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Citizens' Educational Needs in an at-Risk Environment in Trinidad, West Indies

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Trinidad is a small island developing state caught between the need to engage rapid development while respecting and preserving the environment. This study assessed citizens' education needs related to the environmental laws of Trinidad and Tobago. It focused on a densely populated, at- risk area of the country referred to as the East-West (E-W) corridor. Two hundred (200) persons living along the E-W corridor were randomly selected and surveyed using a structured interview schedule to determine their knowledge of three environmental areas: the Litter Act, the Water Pollution Rules and the Public Health Ordinances. It was determined that overall total knowledge of the environmental laws was moderate. The overall knowledge of environmental laws correlated significantly with sex, location of residence and community type. Knowledge regarding the Water Pollution Rules correlated significantly with sex, religion and economic status and knowledge regarding the Litter Act correlated significantly with sex, location and education level and the knowledge regarding the Public Health Ordinances correlated with religion and education level (all at P≤ .05level of significance). Recommendations are for increased education programmes specifically designed to target the intensive residential communities and schools along the corridor. The internet should be the main education tool. **[Oliver et al. Citizens' educational needs in an at-risk environment in Trinidad, West Indies. International Journal of Agricultural Science, Research and Technology, 2012; 2(2):69-75].**

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1. Introduction

In Trinidad and Tobago, the environment and natural resources are constantly under pressure due to rapid urbanisation and industrialization. Moreover, tropical- type weather characterised by high rainfall over short periods regularly, negatively impact on the environment. Where people do not pay sufficient regard to environmental issues, flooding, landslides, pollution of water sources and disease issues arise. Flooding is a major issue in Trinidad and Tobago which causes economic and social burdens on the government and citizens alike. Over the years, extensive flooding has been attributed to disregard for the litter laws. When flooding occurs, litter and solid waste enter water ways and not only clog them, but also directly affects water quality since it introduces contaminants and pollutants (Tyler, 2005).

Several environmental laws, rules and regulations of Trinidad and Tobago were created by the government over the years to manage and protect the country's limited natural resources. These are usually made as crises developed and have small penalties associated with non-compliance. History has shown that as soon as the country emerges from a crisis situation, there is little or no sustained education, monitoring or enforcement. Consequently, there is little or no impetus for persons to follow these laws in spite of their potential to greatly improve citizens' lives, safeguard properties and the environment (CSR Mapping Project, 2007).

The situation is somewhat complicated however, as the demographics of the country show that a large percentage of the population lives in a relatively small flat and hilly area roughly 20 km long and about 1km wide that runs East to West of the country at the base of the Northern range of mountains. It is referred to as The East-West corridor. Housing and businesses are dense and the main roadway and multitude of arterial roads also criss-cross the corridor. Several rivers that emerge from the Northern range traverse the corridor. As a developing country with an oil and gas based economy, many small industries and businesses abound and vehicles are abundant on roadways. All these factors make for conditions that impact negatively on the environment; litter, air and water

pollution, flooding, excessive noise, and land degradation to name a few. In such a scenario, citizens' compliance with the environmental laws is crucial to maintaining the integrity of the environment and natural resources. Environmentalists and other civic minded society members continuously complain about the disregard for the environmental rules and regulations and the low levels of compliance. However, this situation seems to change marginally from year to year. It appears that there is disconnect between environment management, monitoring and enforcement and compliance with the environmental laws in Trinidad and Tobago. Why do people not obey the environmental rules and regulations in Trinidad and Tobago? A precondition for practise of these rules would be knowledge of them. Consequently, this study investigated the level of knowledge of selected environmental laws; the Litter Act established in 1981, the Water Pollution Rules made in 2001 and the Public Health Ordinance established in 1979. It seeks to determine the factors associated with knowledge and practices of the environmental laws among a key at-risk section and sector of the population. These must be understood before any interventions are made.

Literature Review

Environmental management has been defined as managing human affairs so as to achieve an acceptable balance between the quality of human environment and the quality of the natural environment (Petak, 1980). Before the introduction of laws, society was ruled by ethics. In the absence of written laws, the ethical values and morality of the people helped society to function effectively. The creation of laws is a major component of environmental management and according to Alam *et al*. (2010), laws are considered as fundamental tools for governance and regulatory control arguing that there is little hope to control the sector with values and ethics. The use of law is however frequently unwelcomed, since it is the method used when no other alternatives are available. Codes, it has been suggested, may be more useful if the reasons behind each order are stated and teamwork is encouraged (Benson, 1989). Still, some persons firmly believe that there is a need for education of the laws while others hold that ethics, values and policies are sufficient. However, it has been recognised that the education sector of developing nations experience a number of financial and human resource constraints which limit efforts and which give credence to the enacting of laws to effect enforcement (Alam et al., 2010).

