna	77	10,1
Mexico	Monterey	70	9
	Hermosillo	70	9
	La Victoria	22	3
Total		759	100

The questionnaire comprised, among others, specific sections measuring the different uses of water during a typical day, the perception of quantities of water used by the respondent and by others, and the perceived quality of water (sections 1 to 4). The questionnaire also comprised specific sections measuring knowledge/representations about different water sources, knowledge/representations about the water cycle and water renewability; awareness of the consequences of water use and over-use, perception of water problems in relation to other environmental problems (sections 5 to 9). Finally, the questionnaire comprised specific sections measuring general ecological attitudes and worldviews, more or less oriented towards the endorsement of the sustainable development principles; that is, beliefs about the functional and temporal interdependence of human development and nature conservation, according to the sustainable development mandate (sections 10 to 12). Results concerning these sections will be focused on more specifically in this paper, and are presented with more detail also by Corral-Verdugo et al. (2007).

2.4. Phase 2: main results

The questionnaire was very varied and complex, and results cannot be reported here in every detail (more detailed reports of the data analysis are available from the authors on request). In this paper we will present in particular the results of analyses focused on the entire sample. Descriptive statistics (e.g., means, standard deviations, distribution) were first checked on all items. Then multivariate statistical analyses (e.g., Cronbach's alpha, Factor analysis, Pearson's correlations, ANOVA), were performed separately for the various sections of the questionnaire to assess the reliability and construct validity of the different scales developed.

On the whole, the preliminary findings highlighted both similarities and differences across the different towns that were contrasted within each single country involved in the project. Contrasting pattern of perception/representation/uses emerged in fact between the different cities considered; indeed, environmental conditions and type of supply seem to strongly affect participants' perceptions and actions concerning fresh water resources.

A major aim was, as said, the development of standardized psychometric tools for the measure of environmentally relevant attitudes and behaviors in the water consumption domain. In particular, a scale measuring people commitment to save water was subject to psychometric assessment. The former was composed by eleven items; participants were asked to indicate what they actually do to save water in their every day life. These items included behaviors such as "reusing water from washing machine and sink", "watering plants at night", and "turning taps off while soaping".

Furthermore, a scale measuring general ecological worldviews oriented to the endorsement of Sustainable Development principles (i.e., beliefs about the functional and temporal interdependence of human development and nature conservation), was subject to specific psychometric assessment. In our hypotheses, this last factor was to be considered as a significant social psychological determinant of water saving actions among urban residents. Participants were asked to rate their level of agreement with five items, stating that human progress and enjoyment of natural resources, either present or future are functionally and temporally interdependent with the need of preserving the environment. Some examples of these items are: "*Human beings can progress only by conserving nature's resources*", and "*Preserving nature now means ensuring future for human beings*".

Results indicated a satisfactory level of reliability for these two scales on the total sample: the *Cronbach's alpha* values were .71 and .78 for the scale measuring commitment to save water and for the scale measuring endorsement of sustainable development principles, respectively (*Cronbach's alpha* is a statistical index of the internal coherence of a scale: values above .70 are considered satisfactory). As far as the scale measuring general ecological worldviews is concerned, similar satisfactory levels of internal coherence emerged also in the four national sub-samples, with the exception of India.

The structure of the scale on general ecological worldviews was also checked for across the four national sub-samples, by means of a set of multi-sample confirmatory factor analyses. This analysis tests the appropriateness of a model of factor structure simultaneously for more than one sample. Results confirmed that the structure of this scale is generalizable across the four sub-sample considered (i.e., the scale is a unifactorial construct in the four samples). A final set of analyses was performed to assess the role of a general ecological worldview supporting the sustainable development principles upon self-reported commitment to save water: results indicated that the former has a positive and significant impact on the latter: in other words, the higher the endorsement of sustainable development principles, the higher the self-reported commitment to save freshwater resources, independently of the nation and town considered. We could label such an endorsement as a *New Anthro(eco)centric Paradigm* or worldview. Such an integrated vision is, as said, strongly coherent with the major pillars of the Sustainable Development concept. These can be synthesized as an aware recognition of the mutual dynamic interdependences linking the well being of current and future human societies to the ability to care for a proper renewal and restoration - from human needs and impacts - of natural resources in the biosphere. In sum, the two above-mentioned scales emerged as a

valid and reliable tools in the different contexts considered; furthermore, our results indicate that a dynamic combination of anthropocentrism with ecocentrism is probably superior to the sole endorsement of an ecocentric worldview in guiding conservation behavior, when anthropocentrism is not in conflict with the idea of environmental conservation.

