

**Exploring Perceptions, Behaviors and Awareness:
Water and Water Pollution in South Africa**

Barbara A. Anderson
Professor, Department of Sociology
Research Professor, Population Studies Center
University of Michigan

John H. Romani
Professor Emeritus of Public Health Administration
University of Michigan

Heston E. Phillips
Executive Manager, Demographic and Social Analysis
Statistics South Africa

Marie Wentzel
Chief Researcher
Human Sciences Research Council

Kholadi Tlabela
Researcher
Department of Correctional Services, South Africa

ACKNOWLEDGMENTS

Helpful comments were provided by Pieter Kok and J. Louis van Tonder. The research upon which this paper was based was supported by a National Institutes of Child Health and Human Development Infrastructure Grant HD41028 to the Population Studies Center, University of Michigan, by the Human Sciences Research Council, Pretoria, South Africa, and by Statistics South Africa. Anderson and Romani were Visiting Researchers in the Urban and Rural Economic Development Research Programme at Human Sciences Research Council, and Anderson was a Visiting Analyst at Statistics South Africa when this paper was prepared. Tlabela was a Senior Researcher at Human Sciences Research Council when this paper was prepared.

Views presented in this paper are those of the authors and do not represent positions of the Human Sciences Research Council, Statistics South Africa or the University of Michigan.

ABSTRACT

Understanding the relationships among perceptions, behaviors and awareness of environment problems is of increasing interest to both policy makers and social scientists. There is, however, limited consensus among scholars as to the reasons for differences and similarities among population groups in their attitudes and behaviors regarding environmental conditions. South Africa, which has established a constitutional right to a safe environment, together with the presence of parallel first and third world populations and substantial public environmental programs offers an unusual setting in which to look at these issues. Using the 2004 South African General Household Survey, the similarities and differences between the African and non-African households with respect to the perceptions, behaviors and awareness of environmental conditions related to water and sanitation and that are associated with place of residence, specific living conditions, level of education and related factors are examined.

Exploring Perceptions, Behaviors and Awareness: Water and Water Pollution in South Africa

The late 20th and early 21st centuries have witnessed the emergence of the environment as a political and social issue. (Dunlap & Scarce, 1991; Dunlap, Gallup & Gallup, 1993; Inglehart, 1995; Rohrschneider, 1988; Jacobs, 2002). The expanded interest in global warming and related environmental concerns have led government and civil society to increase their efforts to raise public understanding of the underlying nature of water, air and ground pollution. Implicit, if not explicit, in these developments is the expectation that a heightened understanding of the causes and effects of environmental contamination will lead to improved environmental stewardship by both individuals and communities.

Although concerns about the environment are world-wide, South Africa offers a special setting in which to examine public perceptions, behaviors and awareness regarding matters of environmental quality. First is the historical context in which the reshaping of the South African political, economic and social systems is being carried out. South Africa, historically, as well as today, can be viewed as a country containing two parallel societies (Lumby, 2005). One, composed largely of the white population, has enjoyed and, for the most part, continues to enjoy economic and social amenities equal to those found in the developed world. In contrast is a second society made up essentially of the African and Coloured populations, the majority of which continue to live under circumstances comparable to those found in much of the developing world. Redressing these disparities that are the product of over 300 years of history demands substantial improvements not only in the economic status of the historically disadvantaged populations, but also in the social and political well-being of these groups. The simultaneous addressing of these needs directly affects, among other things, the environment.

A second consideration are the constitutional arrangements under which the reconstruction is taking place. The centerpiece of that constitutional framework is a comprehensive set of human rights, among which is the right of South African citizens:

- "a. to an environment that is not harmful to their health and well-being; and
 - b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative acts and measures that
 - i. prevent pollution and ecological degradation;
 - ii. promote conservation; and
 - iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"
- (Constitution of South Africa, Chap. 2. Sec. 24).

In a ten-year review of the new South African government, the Department of Environmental Affairs and Tourism (DEAT) underscored the importance of this provision:

"...the Environmental Right enshrined in the Bill of Rights has meant that environmental issues are now seen as an integral element to be addressed in the democratic transition" (DEAT, 2004: 57).

Also as one observer has suggested, the presence of an environmental right in the constitution facilitates the pursuit of the larger goal of environmental justice which many see as of critical importance in the new South African society (Glazewski, 1999).

This is not to suggest that the South African government is obliged to provide each person with a safe and healthy environment. Indeed, the constitutional article cited above notes that the governmental responsibility is only to provide for these conditions through "reasonable legislative acts." Also detailed in this same chapter of the constitution are the circumstances under which this right, as well as other rights, may be circumscribed (Chap. 2, Sec. 36).

These qualifications aside, the inclusion of this clause in the same constitutional category as other civil and socio-economic rights creates a context in which environmental concerns take on a larger role than might otherwise be the case. This not only establishes a higher level of expectations about environmental matters but also creates the potential that shortcomings in governmental performance in this arena could be viewed more critically. Thus, while the

placement of a concern for the environment as part of the bill of rights could well lead to a greater public awareness of environmental matters, it could also result in a level of public interest in this arena that might not be completely benign (Heyns & Brand, 2004).

Third is the vision of the majority African population for a post-apartheid society. With the transition in 1994 this population acquired, for the first time in over 300 years, responsibility for setting the agenda by which its hopes for this new society could become a reality. Central to these expectations is the equal and equitable distribution of those services necessary for the well being of all citizens. Key among these services are access to safe drinking water and sanitation, the provision of which directly affects environmental quality.

The actions of the African National Congress (ANC) government since it assumed power are an additional factor. Since 1994 substantial efforts have been made to increase the availability of potable water supplies and basic sanitation services. By 2005, some 10 million households had access to safe water compared to less than 7.3 million with such access in 1996 (Statistics South Africa, 2004; Mbeki, 2005). In 2005 basic sanitation services were available to some 67% of the population in contrast to the less than 50% of the population that had such services in 1994 (DWAF, 2005). Equally important has been the enactment of a wide range of legislation focused on the management of South Africa's natural resources within a framework of sustainable development (Peart & Govender, 2001). Despite improved access to safe water and sanitation services and the creation of a legal framework to protect the country's natural resource base, inequities and inequalities in both these areas remain (Hemson & O'Donovan, 2005; Peart & Govender, 2001).

Governmental activities in the environmental arena have not been limited to these endeavors. The Department of Environmental Affairs and Tourism and the Department of Education are jointly engaged in implementing an environmental education program and in its integration into the outcomes-based curriculum (National Environmental Education Program, 2006). Another initiative is the Working for Water Programme, begun by the Department of

Water and Forestry, and carried out in conjunction with the Departments of Agriculture, Social Development, Trade and Industry and the provincial governments.. Since its inception in 1995, the program has employed over 33,000 people in more than 300 projects to clear alien vegetation from the South African waterways (DWAF, Working For Water, 2006). Regulations have also been adopted to control the production, distribution and use of plastic bags (Republic of South Africa, 2003).

There is further, as noted earlier, a clear recognition that the vast social and economic needs of the new South African society can only be met successfully if governmental and civil society efforts alike satisfy the requirements of sustainable development. In its preparation for the post-apartheid period, the ANC committed itself to an environmental strategy designed to ensure that natural resources would be prudently used and that existing levels of environmental pollution, if not reduced, at least would not be increased (ANC, 1992; Republic of South Africa, 1998; Republic of South Africa, 2000; Peart & Govender, 2001).

One indication that some attention has been given to this concern is seen in a recent Department of Housing publication (Department of Housing, 2002). This report reviews nearly 100 different cases in which meeting the need for additional housing was used as an opportunity to apply the principles of sustainable development. The projects described ranged from one in Embalenhle in the province of Mpumalanga that dealt with indoor and outdoor air pollution to another in Ivory Park in Gauteng province involving the creation of a recycling program. In the former the problem was the use of coal and wood by householders for cooking and heating that resulted in increased levels of indoor and outdoor air pollution. By working with the community, consultants were able, through the installation of insulation and of more effective chimneys, together with the education of the residents, to reduce both indoor and outdoor air pollution (Department of Housing, 2002: 58).

The latter example described the work of a community organization to establish a recycling center. Not only has the center provided employment for a number of residents, but it

has also mounted environmental awareness programs in cooperation with the schools and other agencies. The center, which had both governmental and private assistance in its start-up phase, was, at the time of the report, on the verge of becoming self-supporting from revenues generated by the sale of materials it collects (Department of Housing, 2002: 84-85). These, and the other cases discussed in the report, point to both the presence of a grass roots awareness of environmental concerns and a capacity to address these problems consistent with the norms of sustainable development.

The emergence of a number of private and public-private initiatives focused on environmental concerns offers additional support for the contention that the emphasis given environmental matters in the constitution has helped foster an environmental consciousness in the South African public. While prior to 1994 there were a number of non-governmental organizations (NGOs) with an interest in environmental issues, these groups had not only narrow agendas, but also a restricted membership base (Steyn, 2002). It was not until late in the apartheid era that the number and focus of these groups changed.

Among the more recently established environmentally oriented NGOs is the Rose Foundation. Created in 1996, ROSE (Recycling Oil Saves the Environment) has set up a number of centers for the collection of used oil and its transport to four depots where it is stored until sold to oil recyclers (Rose Foundation, 2006). Another is Green Cages which has been developed by the automobile manufacturer BMW in conjunction with Plastics Federation of South Africa to encourage and facilitate the collection of plastic materials for recycling (Green Cages, 2006). Partnerships have been organized with both local schools and municipalities. The “War Against Waste”, started by the private refuse company, PIKITUP, has organized environmental education activities involving primary schools in the Johannesburg area in cooperation with the SAPS Youth Desk (PIKITUP, 2006). The WasteWise Programme is a similar activity developed by the municipality of Cape Town. The collection and recycling of metal beverage cans is the business of Collect a Can, a private company with operations in both South Africa and other parts of sub-

Saharan Africa (Collect-A-Can, 2006).

None of this is to argue that what is happening in South Africa is unique. Rather it is to observe that there are aspects of the South African situation which provide a special context in which to examine perceptions, behaviors and awareness regarding environmental issues. The establishment of a constitutional right to a safe environment, together with the large-scale actions taken to expand access to safe water and sanitation, not only give environmental issues an important place on the governmental agenda, but also create conditions favorable for the development of a significant public awareness and concern about environment. Further is the presence of parallel first and third world populations in which to look at these questions. These considerations suggest that South Africa offers an unusual opportunity in which to examine issues of environmental consciousness.

ISSUES

This paper explores the relationships between perceptions, behaviors and public awareness regarding environmental conditions in South Africa, with a focus on water and sanitation. Attention is directed first to the extent to which water pollution is seen as a community problem. Second is an examination of the circumstances under which this environmental condition is identified as a community problem. A third question is whether the perception that water pollution exists in the community leads to behaviors designed to reduce its impact. Fourth is the level of awareness in the South African population of a special governmental initiative organized to deal with one aspect of water pollution. The similarities and differences that occur with respect to these issues among and between population groups and that are associated with place of residence, specific living conditions, level of education and related factors form the core of the analysis.

An understanding of these relationships is important for both policy makers and social scientists. Information about these matters is a critical element in the identification and

development of public programs to address environmental pollution. How perceptions concerning environmental issues are formed, the relationship of these perceptions to behaviors regarding environmental problems and the relative influence that specific circumstances, social status and other factors have in the development of these attitudes and resultant behaviors are important issues in social science. Although these questions as they concern the field of environmental protection have been studied for more than 40 years, there is a limited consensus among scholars about the reasons for the differences and similarities among population groups in their attitudes and behaviors regarding environmental concerns (Van Liere & Dunlap; Rohrschneider, 1988; Dunlap & Scarce, 1991; Jacobs, 2002).

One perspective about individual perceptions regarding environmental pollution is found in two relatively early studies. The first was a survey conducted in Durham, North Carolina which focused on public awareness of environmental pollution as a problem (Murch, 1971). A principal finding from that study was that while a large proportion of those surveyed saw pollution as a national issue, only a small proportion viewed pollution at the local level as significant, despite the fact that environmental conditions in the community surveyed differed very little from those nationally. Moreover, those who expressed a high level of satisfaction with their particular circumstances were less likely to state that pollution was a problem than those who were dissatisfied with their particular situations.

Similar conclusions were drawn from a study in Los Angeles. Like the situation in North Carolina, satisfaction with one's immediate condition was inversely related to the perception that air pollution was a problem (Hohm, 1976). This suggests that for people to admit that there are serious defects in their immediate neighborhood constitutes a challenge to their individual self image. Moreover, the recognition that one resides in a less than wholesome environment can give rise to pressures to move and to alter one's long standing relationships, both of which one might not want to undertake. This attitude further reflects the possibility that individuals could become so habituated to a given set of circumstances that they are unable to perceive the

shortcomings that exist in addition to an unwillingness to admit that these shortcomings exist.