In recent times, the education sector of a country is being seen as the most vital sector, receiving the outmost attention from politicians, bureaucrats and legislators to ensure better policies (Alam *et al*., 2010). The creation of these policies may be futile without society having a degree of knowledge on issues to be addressed in these policies. One reason researchers have been interested in knowledge, is that it has long been assumed that knowledge plays a role in enhancing the value-attitude-behaviour relationship by providing individuals with the ability to better formulate alternate views and present arguments to support their beliefs and behaviours (Fabrigar et al., 2006).

It has already been recognised that knowledge is the crucial "fourth factor of production", and that sustainable farming practices, as they are linked to the environment, are more demanding on the skills and knowledge of farmers. Williams (2000) found that students perceived the concept of sustainable as having an impact on all three components of agriculture: environmental, economic and social. With respect to environmental and soil benefits provided from organic farming, there is a clear requirement for more information and on-farm advice to support them in their transition to using knowledge-demanding practices (Ingram and Morris, 2007).

Several researchers have examined the issue of knowledge of the environmental laws. It was found that Malaysian teachers had only a fair knowledge of environmental laws and even lower understanding of the underlying causes (Said *et al.*, 2003). Only 47% of adults in Minnesota, USA, had above average knowledge of the environment and that age, location, income and education were important related factors (Murphy, 2004). Esa (2010) stated that although students and teachers may lack sufficient environmental knowledge, they still have positive attitudes towards the environment. Further, persons may have different levels of knowledge of various areas of the environment. For example, Ingram and Morris (2007) found the Agricultural advisors in England had considerably more knowledge of the sustainable management of soils than knowledge of the environment in general. Incekara (2011) stated that students were relatively knowledgeable about general environmental issues but their knowledge of sustainable development was unsatisfactory. Nordstrom et al (1999) found that students with a background in agriculture who were exposed to the laws and regulations protecting the environment were more likely to find that these regulations were sufficient. In Taiwan, Huang et al. (2010) noted that there has been increased social awareness of environmental issues because of the

problem and need for urgent solutions to heavy metal pollution of water.

An integral part of education involves communication. As such, a variety of communication tools and strategies can be used to promote awareness and enhance knowledge of new and existing laws. The changing nature of the current information environment calls for new skills and competencies on the part of information professionals. The introduction of modern Information and Communication Technologies (ICTs) has the potential to expedite dissemination. The challenge in this knowledge age is to manage not only information but also the technological tools that can facilitate knowledge creation and communication (Makori, 2009).

This study sought to determine i) the knowledge of persons of the Litter Act, Public Health Ordinances and Water Pollution Rules, ii) the factors related with knowledge levels, and iii) the preferred modes of communication for these environmental laws.

2. Materials and methods

A structured questionnaire consisting mainly of closed- ended questions was used to evaluate respondents' knowledge and compliance with respect to the Water Pollution Rules, the Litter Act and the Public Health Ordinances of Trinidad and Tobago. There were 29 responses required to assess overall knowledge (11 for the Water Pollution Rules, 7 for the Litter Act and 11 for the Public Health Ordinances). In this study, they are collectively referred to as "the environmental laws". There were 2 questions regarding present and preferred media of communication. For some questions, respondents were provided with a fixed response set from which to choose the correct response while in others they were required to provide answers to questions asked. The questionnaire was pretested among five students of the University of the West Indies St. Augustine campus pursuing environmental studies and five persons of the general public along the East-West corridor for clarity and ease of understanding. Some revisions were made after pretesting. A sample of the final questions on the Water Pollution Rules follows:

Do you know the Water Pollution Rules of Trinidad and Tobago? If yes, can you please list three (3) pollutants listed in the Water Pollution Rules (2001)? Do you know what a source application is? If yes, then briefly explain what is source pollution? (options provided). Where should you submit a source application?(options provided). Who needs to submit a source pollution? Do you know what a water permit is? If yes, what is it? (Options provided).

Similar questions were asked to ascertain knowledge on the Litter act and the Public Health Ordinances. The responses to these three areas were summed into a composite overall knowledge score. This composite score, as well as the scores for the three distinct areas were used in the analysis.

Some 400,000 persons reside along the E-W corridor. A total number of 200 persons were randomly selected using proportionate random sampling to select persons from the four regions based on regional population data received from the central statistical office. Each interview took about 15 minutes to complete and data were analyzed using the Statistical Package for Social Sciences (SPSS version 17). Results were presented in the form of descriptive statistics and relationships explored using Chi square analysis. Significance was set at the $p<.05$ level.