3. DISCUSSION AND CONCLUSIONS

The main goals of the research project presented here were to set up various psychometric tools for measuring relevant aspects of perceptions, attitudes and uses related to domestic water consumption in different geographical and cultural contexts. This major aim was substantially met. For instance, valid and reliable measuring instruments for assessing how residents of urban areas (differing in terms of fresh water supply, and located in differently industrialized countries) use and perceive domestic water received a first test. These instruments could be better developed and used in future studies. The project allowed in particular to set up a specific scale for the measurement of beliefs about the functional and temporal interdependence of human development and nature conservation, according to the major principles of sustainable development. This scale appears as a valid and reliable tool in the different urban and national contexts considered. This factor also emerged as a significant social-psychological determinant of individual commitment to freshwater saving actions, across the very different cultural and geographical contexts considered. Instruments of this kind could be used in the future also to provide useful information to policy institutions and decision makers, in order to promote more sustainable patterns of fresh water consumption among individuals and communities. These instruments could also be used to compare laypersons' and experts' assessments about fresh water issues (e.g., Bonnes et al., 2007), and for monitoring changes through the time in the perceptions, attitudes and behaviors towards freshwater resources.

REFERENCES

- Corraliza, J.A. and Berenguer, J. (2000): Environmental values, beliefs, and actions: A situational approach. *Environment and Behavior*, 32: 832-848.
- Corral-Verdugo, V., Bechtel, R.B. and Fraijo-Sing B (2003): Environmental beliefs and water conservation: an empirical study. *Journal of Environmental Psychology*, 23: 247-257.
- Corral-Verdugo, V., Carrus, G., Bonnes, M., Moser, G. and Sinha, J. (2007): Environmental beliefs and endorsement of Sustainable Development principles in water conservation: towards an Eco-Anthropocentric Paradigm scale. *Environment and Behavior*: manuscript under review.
- Corral-Verdugo, V., Frias-Arment, M., Perez-Urias, F., Orduna-Cabrera, V. and Espinoza-Gallego, N. (2002): Residential water consumption motivation for conserving water and the continuing tragedy of the commons. *Environmental Management*, 30(4): 527-535.
- Bechtel, R. and Churchman, A. (2002): *Handbook of Environmental Psychology*, Wiley, New York.
- Bonnes, M. and Bonaiuto, M. (2002): Environmental Psychology: from spatial-physical environment to sustainable development. In R. Bechtel, A. Churchman, Eds., *Handbook of Environmental Psychology*, Wiley, New York, 28-54.
- Bonnes, M. and Carrus, G. (2004): Environmental Psychology, overview. In C. Spielberger Ed., *Encyclopedia of Applied Psychology*, Elsevier/Academic Press, New York, 801-814.
- Bonnes, M., Uzzell, D., Carrus, G., Kelay, T. (2007): Inhabitants' versus experts' assessment of environmental quality for urban sustainability. *Journal of Social Issues*, 63(1): 59-78.
- Bonaiuto, M., Carrus, G., Martorella, H. and Bonnes, M. (2002): Local identity processes and environmental attitudes in land use changes: the case of natural protected areas. *Journal of Economic Psychology*, 23: 631-653.
- Dietz, T., Stern, P. and Guagnano G.A., (1998): Social structural and social psychological basis of environmental concern. *Environment and Behavior*, 30: 450-471.
- Fransson, N., Garling, T. (1999): Environmental concern: conceptual definitions, measurement methods, and research findings. *Journal of Environmental Psychology*, 19: 369-382.

- Graumann, C.F. and Kruse, L. (1990): The environment: Social construction and psychological problems. In H.T. Himmteit, G. Gaskel (Eds.), *Societal Psychology*, Sage, London, 212-229.
- Kantola, S.J., Syme, G.J. and Nesdale A.R. (1983): The effect of appraised severity and efficacy in promoting water conservation: an informational analysis. *Journal of Applied Social Psychology*, 13: 164-182.
- Lam, SP (1999): Predicting intention to conserve water from the theory of planned behaviour, perceived moral obligation and perceived water right. *Journal of Applied Social Psychology*, 29(5): 1058-1071.
- Levy-Leboyer, C., Bonnes, M., Chase, J. Ferreira-Marques, J. and Pawlik, K. (1996): Determinants of Pro-Environmental Behaviors: A Five-Countries Comparison. *European Psychologists*, 1: 123-129.
- Pawlik, K. (1991): The psychology of global environmental change: Some basic data and an agenda for cooperative international research. *International Journal of Psychology*, 26: 547-563.
- Steg L. and Sievers I. (2000): Cultural theory and individual perceptions of environmental risks. *Environment and Behavior*, 32: 250-269.
- Stern, P. (2000): Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56: 407-424.
- Uzzell, D.L. (2000): The psycho-spatial dimension of global environmental problems. *Journal of Environmental Psychology*, 20: 307-318.
- Van Vugt, M. (1999): Solving natural resource dilemmas through structural change. The social psychology of metering water use. In M.Foddy, M. Smithson (Eds.) *Resolving social dilemmas: dynamic, structural and intergroup aspects*, Psychology Press, Philadelphia, PA, US, 121-133.
- WCED-World Commission on Environment and Development (1987): *Our common future*. University Press, Oxford.