A recent study in Costa Rica provides a slightly different perspective (Holl, Daily & Ehrlich, 1995). Only 22% of respondents in a 1993 survey mentioned the environment as one of the top three national problems. While environmental concerns were not rated high in relation to other national problems, the global nature of environmental problems, was seen as a more important than similar conditions at the national level (Holl, Daily & Ehrlich, 1995: 1551). Of additional interest is that interviewees from "upper-class neighborhoods" saw global problems as not as important and that those from a "lower class neighborhood" ranked national problems as more important than did other groups in the study (Holl, Daily & Ehrlich, 2005: 1552). These observations led the authors to conclude:

"...there were contradictory indications of how Costa Ricans consider environmental problems. The results of our study and others, suggest that, relative to social and economic problems, those of the environment are not considered serious" (Holl, Daily & Ehrlich, 1995: 1553).

Another body of work, based on the World Values Survey, attributes the rise in the interest in environmental issues, in large part, to the move from materialist to post-materialist goals that has occurred in industrialized societies (Inglehart, 1995). Using Maslow's (1984) hierarchy of needs, in which it is stated that only when basic material needs are met will individuals focus their efforts on the satisfaction of higher order needs, Inglehart argues that the expanded attention given to environmental pollution as well as to support for programs to address these conditions represents a comparable shift at the societal level. Once people are satisfied that the basic material needs of a society have been met, attention will be given to the satisfaction of a set of higher order needs, of which environmental protection is an example. This change reflects an inter-generational shift as a younger, better educated generation in these advanced societies has come of political age. At least implicit in this argument is that awareness of environmental problems and the willingness to deal with them are more likely be present among populations

with a higher SES.

In contrast are the conclusions of the Health of the Planet Survey conducted by the Gallup Institute in 24 countries, equally divided between developing and developed societies:

"there is little difference in reported levels of environmental concern between the people of poor, less economically developed nations and those of richer, highly industrialized nations" (Dunlap, Gallup & Gallup, 1993: 13).

Not only were environmental problems not seen as among the most important problems faced by respondents in either the developed or the less-developed worlds, but there were also no significant differences between these societies when it came to choosing between economic development and environmental protection programs:

"Even when it comes to environment-versus-economic tradeoffs, little difference exists between those living in wealthy, industrialized nations and those in the developing nations: Both give strong endorsement to environmental protection" (Dunlap, Gallup & Gallup, 1993: 36).

The study authors also noted, "that environmental quality is no longer seen as a post-materialist value and that environmental degradation is increasingly recognized as a direct threat to human health and welfare" (Dunlap, Gallup & Gallup, 1993, 37). Further support for this position is found in the conclusions of a Canadian study:

"...concern about the environment cuts across key social divisions...there is no statistical association between income levels or education levels...The poorest and least-educated residents are just as likely as the richest and best-educated to care about environmental problems at home or in the world more generally" (Blake, Guppy & Urmetzer, 1997: 469).

Results of two recent studies of environmental perceptions in developing societies are consistent with these observations (Jacobs, 2002; White & Hunter, 2005). Jacobs examined perceptions of environmental concerns and behaviors in a survey of three less well off areas of

Rio de Janeiro and compared the results of that survey with those from the 1992 Euro-Barometer survey. She found that while the residents of the Rio de Janeiro communities were less likely than the Europeans to engage in recycling activities, their level of concern about the environment was higher than that reported in Europe (Jacobs, 2002: 69). Brazilian respondents also expressed a greater concern for matters "such as pollution of the ocean, biodiversity and global warming" than did the Europeans (Jacobs, 2002: 71). When asked about the relative importance of economic development and environmental protection, the interviewees in Brazil were also more likely than the Europeans to give priority to the latter. Moreover, Brazilians were more likely to have participated in a group endeavor designed to deal with particular environmental problems than the Europeans.

White and Hunter (2005) looked at environmental awareness and the relative importance of environmental issues in comparison to economic and social issues among residents of six coastal districts in the Central region of Ghana. Nearly all of the respondents indicated a general awareness of environmental quality; however, when reference was made either to the national or global environments, the level of that awareness declined. Also found was a linkage between environmental concerns and local issues similar to what was reported in the earlier North Carolina and Los Angeles studies (Murch, 1971; Hohm, 1976).

When asked to rank the relative seriousness of a set of four social issues (hunger, crime and violence, poor health care, ethnic and religious prejudice) and a set of four environmental issues (deforestation, fisheries depletion, water pollution, and drinking water availability/quality), residents rated two social issues (hunger and crime and violence) as very serious, but gave only one of the environmental problems (fisheries depletion) the same rating (White & Hunter, 2005: Table 5). However, responses to a question concerning preferences between economic growth and environmental programs, showed that some "70.4% favored environmental protection while 29.6% favored economic growth" (White & Hunter, 2005: 23).

Perhaps more important were findings concerning the association between individual

traits and responses to questions regarding the seriousness of environmental problems.

Multivariate analyses of these associations indicated that the more politically active members of the community, males and those who were literate, were likely to have both more awareness of environmental conditions and a greater concern about the environment than females and those who were not literate. Similarly, literate respondents of higher SES and who voted expressed greater support for environmental protection programs as opposed to economic growth efforts. In other words, "Those who are literate, voted, male and of higher household SES are all more likely to express a priority for environmental preservation" (White & Hunter, 2005: 24). This finding, as pointed out by White and Hunter, had one surprising aspect in relationship to gender. Most other studies regarding environmental perceptions indicate that females, rather than males, were likely to have a higher awareness of, and a concern for, environmental problems (White & Hunter, 2005:21).

The analysis of the linkages among attitudes regarding the seriousness of environmental conditions showed that those who viewed deforestation as a serious or very serious problem were also more likely to consider fisheries depletion in the same light. Of particular interest for this paper was the strong linkage reported between water pollution and drinking water quality and availability (White & Hunter, 2005: Table 6). Individual characteristics which were seen as a significant influence in their earlier analyses of these attitudes were less significant when the linkages among these attitudes were looked at. From these observations they concluded that: "the relationships we discover, e.g. the effect of education and civic engagement, are very likely operating and meaningful beyond our study site" (White & Hunter, 2005: 29).

In one respect, the suggestion of a strong association between higher SES and positive attitudes regarding the environment contradicts findings from other work in this area. Both the Health of the Planet Survey and the Canadian study, cited earlier, reported that there are only marginal differences in environmental awareness and attitudes among those of different social status (Dunlap, Gallup & Gallup, 1993; Blake, Guppy & Urmetzer, 1997). However, White and

Hunter also argue that individuals from:

"less-wealthy nations also express environmental concerns. Further, even when positioned relative to other social and economic concerns, many residents prioritize environmental issues" (White & Hunter, 2005: 30).

Race is another factor which has been advanced as a reason for the differences and similarities in attitudes between groups regarding environmental issues. Conventional wisdom, mainly from the developed world, holds that concern about environmental matters is largely a "white" issue (Mohai & Bryant, 1998). This position is in part derived from findings of the work reviewed above. First is the argument that since much of the world's non-white population lives in societies in which basic security needs are not yet met, it would follow, in keeping with Inglehart (1995) and others, that their principal concerns would be on satisfying basic material needs and not on higher social needs such as environmental protection. Second is the contention that an interest in environmental problems is a product of cultural differences. It is posited that the mores of the people of color are different from those of the white population and therefore they will have different perceptions regarding environmental matters (Mohai, 1990). Third is the assertion that those who live under poor environmental conditions, as do many people of color, become accustomed to their situation to the point that they do not perceive their immediate circumstances either as unusual or requiring action to change the situation, despite the findings of Murch (1971) and Hohm (1980).

Using data from the Detroit Area Study, Mohai and Bryant examined each of these propositions to determine if race was a factor in explaining differences in attitudes regarding the environment. While none of these explanations of differences in perceptions about the environment based on race appeared to hold, there was some evidence that African Americans were more deeply concerned than whites about environmental problems in their immediate neighborhoods, indicating some support for the notion that awareness of environmental issues tends to be a function of direct contact with poor environmental conditions. This observation is

tempered by the consideration that since those of color tend to live in areas more highly impacted by environmental pollution, largely because of socio-economic factors, a heightened interest in environmental pollution could be as much a product of socio-economic circumstances as that of immediate environmental conditions. Mohai and Bryant go on to suggest:

"While recognition has been increasing that African Americans are disproportionately burdened by pollution and that they are concerned about such issues, our results caution against a revision of conventional wisdom that would assert that concerns of African Americans about the environment are limited to pollution issues. It is true they are more concerned about such issues than they are about nature preservation, but the same pattern is also true for whites...To the extent that there is a racial divide in American society, differences in concerns about environmental quality do not appear to be a part of it" (Mohai & Bryant, 1998:502).

This review of the literature concerning perceptions about environmental issues and the reasons underlying these views tends to confirm the earlier observation that there continues to be limited consensus among scholars about these matters. While the argument that environmental quality is of more concern to those from higher SES backgrounds is supported by some of the work cited, this position is tempered by other findings which point to the importance of poor local environmental conditions in shaping views about environmental issues. There is more agreement on the lack of differences regarding environmental matters between the developing and developed worlds (Jacobs, 2005; White & Hunter, 2002; Dunlap, Gallup & Gallup, 1993; Blake, Guppy & Urmetzer, 1997). Less agreement exists concerning the importance given to environmental concerns as opposed to other social issues (Murch, 1971; Holl, Daily & Ehrlich, 1995; Jacobs, 2005).

The particular situation in South Africa provides an opportunity to examine each of these matters from several perspectives. First, as indicated earlier, is the presence of both first and third

world populations that allows a testing of the extent to which people from these two different settings have different or similar perceptions concerning environmental issues. Second is the degree to which there are differences in the level of awareness of environmental problems between the South African population and populations in other parts of the world, especially given the emphasis placed on environmental concerns since 1994. Third is whether race is a factor contributing to differences in attitudes about the environment and behaviors related to those attitudes. Fourth is the degree to which a specific environmental condition is influential in explaining perceptions concerning environmental pollution. The analysis of each of these questions will enable the development of a tentative profile of environmental perceptions, behaviors and awareness in South Africa as they concern water and water pollution. From this profile it may be possible to indicate the extent to which the South African population as a whole and sub-populations within South Africa have similar or different perspectives concerning these matters.

DATA

Data for these analyses are from the 2004 General Household Survey conducted by Statistics South Africa. The 2004 survey was the third in a series of annual household surveys initiated in 2002 as a replacement for the October Household Survey which Statistics South Africa conducted from 1993 through 1999. The 2004 Survey was a stratified random sample which included 26, 214 households, of which 19,950 (75.9%) were African households and 6,264 (23.9%) were non-African households.

The second survey in this series - the 2003 survey - contained a limited number of questions about household involvement in recycling activities and in the disposal of household waste. The 2004 instrument included most of the items used in the 2003 survey as well as a number of other questions regarding environmental issues. Only those questions which dealt with perceptions of water pollution as a community problem, actions taken by households in response

to this problem and the awareness of a program specifically created to deal with one aspect of water pollution are used in the analysis presented here.

TABLE 1
General Household Survey 2004 Items Relating to Perceptions, Behaviors and Awareness in the Area of Water and Water Pollution

Perception of a Community Problem	Which of the following environmental problems do you experience in your community? Water pollution (Also asked about land degradation, outdoor/indoor air pollution and waste removal/littering)
Behaviors to Address the Problem	Do household members treat the water used for drinking? Do household members treat the water used for food preparation?
Awareness of Initiatives Related to the Problem	Are you aware of the following initiative in South Africa? Working for Water (clearing of alien vegetation)

Table 2 shows a summary of the proportions of all households, African households and non-African households which held particular perceptions, engaged in specific behaviors or were aware of a governmental initiative concerning water pollution.

TABLE 2
Percentage of All Households, African Households and non-African Households with Water-Related Perceptions, Behaviors and Awareness

		All Households	African Households	non-African Households
Perceived as a Community Problem	Water Pollution	10.8%	13.0%	3.9%
Behaviors	Treat Drinking Water Sometimes or Always	5.8%	5.8%	6.0%
	Treat Water for Food Sometimes or Always	5.0%	5.1%	4.8%
Awareness of Initiative	Working for Water	12.0%	7.0%	28.1%

Table 3 provides a description of the explanatory or independent variables used. It is necessary to note that the variables - the quality of drinking water, type of sanitation, and availability of refuse collection - are used in two different ways. First, each of these items when taken together with a number of other items make up a package of indicators that can be used to define the level of living of a household. Each is also employed separately as an independent variable related to the perception that a particular environmental condition is viewed as a community problem. The two ways in which these variables can be applied require that a clear distinction be made each time the variable is used in a given part of the analysis.