3. Results and discussion

Sample Characteristics

The majority of respondents were females (68%). Some 64.5% of the respondents belonged to the 18-24 age group, 21.6% belonged to the 25-39 age group and the rest (13.9%) over 40 years. As regards ethnicity, the sample population was dominated by Indo-Trinidadians (35%), 32.5% Mixed descent and 32.5% Afro-Trinidadians. The majority reported belonging to the Christian religion (66%), followed by Hindu (16.5%), Muslim (8.5%) and other religion (9%). The majority of respondents (79.5%) were from urban (60%) and suburban communities (19%) and the rest rural. 52.5% reported secondary level education, 37.5% secondary level, 7.5% possessing Diplomas and 2.5% having Primary level education only. The majority (63.5%) classified their economic status as being in the Lower-middle income level, 26.5% in the Upper-middle income level, 6% in the lowest level and 4% were from the uppermost income level in society. Income levels were assessed as High economic status (>$10,000TT), Middle economic status (between $6,001-10,000TT), Low (<6,000TT).

Overall Knowledge of Environmental Laws, Rules and Regulations

A total of 29 questions were asked to assess the total overall knowledge on all environmental laws. Table 1 shows that Overall knowledge was less than average with a mean score of 11.57 (range 0-29). Details show that a small amount (7.5%) had very good knowledge of the environmental laws and regulations and 19% had fairly good knowledge scores. The majority 73.5% however, had less than average knowledge (53.5% had moderate knowledge

scores and some 20% of persons had low total knowledge scores) on all environmental laws.

Table 1. Percent of Score ranges, mean scores and standard deviations for all environment laws and the Water Pollution rules, the Litter Act and the Public Health Ordinances.

Categories	Score Ranges	Range %	Mean Score (SD)
Knowledge for Water Pollution Rules (n = 11)	0-2	76	2.31 (2.83)
	3-5	8	
	6-8	9	
	9-11	7	
Knowledge for Litter Act (n = 7)	0-2	31	3.45 (2.03)
	3-5	52.5	
	6-7	16.5	
Public Health Ordinances (n = 11)	0-2	12.5	5.82 (2.24)
	3-5	33	
	6-8	39.5	
	9-11	15	
TOTAL SCORE (n = 29)	0-5	20	11.57 (5.36)
	6-10	53.5	
	11-20	19	
	>21	7.5	

Based on the mean scores of the three areas assessed, it would appear that highest knowledge was about the Public Health Ordinances, with knowledge of the Litter Act next highest. Knowledge of the Water Pollution Rules was lowest among the sample.

Knowledge of Water Pollution Rules

Respondents were asked to respond to eight questions (11 responses required) on the Water Pollution Rules of Trinidad and Tobago. They were required to list the water pollutants, describe what a source application was, what a water pollution permit was and who are required to apply for these documents. Scores above 5.5 were considered good-very good and those less than 5.5 were considered fair to low based on the values. Knowledge was low with a mean score of 2.31 (range 0-11). Seventy six percent (76%) of the sample had very low knowledge score (0 to 2); 8% had fairly low scores (3-5); 9% had good knowledge and 7% had highest knowledge scores (9-11) with respect to the Water Pollution rules.

Knowledge of the Litter Act

Respondents were assessed on seven (7) questions on the Litter Act of Trinidad and Tobago. Scores above 3.5 were considered good-very good and those less than 3.5 were considered fair to low based on the values. Overall knowledge was just below average with a mean score of 3.45 (range 0-7). Results show that 16.5% had high knowledge (score 6 to 7); 52.5% had fair knowledge (score 3-5); 31% had low knowledge of the Litter act (score 0-2).

Knowledge of the Public Health Ordinances

Participants were asked to provide 11 responses to four questions based on environmental issues under the Public Health Ordinance of Trinidad and Tobago. Scores above 5.5 were considered good-very good and those less than 5.5 were considered fair to low based on the values. Knowledge was just above average with a mean score of 5.82 (range 0-11). Results show that 15% of participants attained a high knowledge (Score 9-11); 39.5% of the sample had good knowledge (score 6-8), and 33% had fairly low knowledge (score 3-5) and 12.5% had very low knowledge (0-2) of the Public Health Ordinances of Trinidad and Tobago.

