STAKEHOLDERS' PERCEPTION AND WILLINGNESS TO COLLABORATE FOR EFFECTIVE WATERSHED MANAGEMENT IN TRINIDAD

Percepção e Disposição dos Stakeholders para Colaborar em uma Gestão Eficaz da Bacia Hidrográfica em Trinidad

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Abstract: Proper watershed management is important for several reasons; the latest, and maybe most important, being to help mitigate climate change impacts. For countries with small landmasses and burgeoning populations, watersheds are increasingly at risk of being negatively impacted. The environment and water supply are particularly vulnerable if no actions are taken to manage them properly. This study sought to understand the perceptions of the various stakeholders who interact with the largest and most important watershed in Trinidad; their perceptions of the problems, the causes of the problems and possible solutions. It also investigated their willingness to collaborate on action plans to manage the watershed. A purposive sample of 266 respondents from four stakeholder groups was selected and interviewed using a structured questionnaire; comprising in the main of three perception scales and a modified Wilder Collaboration Factor Inventory. The latter is used to assess stakeholders willingness to collaborate. ANOVA results showed that there were similarities in perceptions to 5 of the 10 identified problems, 7 of the 18 possible causes and 6 of the 10 solutions presented. Such results suggested that there were opportunities for positive intervention and 21.3% of the stakeholders expressed a high level of willingness and a further 69.5% a moderate level of willingness to collaborate on community activities geared toward addressing water management issues. Recommendations included; increased community education on watershed importance, more constructive dialogue among stakeholders to achieve better agreements on the watershed issues and increased engagement with institutional stakeholders who are key to fashioning developmental plans for the watershed.
Key words: watershed management, stakeholders, perceptions, collaboration, Trinidad

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Resumo: A gestão adequada das bacias hidrográficas é importante por várias razões; o mais recente, e talvez o mais importante, é ajudar a mitigar os impactos das mudanças climáticas. Para países com pequenas massas de terra e populações crescentes, as bacias estão cada vez mais em risco de serem impactadas negativamente. O meio ambiente e o abastecimento de água são particularmente vulneráveis se nenhuma ação for tomada para gerenciá-los adequadamente. Este estudo buscou compreender as percepções dos diversos atores que interagem com a maior e mais importante bacia hidrográfica de Trinidad; suas percepções dos problemas, as causas dos problemas e possíveis soluções. Também investigou sua disposição de colaborar em planos de ação para administrar a bacia hidrográfica. Uma amostra intencional de 266 entrevistados de quatro grupos de stakeholders foi selecionada e entrevistada usando um questionário estruturado; compreendendo na principal das três escalas de percepção e um Inventário de Fator de Colaboração Wilder modificado. Este último é usado para avaliar a disposição dos interessados em colaborar. Os resultados da ANOVA mostraram que houve semelhanças na percepção de 5 dos 10 problemas identificados, 7 das 18 causas possíveis e 6 das 10 soluções apresentadas. Tais resultados sugeriram que havia oportunidades para intervenção positiva e 21,3% das partes interessadas expressaram um alto nível de disposição e mais 69,5% um nível moderado de disposição para colaborar em atividades comunitárias voltadas para questões de gestão da água. Recomendações incluídas; maior educação da comunidade sobre a importância das bacias hidrográficas, diálogo mais construtivo entre as partes interessadas para alcançar melhores acordos sobre as questões da bacia hidrográfica e maior engajamento com as partes interessadas institucionais que são fundamentais para a elaboração de planos de desenvolvimento para a bacia hidrográfica

Palavras-Chave: Bacias Hidrográficas, Stakeholders, Percepção, Colaboração, Trinidad.

INTRODUCTION

Watersheds provide important essential environmental services; as such its management is very important for several reasons. Services include food provision, wildlife habitat, recreation, waste recycling and assimilation and storage among others. Within recent times, as climate change impacts become more visible, persons are becoming more acutely aware of the value of watersheds and there have been increased demands for their protection and sustaining the services that are provided. Across the world, watershed management has become a major focus for attention, and there have been concerted efforts to prevent its misuse or overexploitation, as well as to mitigate the potentially harsh effects of its degradation on both people and the environment.

For Caribbean states, most with small land masses, the challenge relating to watershed management tends to be more complex and it appears that social and human impacts on watersheds are especially important and should be understood as a basis for any successful watershed management plan. The implementation of effective watershed management activities should take on board the views of all the various stakeholders, both internal and external, who are willing to collaborate with each other. A prerequisite for successful collaboration approach would thus require, not only an understanding of the perceptions of stakeholders relating to watershed management problems, but must include their perceptions of the causes of these problems and the solutions as they see them.

This process is complicated however, as stakeholders are not a homogenous group. The definition of a stakeholder can refer to local residents and communities, to governments and their agencies, private individuals, organisations, institutions and also markets. All may have differing viewpoints on how to deal with a given problem. A detailed analysis of stakeholders' perceptions to focus on identifying similarities in perceptions is a strategic entry point for action in the design of an effective watershed management plan.

Based on this premise, this paper analyses the range of perceptions of four stakeholder groups within the Northern Range catchments of the Caroni Watershed in Trinidad. Such perceptions relate to watershed management problems, causes of these problems, and possible solutions. Perceptions, we hypothesize, will have some influence on stakeholders' willingness to collaborate on action plans.