TABLE 3
Description of Explanatory Variables Used

Urban	Urban/non-urban classification based on 1996 South Africa Census 1=Yes, is an urban place, 0=No, is not an urban place
Flush/Chemical Toilet	Flush/chemical toilet includes flush toilet connected to a public sewage system, whether in dwelling, on site or off site, slush toilet connected to a septic tank whether in dwelling, on site or off site, or chemical toilet whether on site or off site 1=Yes, uses a flush or chemical toilet, 0=No, does not use a flush or chemical toilet
Clean Water	The household's main source of water for drinking and food preparation. Clean water includes piped(tap) water in dwelling, piped tap) water on site or in yard, neighbour's tap, public tap, or water from a water carrier/tanker 1=Yes, has clean water, 0=No, does not have clean water
Formal Housing	Formal housing includes dwelling/house or brick structure on a separate stand or yard or on farm, flat or apartment in a block of flats, town/cluster/semi-detached, or unit in a retirement village 1=Yes, lives in formal housing, 0=No, does not live in formal housing
Household Head 5+ Years Education	Education of household head 1=Yes, household head has 5 or more years of education, 0=No, household head does not have 5 or more years of education
African Household	Population group of household head 1=Yes, household head is African/Black, 0=No, Household head is not African/Black

An additional matter is who answered the questions that we analyze. The 2004 General Household survey had a "person" section and a "household" section. For items in the person

section, it is clear who the respondent was. The items that we analyzed were all in the "household" section. The 2004 Survey does not indicate which household member answered these questions. The interviewer instructions only indicated that it was to be a "responsible adult". The education of the household head is a relevant characteristic, but we do not know whether the actual respondent was male or female or his or her age.

The 2004 General Household Survey was not totally representative both because of differential response rates according to characteristics of households and because, despite the best efforts of Statistics South Africa, the survey sample was not perfectly representative of the South African population. In all of the tables with numerical results and in the figures, the data are weighted. The weights provided with the data inflate the numbers to that of South Africa as a whole. In the statistical tables -- the difference of means tests and the logistic regression results -- it would not be appropriate to pretend that the number of cases was that in South Africa as a whole, because then the statistical tests would give incorrect results.

When the results are shown for all households, the weights from the survey are scaled so that the weighted total number of households equals the total number of households in the survey. When results are shown for African households alone, the weights for African households are scaled to make the weighted number of African households equal to the number of African households in the survey. Similarly, when results are shown for non-African households alone, the weights for non-African households are scaled to make the weighted number of non-African households equal the number of non-African households in the survey. This is the weighting procedure employed for the results in all of the statistical tables.

Shown in Table 4 are proportions of all households, African households and non-African households with particular characteristics. Non-African households are made up of households occupied by members of the White, Coloured and Asian populations. There were 2886 Coloured, 604 Asian and 2950 White households in the survey. Readily evident from Table 4 are the differences between the African and non-African households. For almost every one of these

characteristics which can be used to define the level of living of a particular household, non-African households are better off than African households. Reflected here is the pattern of inequality that existed in the period prior to 1994 and which continues to be an important part of the context of this study.

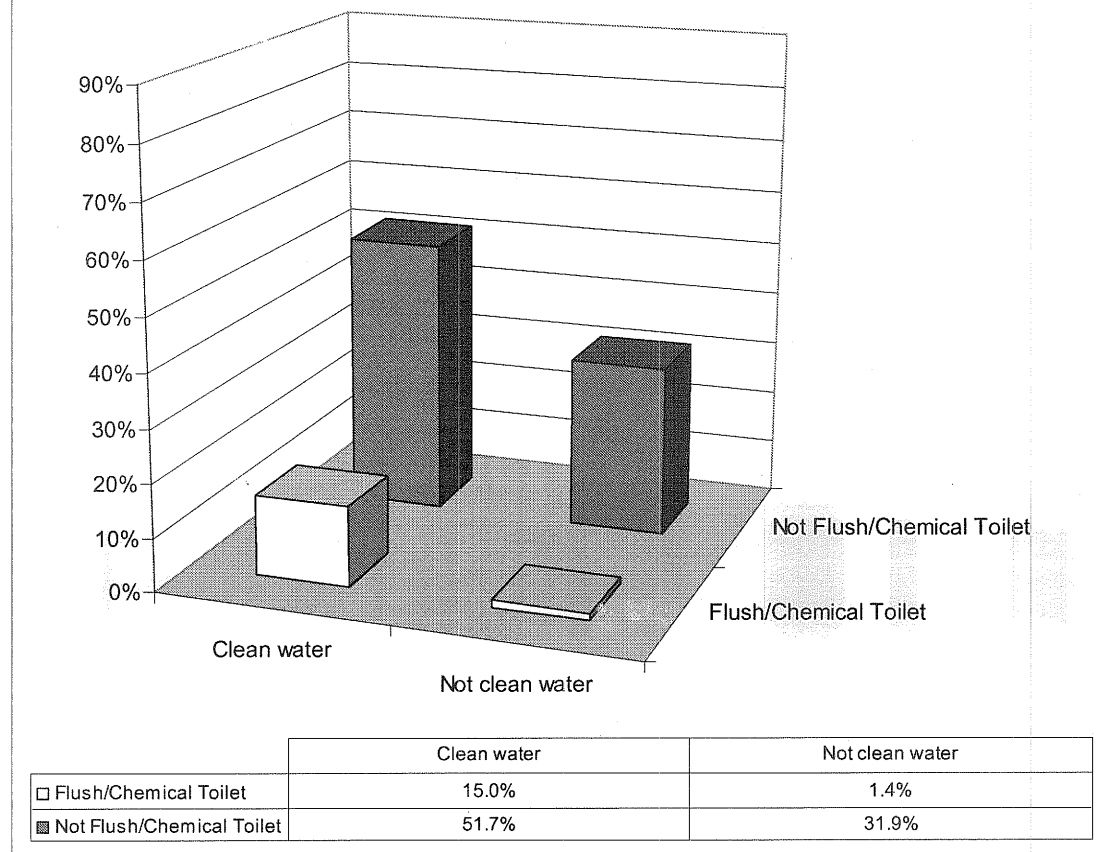
TABLE 4
Proportion of Households with Various Characteristics, 2004

	All Households	African Households	non-African Households
Urban	.591	.504	.876
Flush/Chemical Toilet	.572	.455	.954
Clean Water	.860	.822	.984
Formal Housing	.668	.585	.938
Household Head 5+ Years Education	.751	.695	.933
Rubbish Collected at Least Weekly	.558	.459	.877
African Household	.765	---	---

ANALYSIS

The distribution of all rural households by sanitation and drinking water quality is shown in Figure 1 and the distribution of all urban households with respect to sanitation and drinking water quality is seen in Figure 2. In each figure, the four categories sum to 100%. The differences between rural and urban households in 2004 with reference to water quality and type of sanitation are clear. Only 15% of all rural households had access to both clean water and a flush or chemical toilet compared to slightly less than 32% of rural households which lacked both clean water and a flush or chemical toilet. A completely different picture is found for urban households. Eighty-five percent of urban households had both clean water and a flush or chemical toilet, while less than 0.5% lacked clean water and did not have a flush or chemical toilet.

Figure 1. Rural Distribution of All Households by Sanitation and Water Quality, 2004



Perception of Water Pollution as a Community Problem

The extent to which water pollution is seen as a community problem is the first question addressed. As seen in Table 2, slightly less than 11% of all households viewed water pollution as a community problem. This is a substantially lower proportion of households reporting perception of pollution in their communities than has been cited in other studies where up to 90% of respondents expressed awareness of such conditions (White & Hunter, 2005). However, perhaps more important for this analysis are the differences between the African and non-African households. African households are three times more likely to see water pollution as a community problem than non-African households (13% versus 4%). Given the historic situations

in which the African and non-African households have lived in South African society, this is perhaps not surprising. It also suggests that those who live in a worse environmental situation are more likely to perceive environmental problems.

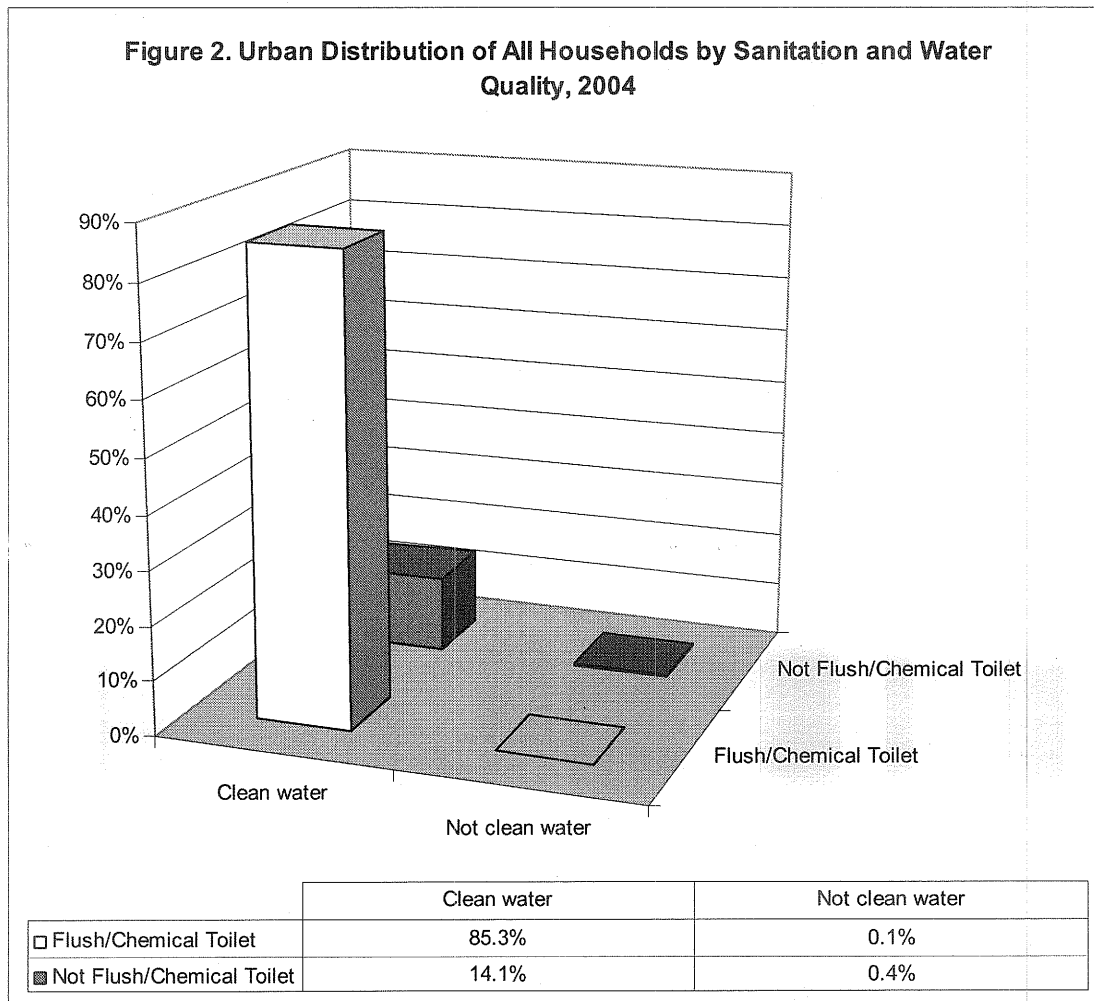


Table 5 shows the results of difference of means tests. In this table, the mean value of a given group (all households, African households, non-African households) for a given outcome (perception of water pollution as a problem, treatment of water, awareness of Working for Water initiative) according to whether the condition indicated by a particular independent variable is present or not. For example, for all households that do not have clean water, .234 of them (23.4%) perceive water pollution as a community problem. For all households that have clean water, .088 (8.8%) perceive water pollution as a community problem.