Relationship between selected variables and Overall Knowledge score

Table 2 shows the relationships determined based on Chi square analysis between selected variables and knowledge of the environment Laws, rules and regulations collectively and individually. Results show that gender, location of residence along the East-West corridor and Community type were significantly associated ($p < 0.05$ level) with total knowledge scores. The detailed cross tabulations show that women had higher scores than men; persons living toward the eastern end of the E-W corridor were more knowledgeable than those toward the western end of the corridor and suburban residents were more knowledgeable than both rural and urban residents. Ethnicity, religion, age, education level and economic status were unrelated to overall knowledge scores.

An examination of the individual rules and regulations show other significant findings. Results showed that religion and gender ($p < 0.05$ level) were significantly related with knowledge of the Water Pollution Rules. Male respondents were more knowledgeable than females about this set of rules and persons of Christian faith were more knowledgeable than persons from other religious persuasions. Education level, gender and Location of residence were significantly related ($p < 0.05$ level) with knowledge of the Litter Act. Persons with higher levels of education were more knowledgeable about these rules; females were more knowledgeable; and those living furthest west along the east-west corridor were more knowledgeable than others. Results also showed that education level and religion were significantly related ($p< 0.05$ level) with knowledge of the Public Health Ordinances. Persons with higher levels of education were more knowledgeable about

these ordinances; persons of the Christian and Muslim faiths were also more knowledgeable than persons of other religious persuasions.

Table 2. Summary Results of Relationships of Selected variables and Knowledge of Environmental Laws, Rules and Regulations

Variables	X^2 values[1] (df) and p values:			
	Total Environmental Knowledge	Wr Pollution Rules	Litter Act	Public Health Ordinances
Gender	16.01*** (df=3) p = .001	8.98** (df=3) p = .030	7.13** (df=2) p = .028	NS
Ethnicity	NS	NS	NS	NS
Religion	NS	22.57*** (df = 9) p = .007	NS	17.78** (df = 9) p = .038
Age Group	NS	NS	NS	NS
Location of Residence along E-W corridor	37.80*** (df = 9) p = .000	NS	18.28*** (df = 6) p = .006	NS
Community Type	15.69** (df = 6) p = .016	NS	NS	NS
Highest Educational level	NS	NS	20.63*** (df = 8) p = .008	25.08** (df = 12) p = .014
Economic Status	NS	NS	NS	NS

Note. *** denotes significance at the $P \leq 0.01$ level; ** denotes significance at the $P \leq 0.05$ level; [1]:0 cells have expected frequencies less than 5. The minimum expected cell frequency is 20.

Knowledge Needs and preferred sources of information

The majority (85%) of the persons indicated that they were not satisfied with their level of knowledge of the environmental laws. Some 85% of persons shared the view that the environment is very important to preserve and 92% of persons expressed that they will be interested in learning more about the environmental laws of Trinidad and Tobago.

Citizens obtained information on the Environmental Laws, rules and regulations from the Internet (n=69) followed by radio (n=63). Newspaper and television were less identified as preferred sources of obtaining information. Respondents indicated that their most preferred media for obtaining information on selected Environmental Laws is the Radio (n=110) followed by the Newspaper (n=93) and then by television (n=61). Face to Face interaction (n=4) was the least preferred mode of communication.

Discussion

The persons living along the East-West corridor, the area of Trinidad most vulnerable to flooding and other environmental disasters, for example, flooding, water pollution, noise pollution, landslides etc, do not have sufficient knowledge about the environmental laws, rules and regulations of the country.

Although, overall knowledge is just about fair, knowledge of the Litter act and knowledge of the Public Health Ordinances were higher than knowledge of the Water Pollution Rules which was less than acceptable. The results of this level of knowledge can be seen in the large amount of plastics and other debris along the roads, drains and other waterways and the poor quality of water in the rivers. The consequence is regular flooding during the rainy seasons annually in town centres along the E-W corridor and the high incidence of Dengue Hemorrhagic fever which is caused by the prevalence of mosquitoes in stagnant waterways. This occurs in spite of the many education materials and programmes that target compliance with the Litter act. There are fewer materials that address the Water Pollution Rules and the Public Health Ordinances.

Persons seem to be least knowledgeable of the Water Pollution Rules, maybe under the impression that these rules are for businesses, and not geared towards individuals, including householders, whose actions also negatively impact on water quality. The many rivers that traverse the E-W corridor are used both for recreational and drinking water purposes. While some larger businesses are environmentally conscious, the large number of many small businesses and light industrial and manufacturing establishments along the corridor appear to be the major defaulters, depositing their waste water directly into drains and canals. This may be linked to a lack of knowledge and some measure of disregard for the rules that govern their operations. It also calls into question the enforcement of these laws as well.