TABLE 5
Mean Values of Water-Related Perceptions, Behaviors and
Awareness of Programs by Household Characteristics and
Results of Difference of Means Tests, 2004

	Water Pollution a Community Problem			Treat Drinking Water Sometimes or Always			Treat Water for Food Preparation Sometimes or Always			Aware of Working for Water Initiative		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Yes	No	Sig.	Yes	No	Sig.	Yes	No	Sig.	Yes	No	Sig.
All Households (26,214 households)												
Urban	.095	<u>.128</u>	.000	.043	<u>.080</u>	.000	.039	<u>.066</u>	.000	<u>.152</u>	.073	.000
Flush/Chemical Toilet	.079	<u>.148</u>	.000	.044	<u>.078</u>	.000	.039	<u>.066</u>	.000	<u>.167</u>	.057	.000
Clean Water	.088	<u>.234</u>	.000	.043	<u>.154</u>	.000	.038	<u>.126</u>	.000	<u>.132</u>	.044	.000
Formal Housing	.078	<u>.174</u>	.000	.055	<u>.066</u>	.000	.048	<u>.056</u>	.008	<u>.156</u>	.048	.000
Household Head 5+ Years Education	.100	<u>.133</u>	.000	.057	.061	.239	.049	.053	.300	<u>.142</u>	.054	.000
Water Pollution a Problem	---	---	---	<u>.129</u>	.050	.000	<u>.099</u>	.044	.000	---	---	---
African Household	<u>.130</u>	.039	.000	.156	.060	.529	.051	.049	.502	.070	<u>.281</u>	.000
African Households (19,950 households)												
Urban	.124	<u>.136</u>	.015	.035	<u>.081</u>	.000	.034	<u>.067</u>	.000	<u>.082</u>	.058	.000
Flush/Chemical Toilet	.105	<u>.151</u>	.000	.033	<u>.079</u>	.000	.032	<u>.066</u>	.000	<u>.088</u>	.056	.000
Clean Water	.106	<u>.239</u>	.000	.038	<u>.151</u>	.000	.035	<u>.124</u>	.000	<u>.077</u>	.038	.000
Formal Housing	.096	<u>.178</u>	.000	.052	<u>.067</u>	.000	.046	<u>.057</u>	.001	<u>.090</u>	.042	.000
Household Head 5+ Years Education	.127	<u>.137</u>	.036	.055	<u>.063</u>	.029	.049	.054	.191	<u>.080</u>	.050	.000
Water Pollution a Problem	---	---	---	<u>.117</u>	.049	.000	<u>.096</u>	.044	.000	---	---	---
Non-African Households (6,264 households)												
Urban	.040	.032	.327	.058	.072	.127	.047	.059	.154	.284	.262	.207
Flush/Chemical Toilet	.038	<u>.063</u>	.031	.060	.056	.779	.049	.046	.861	<u>.291</u>	.087	.000
Clean Water	.039	.046	.710	.057	<u>.256</u>	.000	.046	<u>.224</u>	.000	.281	.299	.709
Formal Housing	.037	<u>.074</u>	.000	.061	.052	.518	<u>.050</u>	.026	.038	<u>.288</u>	.178	.000
Household Head 5+ Years Education	.037	<u>.060</u>	.017	<u>.062</u>	.032	.012	.049	.036	.207	<u>.293</u>	.126	.000
Water Pollution a Problem	---	---	---	<u>.257</u>	.052	.000	<u>.129</u>	.045	.000	---	---	---

The Yes and No columns show the proportion of households with a given characteristic who hold a given perception, engage in a particular behavior or are aware of a given program. For example, 12.8% of all urban households perceive water pollution to be a community problem. The significance column shows the p value for the difference of means between the two categories (Yes and No) for each variable. The higher value is underlined and bolded if $p < .05$.

A difference of means test is done on the difference between the mean value when the household has clean water and when it does not have clean water, and a significance test is performed on this difference. In this example, households without clean water are significantly more likely to perceive water pollution as a community problem than households with clean water. This is indicated in Table 5 by the value .234 being bolded and underlined.

For all households considered as a group, water pollution was more likely be viewed as a problem if the household was rural, or lacked a flush or chemical toilet, or did not have access to clean water, or was residing in informal housing, or whose head had less than 5 years of education. Additionally, African households were more likely than other households to see water pollution as a community problem. For each of these variables, the influence was statistically significant.

All of the variables that were statistically significant for all households were also statistically significant for African households. A slightly different pattern existed for non-African households. Water pollution was perceived as a community problem only in those non-African households whose head had less than 5 years of education or which lacked a flush or chemical toilet or lived in informal housing. Neither the classification of the household as rural or urban nor the presence or the absence of clean water were statistically significant for the non-African households. This last observation could either be because almost all non-African households have clean water or it could be due to the small number of non-African households in the survey or both.

A somewhat different perspective on the influence of these independent variables is seen when they are looked at using a logistic regression, in which the influence of all the independent variables is considered together. The results of this analysis, presented in Table 6, show that for all households there was the strong likelihood that water pollution will be considered a problem when that household is urban, lacks a flush or chemical toilet, lacks clean water, and is classified as residing in non-formal housing. African households are also significantly more likely than

non-African households to perceive water pollution as a community problem, even after the other independent variables have been taken into account. It is important to note that in this analysis the educational level of the head of household is no longer statistically significant. Again the same pattern of relationships is true for African households.

There are two important differences in the influence of these factors in non-African households. Here the education of the head of household and the type of housing are both statistically significant. For these households water pollution was more likely to be seen as a problem where the head had less than 5 years of education and which lived in informal housing.

Given the very different distribution of characteristics of African and non-African households as shown in Table 4, it is difficult to find a set of independent variables that is equally appropriate for analysis of both groups. The independent variables selected work well for the analysis of all households and of African households. If, however, the main purpose of the analysis were the examination of non-African households, a somewhat different set of independent variables might have been used.

A comparison of the findings using these two different tests is summarized in Table 7. In this table, the significance and the sign of the significant independent variables from the difference of means tests and the logistic regression analyses are shown. Column 1 of that table shows which of the independent variables when considered separately (from the difference of means test) has a significant influence. For all households and African households each of the independent variables has a statistically significant relationship to the perception of water pollution as a community problem. Also African households are significantly more likely to perceive water pollution as a community problem than non-African households. One difference for non-African households is that urban location and access to clean water are not significant.

TABLE 6
Logistic Regression Results Related to Water and Water Pollution, 2004

	All Households			African Households			non-African Households					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Water Pollution a Problem (0=No, 1=Yes)	Treat Drinking Water Sometimes or Always (0=No, 1=Yes)	Treat Water for Food Preparation Sometimes or Always (0=No, 1=Yes)	Aware of Working for Water Initiative (0=No, 1=Yes)	Water Pollution a Problem (0=No, 1=Yes)	Treat Drinking Water Sometimes or Always (0=No, 1=Yes)	Treat Water for Food Preparation Sometimes or Always (0=No, 1=Yes)	Aware of Working for Water Initiative (0=No, 1=Yes)	Water Pollution a Problem (0=No, 1=Yes)	Treat Drinking Water Sometimes or Always (0=No, 1=Yes)	Treat Water for Food Preparation Sometimes or Always (0=No, 1=Yes)	Aware of Working for Water Initiative (0=No, 1=Yes)
Urban (0=No, 1=Yes)	.639 (.000)	-.114 (.191)	-.001 (.989)	-.112 (.069)	.653 (.000)	-.095 (.341)	.026 (.805)	-.048 (.553)	.429 (.077)	-.090 (.619)	.001 (.996)	-.164 (.084)
Flush/Chemical Toilet (0=No, 1=Yes)	-.333 (.000)	-.270 (.003)	-.236 (.013)	.342 (.000)	-.333 (.000)	-.348 (.000)	-.306 (.003)	.204 (.011)	-.400 (.184)	.447 (.162)	.404 (.216)	1.314 (.000)
Clean Water (0=No, 1=Yes)	-1.087 (.000)	-1.311 (.000)	-1.269 (.000)	.325 (.001)	-1.111 (.000)	-1.279 (.000)	-1.221 (.000)	.453 (.000)	-.117 (.821)	-2.017 (.000)	-2.025 (.000)	-.505 (.049)
Formal Housing (0=No, 1=Yes)	-.565 (.000)	.122 (.052)	.157 (.019)	.680 (.000)	-.560 (.000)	.101 (.121)	.120 (.081)	.714 (.000)	-.635 (.003)	.201 (.417)	.671 (.042)	.477 (.001)
HH Head 5+ Yrs Education (0=No, 1=Yes)	.057 (.371)	.299 (.000)	.262 (.000)	.466 (.000)	.079 (.108)	.255 (.000)	.244 (.001)	.353 (.000)	-.469 (.045)	.915 (.002)	.456 (.113)	.875 (.000)
Water Pollution a Problem (0=No, 1=Yes)	---	.858 (.000)	.667 (.000)	---	---	.691 (.000)	.604 (.000)	---	---	1.922 (.000)	1.202 (.000)	---
African Household (0=No, 1=Yes)	.945 (.000)	-.597 (.000)	-.384 (.000)	-1.206 (.000)	---	---	---	---	---	---	---	---
Constant	-1.940 (.000)	-1.565 (.000)	-1.944 (.000)	-2.572 (.000)	-1.001 (.000)	-2.081 (.000)	-2.297 (.000)	-3.788 (.000)	-2.088 (.000)	-2.363 (.000)	-2.552 (.000)	-2.852 (.000)
X ²	1119.480 (.000)	757.547 (.000)	506.985 (.000)	2048.289 (.000)	697.953 (.000)	654.754 (.000)	452.841 (.000)	273.827 (.000)	19.292 (.002)	160.063 (.000)	72.273 (.000)	126.284 (.000)
d.f.	6	7	7	8	5	6	6	5	5	6	6	5
N	26214	26185	26214	26214	19950	19932	19950	19920	6264	6264	6264	6264

p values in parenthesis. Coefficients underlined if p < .05

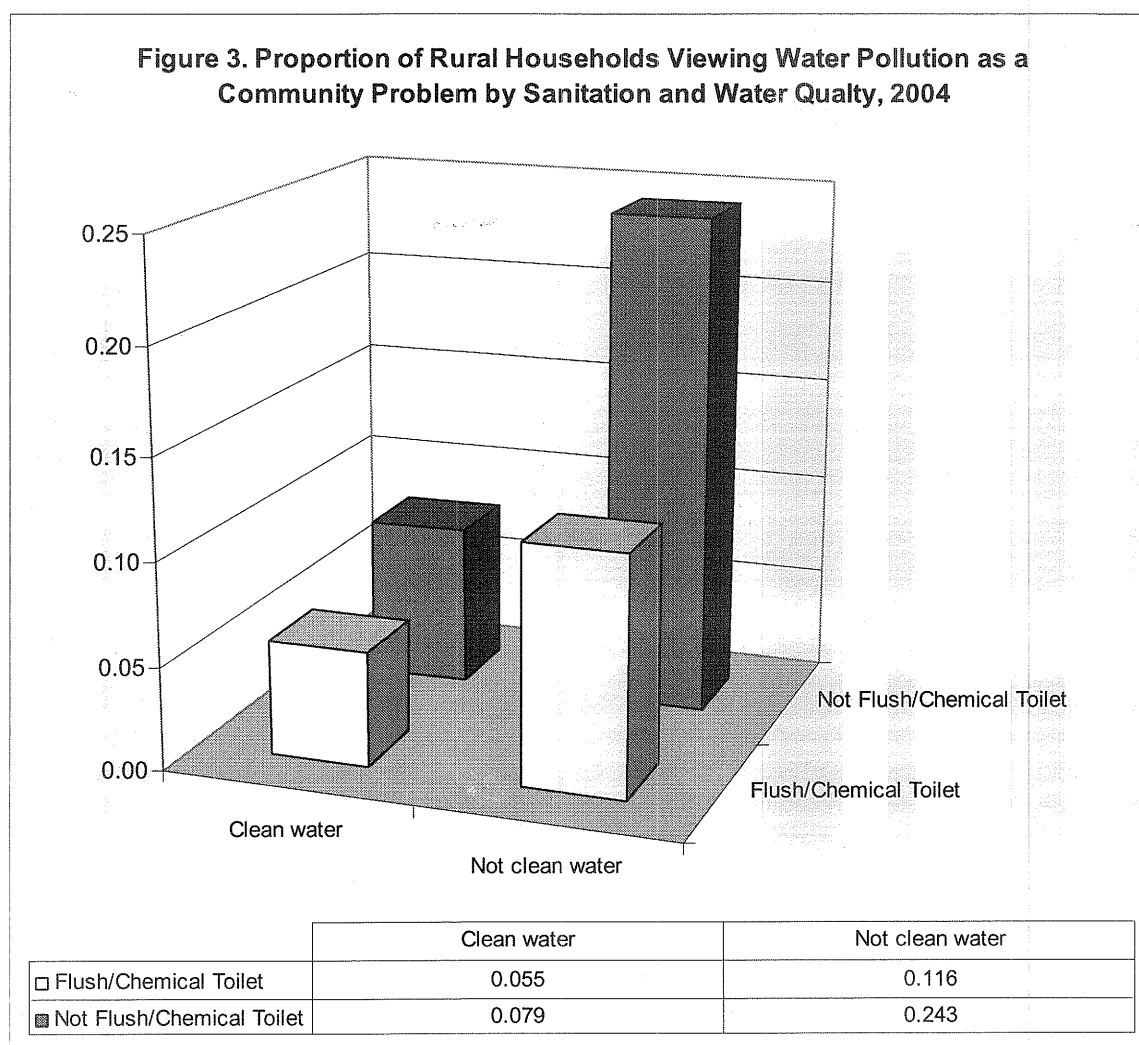
p values in parenthesis. Coefficients underlined if p < .05

TABLE 7
Comparison of Significance of Factors Affecting Water and Water Pollution Issues
in the Difference of Means and the Logistic Regression Analyses

	Difference of Means Results				Logistic Regression Results			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Water Pollution	Treat Drinking Water	Treat Food Prep Water	Aware Work for Water	Water Pollution	Treat Drinking Water	Treat Food Prep Water	Aware Work for Water
All Households								
Urban	-	-	-	+	+	n.s.	n.s.	n.s.
Flush/Chemical Toilet	-	-	-	+	-	-	-	+
Clean Water	-	-	-	+	-	-	-	+
Formal Housing	-	-	-	+	-	n.s.	+	+
Household Head 5+ Years Education	-	n.s.	n.s.	+	n.s.	+	+	+
Water Pollution a Problem	XX	+	+	XX	XX	+	+	XX
African Household	+	-	-	-	+	-	-	-
African Households								
Urban	-	-	-	+	+	n.s.	n.s.	n.s.
Flush/Chemical Toilet	-	-	-	+	-	-	-	+
Clean Water	-	-	-	+	-	-	-	+
Formal Housing	-	-	-	+	-	n.s.	n.s.	+
Household Head 5+ Years Education	-	-	n.s.	+	n.s.	+	+	+
Water Pollution a Problem	XX	+	+	XX	XX	+	+	XX
non-African Households								
Urban	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Flush/Chemical Toilet	-	n.s.	n.s.	+	n.s.	n.s.	n.s.	+
Clean Water	n.s.	-	-	-	n.s.	-	-	-
Formal Housing	-	n.s.	+	+	-	n.s.	+	+
Household Head 5+ Years Education	-	+	n.s.	+	-	+	n.s.	+
Water Pollution a Problem	XX	+	+	XX	XX	+	+	XX
+ or - indicates $p < .05$ in the given statistical analysis and the sign of the relationship. A XX indicates that the variable was not included in the given analysis. n.s. indicates that the variable is not statistically significant at the .05 level.								

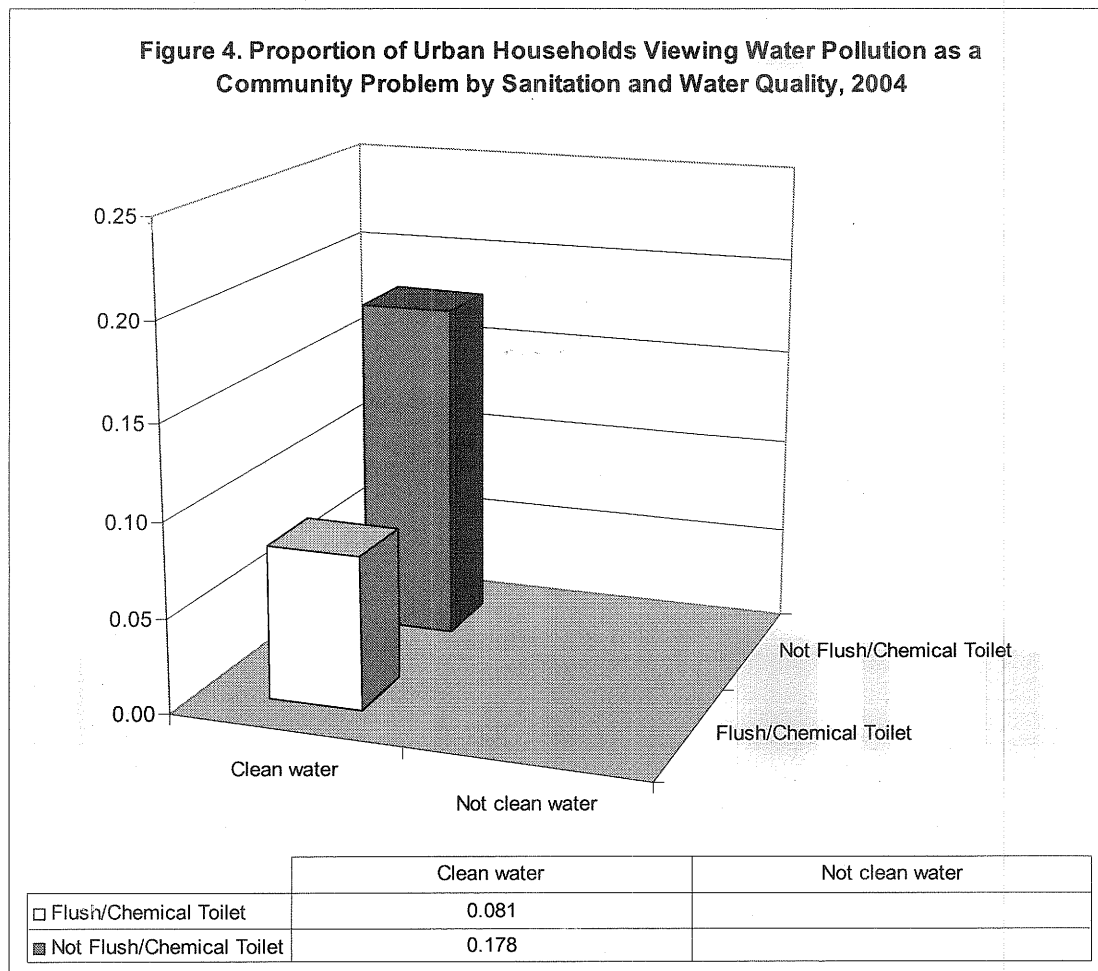
Column 5 of that table provides a similar summary for the logistic regression analysis. An important result of that analysis, as noted above, is the lack of significance that the educational level

of the head of household has in explaining the perception of water pollution as an issue for African households as well as for all households. This is a change from what was found in the difference of means tests. It is also interesting that while in the difference of means tests, for all households and African households, non-urban households were more likely to perceive water pollution as a problem; in the logistic regression analysis, urban households were more likely to see water pollution as a problem. It should also be pointed out that for non-African households the absence of a flush or chemical toilet is no longer a statistically significant influence when considered together with the other characteristics of the household.



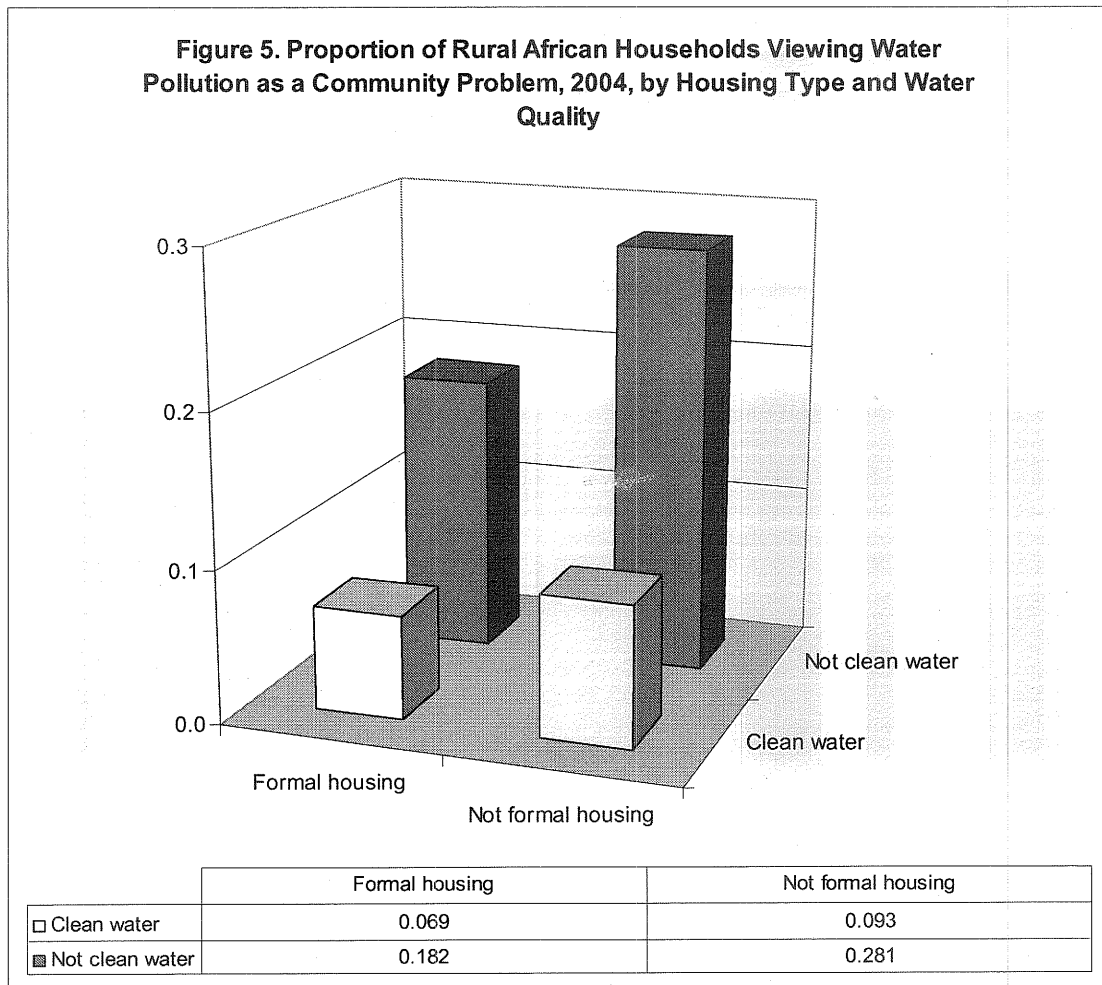
Not dealt with directly in these analyses of the data is whether urban and rural Africans differ

regarding the perception of water pollution as an issue. The substantial difference in the position of the urban and rural populations in South Africa with reference to water supplies and type of sanitation available was mentioned earlier (Figures 1 and 2). Also noted was that nearly 90% of non-African households are classified as urban. This observation might lead to the conclusion that differences in perceptions of water pollution as a problem between urban and rural households may simply reflect an African versus-non-African distinction.



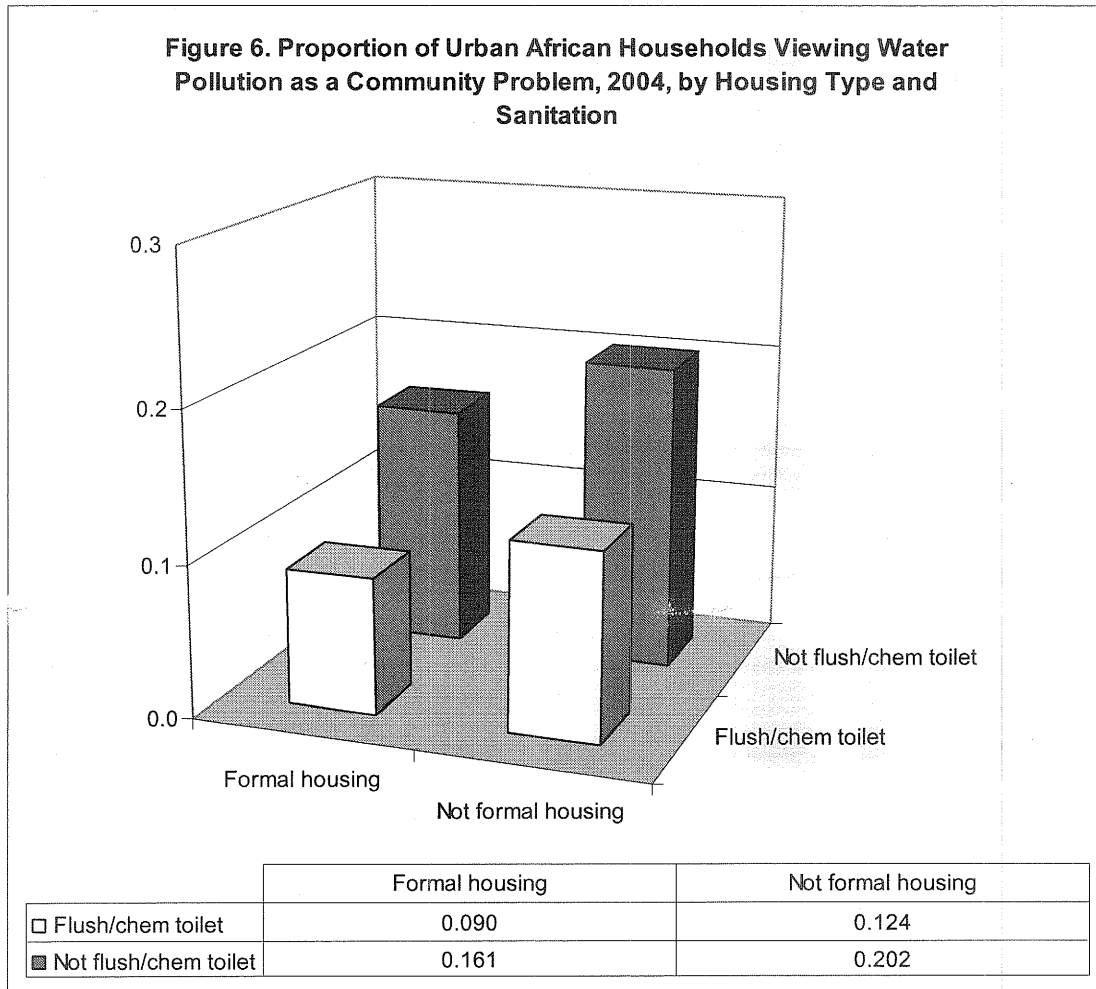
This does not appear to be the case. First, as seen in Figure 3, for rural African households the quality of the water source is crucial in determining if water pollution is identified as a problem. A substantially higher proportion of rural African households dependent on unclean water supplies viewed water pollution as a community issue than those rural African households who have access to

clean water. Urban African households, largely by virtue of an urban location, almost all have clean water. Only 0.7% do not have access to clean water. However, the type of sanitation available to these units is more varied and plays a significant role in the perception of water pollution as a problem (Figure 4).