Women appear to be more knowledgeable than men on the environmental laws. This is not surprising, as women are often associated with a more caring and nurturing disposition in general. This may be reflected in their concern for the environment and perhaps paying more attention to the rules and regulations. Geographic location of persons along the E-W corridor is also a factor related to knowledge. Persons living in the eastern parts were more knowledgeable than those in the middle and western parts of the corridor. This is significant as the capital of the country is at the western end and is surrounded by many tightly packed housing settlements with large numbers of

persons and light manufacturing industries. This settlement pattern stretches up to the middle parts of the corridor. That these persons are generally low in knowledge about the Environmental laws and less knowledgeable than those living in the less populated eastern end is cause for serious concern. At lot of waste is generated in these areas and has the capacity to cause tremendous ill effects on the environment if not adequately disposed. Sufficient to say, the capital and towns up to the middle areas of the E-W corridor flood regularly due to drains clogged by debris and silt from indiscriminate land clearing on the mountainsides. Not surprisingly, no such flooding occurs towards the eastern parts of the corridor although the demography and topography are similar. Additionally, the manufacturing sector located on the outskirts of the city have only in recent times sought to stop the practice of putting their waste and foul- odour water directly into the main drains. Since the areas around the capital are almost at sea level in terms of elevation, often these drains retain their debris and odour for long periods of time causing distress to the travelling public and residents. The many complaints of the impoverished communities that live in these areas often go unattended by government and big businesses. In recent times however, more corporate social responsibility by some of them has resulted in some positive changes. The eastern end of the corridor is less tightly packed with housing and manufacturing and is reflected in the quality of the river water and the environment in general.

The finding that suburban residents are more knowledgeable than urban residents may be related to the finding of location along the corridor. The western and middle parts are closer to the capital and are described as urban whereas the eastern parts are rural, although not very far apart, but for a small country can show the signs of rurality. One would expected however, that urban persons would be more educated generally, and specifically with respect to the environment than rural persons. This does not appear to be true for the persons studied.

Education level is not related to overall knowledge of the rules and regulations; however, there is some association with knowledge of the Litter act and the Public Health Ordinances. These are more likely the ones stressed and given more attention by local government agencies responsible for the environment. Economic status and knowledge were not linked. In Trinidad, persons with differing economic statuses live anywhere along the corridor, with the more affluent living in niche communities in the higher parts of the valleys, but could be anywhere among the many valleys that exist on the periphery of the E-W corridor. All the rivers associated with these valleys cross the E-W corridor at some point. The wealthiest persons live to the extreme west of the country in areas not considered to be along the corridor. This study did not survey these persons.

Age and religion were not associated with overall knowledge. Age in particular was not associated with any of the individual rules and regulations. For religion, there was some association with knowledge of the Water Pollution Rules and the Public Health Ordinances. These findings point to the many opportunities for educational intervention among schools and places of worship. While some activities do take place, much more could be done at communal gatherings, schools and worship centres to educate citizens.

4. Conclusion

The study found that persons had fair overall knowledge of all environmental laws. However, there is still a strong need for urgent educational intervention among all citizens who live along the E-W corridor with respect to environmental issues. Knowledge among these at-risk citizens is inadequate in Trinidad and can be greatly improved. Noteworthy is that knowledge of the individual laws varied; knowledge of the Litter Act and the Public Health Ordinances were moderate but low for the Water Pollution Rules. If the environmental rules and regulations are not followed, the environment is negatively affected. This has consequences for the health and well-being of not only the persons living along the corridor but for a small island, the entire population. To mitigate the effects of environmental disasters, money will have to be spent to fix landslides, unclog drains, desilt rivers etc, which could be better spent on developmental efforts around the country. Moreover, some pollutants have long term effects on the water and soil and clean up actions are very costly. It is better to invest in education towards long-term preservation of the environment.

Government and civic minded bodies should play a more active role in meeting the educational needs of its population. Government has paid much more emphasis on the Litter Act than the other aspects of the laws and this is reflected in persons having a greater knowledge of the Litter Act. Similar efforts could be applied to effect increased knowledge changes towards the other aspects of the environmental laws. Special audiences identified in the study; women and those living in housing developments in urban areas should be targeted for intervention and the preferred modes of communication should be the newspaper and radio. In so far as the government pays special attention to persons living in the E-W corridor and knowledge

levels are less than adequate for an at-risk people and environment leaves one to wonder about the rest of the country where less attention and resources are provided. Perhaps a national action plan may be needed for the entire country to bring education levels up to desired standards.

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