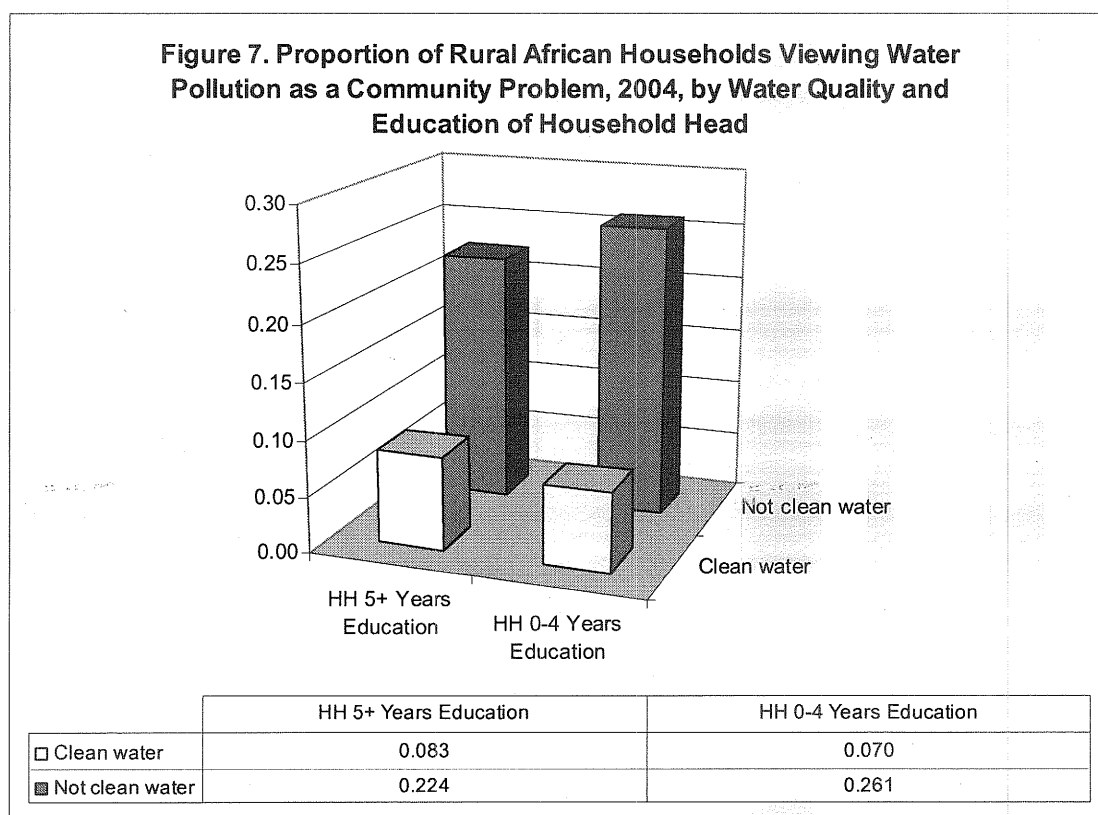
Figures 3 and 4 also help explain the change in the sign of urban residence between the difference of means test and the logistic regression analysis for all households and for African households. A higher percentage of urban African households with clean water and a flush or chemical toilet perceived water pollution as a problem than rural African households with clean water and a flush or chemical toilet (11% versus 7%). Similarly, a greater proportion of urban African households with clean water and without a flush or chemical toilet perceived that water pollution was

a problem than rural African households with the same conditions, clean water and without a flush or chemical toilet (18% versus 8%).



Similar is the influence of the type of housing - formal or informal - on the perception that water pollution is a community problem. The earlier examination of the influence of this variable using both the difference of means test and the logistic regression analysis indicated that the type of housing for African households had a statistically significance influence on whether water pollution was perceived as a community issue. This is shown in Figures 5 and 6 in which for both rural and urban African households the lack of formal housing is related to the perception that water pollution is a problem. It is important to note that when the type of housing is looked at together with the quality of the water supply and sanitation available to each of these populations, the observation from

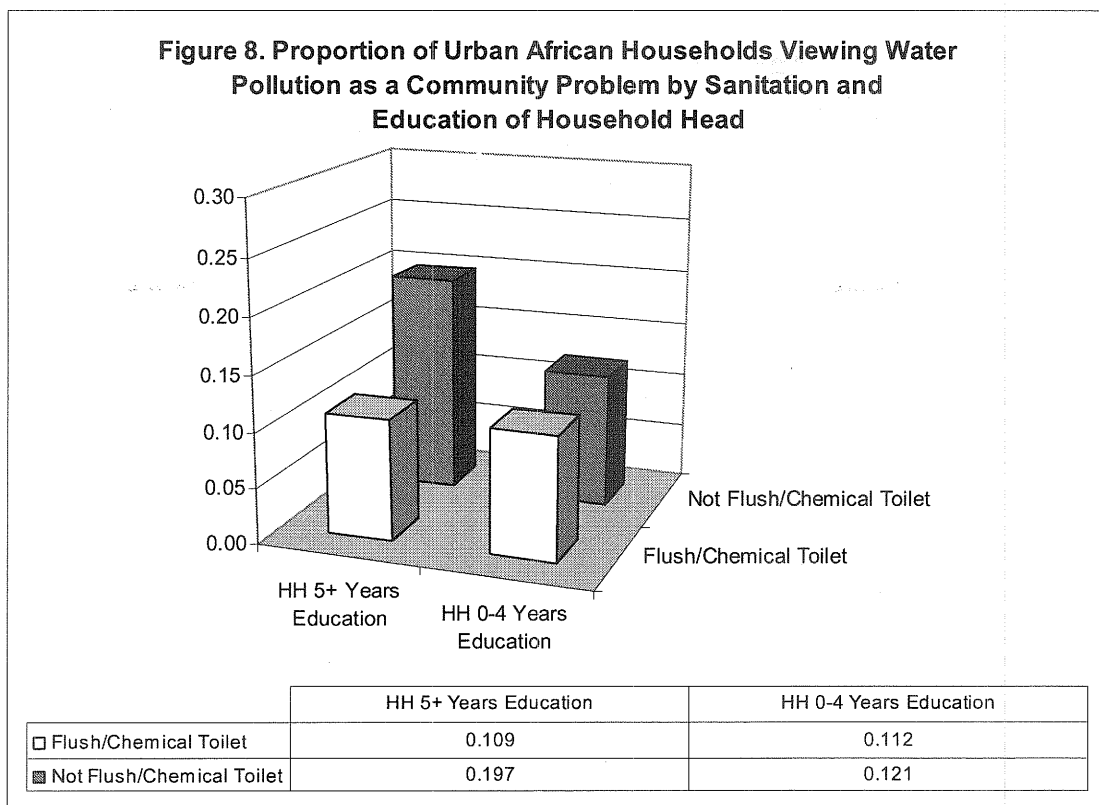
the earlier analyses of this question in which the strong influence of the two latter factors in the perception of water pollution as a community problem is reinforced (Figures 3 and 4). For rural Africans the quality of the water supply is critical, while for urban Africans the type of sanitation is the important household characteristic.



Other studies have suggested that the educational background of the respondent was an important factor in forming perceptions of the presence or absence of environmental contamination, with those having a higher level of educational attainment more likely to be aware of environmental problems (White & Hunter, 2005). Our analysis, however, indicates that educational level of the head of the household on the perception of water pollution as a problem has, at best, an inconsistent influence. As noted above, this factor had a negative, but weak, statistically significant relationship with the perception of water pollution as a community problem when using the difference of means test (Table 5). Households with less educated heads were more likely to perceive water pollution as a community problem. This relationship held true for all households as well as for African and non-

African households looked at separately.

The results of the logistic regression analysis, however, show that the educational level of the head household is not statistically significant in explaining the perception of water pollution as a problem either for all households or for African households (Table 6). For non-African households, the educational level of the household has a moderately strong negative relationship. In these households there is a greater likelihood that water pollution was seen as an issue when the education of the household head was less than 5 years (Table 6).



Figures 7 and 8 look at the role that the education of household head plays when associated with source of water for rural African households and type of sanitation for urban African households. Again it can be seen that this variable is of less importance in explaining the view of water pollution as a problem than is the quality of the water supply for rural African households, and the type of sanitation for urban African households. It also has an inconsistent relationship with the perception of water pollution as a problem when combined with different water quality or sanitation

situations.

Water-Related Behaviors: Treatment of Drinking Water and Water for Food Preparation

A second question is: What is related to whether households take any action to treat their water before using it for either drinking or cooking? It is also important to determine how important perception of water pollution as a problem is in influencing households to treat their water.

Table 2 shows that overall non-African households were slightly more likely to treat water for drinking, but African households were slightly more likely than non-African households to treat cooking water. The analysis of this issue using the difference of means tests is presented in Columns 4-9 of Table 5. It is clear that perception of water pollution as a problem is strongly related to households treating water both for drinking and for food preparation. For all households, African households, and non-African households, perception of water pollution as a problem is significantly related to treating water both for drinking and for food preparation. In addition, among all households, those that were rural, or lacked a flush or chemical toilet or did not have access to clean water or were living in informal housing were more likely to treat water for both drinking and use in cooking. Whether a household was African had no significant relation to whether that household treated its water either for drinking or food preparation.

When African households are looked at separately, they also were more likely to treat water for drinking and cooking when these conditions are present. Further, the behavior of these households is also influenced by an additional consideration. This is the educational level of the head of household. African households in which the head has less than 5 years of education are more likely to treat the water for drinking, but not for cooking.

The situation for non-African households is substantially different. Drinking water will be treated in those households which lack clean water and whose head has 5 or more years of education. Treatment of water for cooking among non-African households is limited to those which are resident in formal housing or lack clean water (in addition to those that perceive water pollution as a problem).

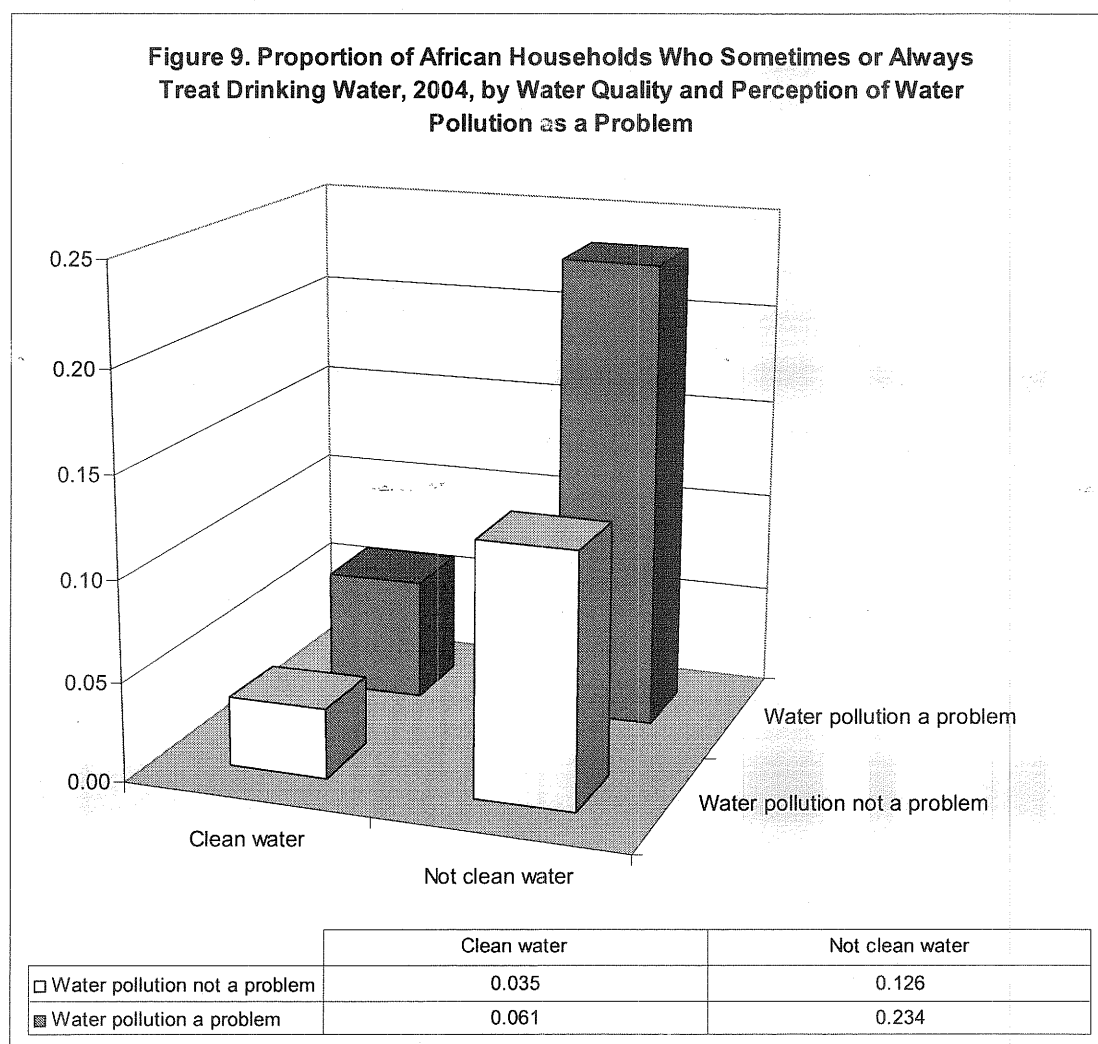
Other factors such as urban setting or the presence or absence of a flush or chemical toilet were not statistically significantly related to the behavior of non-African households with regard to treating water for either drinking or cooking.

Analysis of these relationships using logistic regression reveals some different relationships (Table 6). Perception of water pollution as a problem retains the strong significant relation to treatment of water for both drinking and food preparation that was found in the difference of means tests. It also remains significant for all three groups considered. For all households it is more likely that water for drinking and cooking will be treated if such households lack access to clean water and do not have a flush or chemical toilet and whose head has 5 or more years of education (Table 6, Columns 2 and 3). Households which exhibit these characteristics plus those who live in formal housing are also more likely to treat water for cooking, but not for drinking. While the relationship between formal housing and treatment of water for drinking is positive, it is not statistically significant. When other factors are taken into account in the logistic regression analysis, African households are significantly less likely than non-African households to treat water for either drinking or food preparation, a major change from the difference of means test.

The influence of these several factors on the decision to treat water by African households yields results almost identical to those for all households (Table 6, Columns 6 and 7). Water is more likely to be treated for both drinking and cooking if these households lack a flush toilet, lack a clean supply of water, and whose head has 5 or more years of education. Neither urban/rural residence nor whether the housing is formal or informal are related significantly to this behavior. These findings are different from those of the difference of means tests. In that analysis it was noted that both the rural/urban factor and housing type had some influence, but that the education of head of household was not significant.

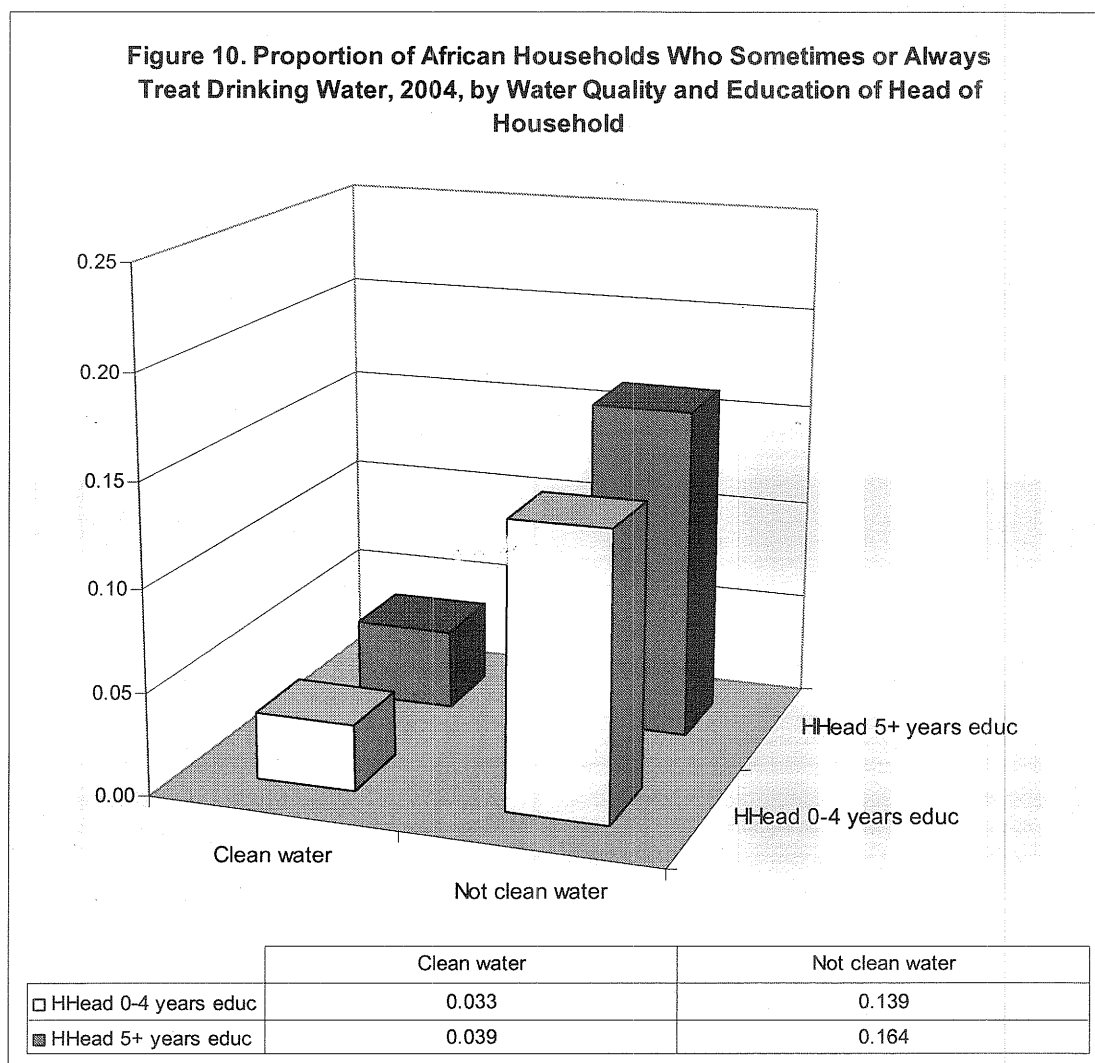
Drinking water will be treated by non-African households (Table 6, Columns 10, 11) for both drinking and food preparation if the household lacks clean water. Also these households are more likely to treat drinking water if the head of household has 5 or more years of education. While

treatment of cooking water is more likely if the non-African household is also in formal housing, treatment of cooking water is not significantly related to the educational level of the head of household. None of the other factors are statistically significant in explaining the treatment of water by the non-African households.



Figures 9 and 10 present another way of looking at the behavior of African households concerning the treatment of water. Figure 9 indicates that drinking water will more likely be treated by African households in which water pollution is viewed as a problem and whose water supply is not clean than in those households which have access to clean water and do not view water pollution as an issue. Another perspective is shown in Figure 10. While a slightly larger proportion

of households whose head has 5 or more years of education are likely to treat drinking water than is the case in other households, the critical difference is whether the household has access to clean water.



Awareness of the Working for Water Programme

Awareness of Working for Water Programme initiative of the Department of Water Affairs and Forestry was a specific question in the 2004 General Household Survey. Responses to that item yielded somewhat disappointing results if this endeavor is viewed as a well-known environmental undertaking. While 28% of non-African households had heard of the program, knowledge of the

program was reported by only 7% of African households and barely 10% of all households (Table 2).

Awareness of this program for all households, as shown by the difference of means test (Table 5, Columns 10,11,12), was confined to those which were urban or with access to clean water, or with a flush or chemical toilet, or in formal housing. Also, African households were significantly less likely to be aware of the program than non-African households. There was essentially the same pattern of significant variables among African households. For non-African households those with flush or chemical toilet, or formal housing or whose head had 5 or more years of education were more likely to be aware of the program.

Table 5 also shows that for each characteristic that was significantly related to awareness of the program, a lower proportion of African households with that characteristic knew of the program than non-African households. For example, having a flush or chemical toilet was significantly related to awareness of the program for both African and non-African households. However, among those households with a flush or chemical toilet, 8.8% of African households were aware of the program, but 291% of non-African households were aware of the program.

The logistic regression analysis yielded similar results to those in the difference of means tests. For all households and for African households, urban setting was no longer statistically significant (Table 6, Columns 4, 8). For non-African households, awareness of the program was again generally higher than that of all households and of African households. However, the coefficient for the independent variable for clean water was negative for the non-African households, but positive for all households as well as for African households. Similarly, the coefficient for the formal housing variable was also lower for non-African households than that for all households and African households. Perhaps most important is the negative coefficient of -1.206 for African households when this factor is considered as an independent variable (Table 6, Column 4). This clearly suggests that whatever efforts have been taken to publicize the program, they have not produced any substantial level of awareness of this endeavor within the African community.

DISCUSSION AND CONCLUSIONS

Evident from this analysis of the perceptions of water pollution by South African households, the circumstances which lead to these perceptions, behaviors in response to these situations and the awareness of a specific program developed to deal with one aspect of water pollution are a set of consistent patterns across South African households. In the logistic regression analyses presented in Table 6 it can be seen that having a low SES is generally related to perceiving water pollution as a problem. Not having a flush or chemical toilet, not having clean water, and not living in formal housing is related to seeing water pollution as a problem for all three groups of households, even though the sanitation and water variables were not statistically significant for non-African households. The education of the household head either was not significantly related or was negatively related to perception of water pollution as a problem. Thus, living in poor environmental circumstances was generally associated with the perception of an environmental problem, and it was not necessary for the household head to have a high education.

Secondly, not having clean water was significantly related to treatment of water for all groups, and not having a flush or chemical toilet was significant for all households and for African households. The type of housing was either statistically insignificant or positively related to treating water. Education of household head was positively related to treating water for all groups and was statistically significant except for treatment of water for food preparation for non-Africans. While living in poor environmental conditions overall is somewhat less important for the treatment of water than it was for perception of water pollution as a problem, it still is related to this behavior. We also see that in the presence of poor environmental conditions, especially not having clean water, the education of the household head is important in determining whether the household takes the action of treating water.

For awareness of the Working for Water Programme, living in favorable environmental conditions is significantly related to awareness for all groups and, again, education of the household head is significantly related to awareness. Thus across perceptions, behavior and awareness, we see a

changing configuration of the importance of living in poor environmental conditions and of the influence of education. It seems that the transition from perception to behavior to awareness is not automatic or easy.

The proposition that perceptions of environmental pollution as well as actions that may be taken to mitigate the impact of that condition are associated with the specific circumstances of the household or individual involved is supported by this analysis. This is seen in the consistency of the relationship between lack of access to safe water and treatment of water across all households, African households and non-African households, whether one uses difference of means tests or logistic regression analyses to determine the significance of the relationships (Table 7, Columns 2, 3, 6, 7). Further is the observation that for rural African households, the source of water is a significant factor in the perception of water pollution as a community issue as is the type of sanitation available the critical influence for urban African households (Figures 5 and 6).

The similarities noted in the perceptions and behaviors between the African and non-African households also reinforce the idea that the particular living conditions may be more important than other factors in determining how a given South African household views the presence of water pollution as a community problem and responds to that condition. If this is the case, this suggests that there is some similarity between the situation in South Africa and that found in Ghana by White and Hunter (2005) regarding the influence of socio-economic status.

It was suggested at the beginning of this paper that given the particular situation in South Africa one might expect a higher level of awareness of environmental matters among South Africans than in populations in other parts of the world. That only slightly more than 10% of all households identified water pollution as a community problem (Table 2) challenges this assertion. Not only is the proportion of households indicating a awareness of water pollution as an issue much lower than that reported in other studies, it is also lower than that reported in Costa Rica where only 22% of the population saw environmental problems as a major concern (Holl, Daily & Ehrlich, 1995). Further, as reported in other studies that environmental concerns are generally not seen as among the most

important issues facing a particular nation, the situation in South Africa appears to be more consistent with that elsewhere than originally anticipated (Bloom, 1995; Dunlap & Scarce, 1991; Dunlap, Gallup & Gallup, 1993; Van Liere & Dunlap, 1980). However, it is not possible from the data available to determine if the South African population, like other populations, attaches a higher level of importance to social and political issues than to environmental concerns.

Closely related is the small proportion of households indicating knowledge of the Working for Water Programme. Only 12% of all households indicated awareness of this endeavor. Further, knowledge of this activity was largely restricted to households with clean water and safe sanitation, and which were classified as residing in formal housing. A substantially larger proportion of non-African households than African households reported having heard of the program. The households which knew of the program generally had characteristics associated with higher standards of living, suggesting the possibility, at least in this particular case, that there is an association between greater awareness of environmental concerns and higher SES. If this is true, it would provide further confirmation of the finding by White and Hunter (2005) that there is likely to be more awareness of environmental issues among higher SES groups.

An alternative explanation for the low level of awareness of this particular program may lie in the program's purpose and focus. While the need to clear alien vegetation from the waterways is important, what may not be clear is how this activity directly contributes to meeting the critical need for access to safe water. A recent poll by a private polling organization reported that 30% of respondents were more satisfied with the supply of clean water than some two years earlier (Markinor, 2006). While this is not a completely comparable measure of awareness, it suggests, at least in this area where the activities are seen as contributing directly to the amelioration of a specific environmental condition of importance to the people, there is a higher level of awareness of what is going on. This suggests the need to examine further the degree to which awareness of particular environmental concerns is a function of the extent to which the issue or activity involved is seen as being of immediate concern to those whose awareness of the matter is being explored.

Although there are some similarities in perceptions and behaviors between the African and non-African households, important differences between these households in these matters do exist. One explanation is to attribute these differences to race. Another explanation is that the differences are a function of the historic positions of these population groups in South Africa. The standard of living among African households is still, on the whole, significantly lower than that for non-African households. More than 80% of non-African households are urban; over 90% have access to clean water supplies, flush or chemical toilets, are classified as formal housing and are headed by individuals with 5 or more years of education (Table 4).

However it is not clear whether, as African households have acquired higher SES characteristics, their perceptions and awareness concerning environmental matters have also changed. That this may not be the case is seen when one examines the independent variables with reference to water pollution as a problem using a logistic regression. This analysis shows that not only will African households more likely see water pollution as a community problem than non-African households, but that the effect of being an African household is extremely strong (Table 6, Column 1). What perhaps can be said is that as African households acquire clean water, access to a flush toilet and formal housing there will be a tendency for these households to develop attitudes and behaviors on some questions comparable to those of non-African households.

That the possibility exists of a shift in attitudes concerning environmental issues as the living conditions for Africans approach those of the non-Africans is seen in the responses of these two population groups concerning awareness of the Working for Water Programme. As noted, non-African households were 4 times more likely to be aware of this program than African households (28.1% versus 7%). However, knowledge of the program was much more likely to occur in households - African as well as non-African - which had characteristics associated with a higher standard of living.

TABLE 8 Percent of African Households and non-African Households Aware of the Working for Water Initiative Among those Households which Simultaneously Have Clean Water, a Flush or Chemical Toilet, a Household Head with Five or More Years of Education and Who Live in Formal Housing	
African Households	11%
non-African Households	30%

An analysis of African and non-African households which simultaneously had clean water, a flush or chemical toilet, lived in formal housing and a head with 5 or more years of education showed that these households, African and non-African, were much more likely to be aware of this program than all African or non-African households shown in Table 2. Table 8 shows the percentage of all African and all non-African households with these characteristics which were aware of the program. Shown in that table is the considerable increase in the awareness for African households (7% versus 11%). That table also indicates that there is still a large gap in the proportions of African and non-African households with knowledge of the program. Moreover, the presence of clean water, a flush or chemical toilet, formal housing and a head with 5 or more years of education are descriptive of the conditions for 84% of all non-African households, but only for 26% of all African households.

It is not possible to make the comparison shown in Table 8 for households which lack all of the characteristics considered in that table - no clean water, no flush or chemical toilet, not living in formal housing, head of household with less than 5 years of education. Although 6% of African households live in these conditions, only .1% (8 households in the survey) of non-African households live in these circumstances. In the African households with all of the advantages shown in Table 8,

13% were aware of the Working for Water initiative.

Three things can be noted from these observations. The direction of change towards a similarity in viewpoints when non-African and African households have comparable living conditions offers some support for the idea that socio-economic conditions are an important influence in framing attitudes about environmental problems. In this respect, the finding here tends to confirm those of Hunter and White (2005) and provide limited support for the proposition advanced by Inglehart (1995) that an interest in environmental matters reflects a fundamental shift in societal values. In this case, it can be argued that those African households in which basic service needs have been satisfied will now more open to consider meeting other needs such as those of environmental protection. Thus, the living conditions of these households can be seen as an underlying factor explaining their greater awareness of the Working for Water Programme.

However, it needs to be noted that even when one controls for the simultaneous presence of particular conditions in a household, as done here, the percentage of non-African households with an awareness of this program is still nearly 3 times the proportion of African households with a knowledge of the program (30% to 11%). Perhaps even more important is the consideration that non-African households are also over 3 times (84% to 26%) more likely than African households to have clean water, a flush toilet, formal housing and a head of household with 5 or more years of education. This suggests that the likelihood of a large shift in attitudes about environmental concerns resulting from changes in living standards does not appear to be immediate.

This preliminary analysis of the relationship among perceptions, behaviors and awareness of environmental issues in South Africa suggests that the situation in South Africa is somewhat comparable to that found elsewhere. Not only does there appear to be a lower level of awareness of environmental concerns than anticipated, but also is the importance of specific living conditions in determining the perception of water pollution as a community issue, such as the linkage between lack of safe water supplies and flush or chemical toilets and this perception. Socio-economic status as measured by specific indicators such as access to clean water, formal housing, and safe sanitation also

appear to be more important than examinations of this matter elsewhere have suggested (Dunlap, Gallup & Gallup, 1993; Blake, Guppy & Urmetzer, 1997). In this respect, our results come closer to what White and Hunter (2005) found in Ghana. Moreover, the pattern of differences between African and non-African households appear to be more related to living conditions than to race, reflecting, in some measure, that which Mohai and Bryant (1998) suggest. The pattern of consistency in the influence of the independent variables on the view of water pollution as a community problem also suggests that first and third world societies in South Africa have similar concerns about this matter. Not clear from our analysis is the extent to these patterns will also hold when other conditions of environmental pollution such as land degradation, air pollution or littering are looked at. An examination of these questions constitutes the next area to be explored.

REFERENCES

- African National Congress (ANC). (1992). *Ready to govern: Policy guidelines for a democratic South Africa*. (28-31 May, 1992) Available at <http://www.anc.org.za/ancdocs/policy/readyto.html> Accessed February 2, 2006.
- Blake, D. E., Guppy, N., & Urmetzer, P. (1997). Canadian public opinion and environmental action: Evidence from British Columbia. *Canadian Journal of Political Science*, 30, 451-472.
- Bloom, D. E. (1995). International public opinion on the environment. *National Bureau of Economic Research Reprint 1998*. (pp. 354-358) Cambridge, MA: National Bureau of Economic Research. Series, 269 (5222).
- Collect-A Can, 2006. Available at <http://www.collectacan.co.za>. Accessed February 15, 2006.
- DEAT (Department of Environmental Affairs and Tourism). (2004). *Ten year review 1994-2004*. Pretoria: DEAT.
- DEAT (Department of Environmental Affairs and Tourism). 2003. *National environmental education programme (NEEP)*. Available at http://www.environment.gov.za/ProjProg/2003NEEP/capacity_building_21052003ht Accessed February 2, 2006.
- DWAF (Department of Water Affairs and Forestry). (2005). *Annual report: 2004-2005*. Pretoria. Pretoria: DWAF.
- DWAF. (2006). *Working for water*. Pretoria: DWAF.
- Dunlap, R. E., & Scarce, R. (1991). Poll trends: Environmental problems and protection. *Public Opinion Quarterly*, 55, 651-672.

- Dunlap, R. E., Gallup, G. H. Jr., & Gallup, A. (1993). Of global concern: Results of the Health of the Planet Survey. *Environment*, 35, 6-15, 33-39.
- Glazewski, J. (1999). Environmental justice and the new South African democratic legal order. *Environmental Justice Governance and Law*, 1, 1-35.
- Green Cages, 2006. Available at <http://www.partnershipscentral.org/mainpages/sa>. Accessed February 15, 2006.
- Hemson, D., & O'Donovan, M. (2006). Putting numbers to the scorecard: Presidential targets and the state of delivery in Buhlungu. In S., Daniel, J., Southall, R., & Lutchman, J. (Eds.), *State of the nation: South Africa 2005-2006*. (pp. 11-45) Cape Town: HSRC Press.
- Hershey, M. R., & Hill, D. B. (1977). Is pollution 'A white thing'? The racial differences in preadults' attitudes. *Public Opinion Quarterly*, 41, 439-458.
- Heyns, C., & Brand, D. (2004). Socio-economic rights and the transition. In Manganyi, N. Chabani (Ed.), *On becoming a democracy: Transition and transformation in South African society*. (pp. 25-39) Pretoria: University of South Africa Press.
- Hohm, C. (1976). A human ecological approach to the reality and perception of air pollution: The Los Angeles case. *Pacific Sociological Review*, 19, 21-44.
- Holl, K. D., Daily, G. C., & Ehrlich, P. R. (1995). Knowledge and perceptions in Costa Rica regarding environment, population, and biodiversity issues. *Conservation Biology*, 9, 1548-1558.
- Inglehart, R. (1995). Public support for environmental protection: Objective problems and subjective values in 43 societies. *PS: Political Science and Politics*, 28, 57-72.
- Jacobs, J. E. (2002). Community participation, the environment, and democracy: Brazil in comparative perspective. *Latin American Politics and Society*, 44, 59-88.
- Lumby, A. (2005). Government and sustainable development in South Africa. *South African Journal of Economic History*, 20, 65-82.
- Markinor. (2006). Perceptions of government responsibility and delivery. *Press release*, 10 February 2006. Cape Town.
- Mbeki, T. (2006). Address of the President of South Africa, Thabo Mbeki, to the third joint sitting of the third democratic parliament, Cape Town 3 February 2006.
- Mohai, Pl. (1990). Black environmentalism. *Social Science Quarterly*, 71, 745-765.
- Mohai, P., & Bryant, B. (1998). Is there a 'race' effect on concern for environmental quality? *Public Opinion Quarterly*, 62, 475-505.
- Murch, A. W. (1971). Public concern for environmental pollution. *Public Opinion Quarterly*, 35, 100-106.
- Peart, R., & Govender, K. (2001). Natural resource policies for the new millennium: Is South Africa moving towards a more sustainable development? *South African Journal of Environmental Law and Policy*, 8, 39-76.
- PIKITUP. 2006. Available at <http://pikitung.co.za> Accessed February 17, 2006

- Republic of South Africa. (1996). *Constitution of the Republic of South Africa* (Act 108 of 1996). Pretoria. Available at <http://www.info.gov.za/documents/constitution/index.htm> Accessed March 3, 2006.
- Republic of South Africa. (1998). *National environmental management* (Act 107 of 1998) Pretoria.
- Republic of South Africa. (2000). Department of Environmental Affairs and Tourism (DEAT). *White paper on integrated pollution and waste management for South Africa* Government Gazette 227 (20978) Pretoria. Available at <http://www.info.gov.za/whitepapers/2000/20978.pdf> Accessed March 15, 2006.
- Republic of South Africa. (2003). *Government Gazette* 45 (24831). Pretoria. Available at <http://www.info.gov.za/gazette/regulations/2003/24839> Accessed March 14, 2006.
- Rohrschneider, R. T. (1988). Citizens' attitudes towards environmental issues: Selfish or selfless. *Comparative Political Studies*, 21, 347-367.
- Rose Foundation, 2006. Available at <http://www.rosefoundation.org.za>. Accessed February 2, 2006.
- Statistics South Africa. (2004). *Stats in brief: Ten years of democratic governance*. Pretoria: Statistics South Africa.
- Steyn, P. (2002). Popular environmental struggles in South Africa, 1972-1992. *Historia*, 47, 125-158.
- Van Liere, K. D., & Dunlap, R. E. (1980). The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public Opinion Quarterly*, 44, 181-197.
- White, M. J., & Hunter, L. (2005). Public perceptions of environmental issues in a developing setting. Boulder: *University of Colorado Research Program on Environment and Behavior Working Paper EB2005-0003*. Boulder.