Literature Review

Stakeholder analysis is typically employed to assess the interests of key actors in a complex issue and to improve understanding about a complex issue (Ramirez, 1999). Watershed management activities constitute one such issue because of the range of possible stakeholders and issues that may impact efforts. Lubell (2004) posited that it is critical to understand the views and behaviours of stakeholders, since this can indicate the degree of success of any collaborative effort. Blackstock and Richards (2007) indicated that if collaborative problem solving is key to delivering watershed management, then stakeholder involvement; the relationships among multiple stakeholders, is vital. Borisova et al. (2012) also contended that stakeholder analysis serves as a means of building understanding of stakeholder perceptions when it comes to water quality and policy issues. Rastogi et al. (2010) indicated that stakeholder analysis proves to be a simple yet effective method which can be used to help in understanding why and how decisions concerning natural resources are made while waiting for long-term policy changes.

The situation is even more complex as stakeholders are not a homogenous set of persons particularly within the realm of watershed management. Grimble and Wellard (1997) suggested classifying stakeholders based on those who affect a decision or action, as opposed to those who stand to be affected by a particular decision or action; both negatively or positively. These groups according to Grimble and Wellard (1997) are called active and passive stakeholders. Later, Townsely (1998) categorised stakeholders as primary and secondary. The primary stakeholders being the ones with a direct interest in the resource either because they depend on it for their livelihoods or they are directly involved in its exploitation in some way. The secondary stakeholders are those with a more indirect interest, such as those involved in institutions or agencies concerned with managing the resource either fully or at least partially, as well as the wealth or business generated by the resource. Stakeholders may also be categorised according to their role, and Hein et al. (2006) suggested that stakeholders can be classified as either institutional stakeholders (for example, government and NGOs) or non-

institutional stakeholders (for example, householders and small scale farmers). Rastogi et al. (2010) further suggested that stakeholders can also be classified based on whether or not they support, are neutral or opposed to the particular issue being considered.

The identification of stakeholder perceptions can be determined several ways; stakeholders can be engaged either in a formal or an informal setting. Blackstock and Richards (2007) utilised a stakeholder analysis approach which included public consultations in the first instance followed by in-depth group work. A second public consultation was then conducted to discuss and review plans based on feedback. Mutekanga et al. (2013) adopted a multi- step approach in which reviews of relevant literature and policies were conducted, followed by community participatory rural appraisal meetings, semi-structured interviews with key informants and direct field observations coupled with transect walks.

In the Caribbean, substantial work regarding stakeholder analysis for watershed management has been conducted. Such studies, have offered several approaches to stakeholder categorisation. In Trinidad, a study on fisheries management was conducted by Chan-Shing (2001). This study focused on the more traditional approach towards stakeholder categorisation making reference to primary and secondary stakeholders. Cumberbatch (2001) investigated marine park management in Barbados, but only focused on the primary stakeholders. Otuokon (2001) identified and focused on institutional (formal) stakeholder groups whilst conducting a study relating to environmental management in Negril, Jamaica and Scott-Dunkley and Barret (2001) used frontline, functional and passive stakeholders in their study relating to the conservation of the Blue Mountain and John Crow Mountains in Jamaica.

The theoretical framework for this study used Renard's (2004) characterisation of stakeholders to identify key the stakeholder groups. The characteristics included: i) stakeholders not being only local people, ii) stakeholders tending to not only be organisations and formal groups, iii) stakeholders not only being the users of the natural resources, but also those who impact on the natural resource and iv) recognition that stakeholders' roles and interests may change over time. The stakeholder categories used in this study included: primary stakeholders- defined as those persons who are directly impacted and or derive benefits from the watershed under consideration; secondary stakeholders- defined as those individuals who live in another watershed, but derive benefits from the particular watershed under consideration; external stakeholders- those living in downstream communities and are affected by unsustainable upstream watershed use and institutional stakeholders- governmental and private institutions, as well as NGOs and CBOs.

To understand the perceptions of stakeholders with respect to collaborative watershed management, the paper is further guided by Grimble and Wellard (1997) who indicated that the most fundamental division between stakeholders is likely to be between those who affect (determine) a decision or action, and those affected by this decision or action (either positively or negatively). We posit that institutional stakeholders have the ability to positively affect a decision or action in terms of watershed management, while at the same time being indirectly affected by their decisions or actions. Primary and secondary stakeholders on the other hand, can positively affect a collaborative approach towards watershed management and also be directly affected by their decisions. External stakeholders also have the potential to negatively affect (determine) a decision as it relates to collaborative watershed management while at the same time being directly affected by their actions.

Understanding stakeholders' perceptions, as we indicated, is a first step to successful watershed management. Another important next step is collaboration to bring about successful changes. One measure to assess predisposition to collaborate, is the Wilder Collaboration Factor Inventory (WCFI), which has been used by organisations to assess their collaborative strengths and weaknesses (Mattessich, 2001). The WCFI was adapted to reflect an environmental purpose and these adapted factors were considered for measuring the level of willingness to collaborate for watershed management.

Objectives of the Study

The main objectives of this study were to: (i) identify stakeholders' perceptions on various land and water management problems, causes and related solutions; (ii) identify similarities and differences among the various stakeholder groups with respect to their perceptions on various watershed management problems, causes and related solutions; and (iii) assess stakeholders' level of willingness

to collaborate on improved watershed management plans.

METHOD
Description of the Study Area
The Caroni River basin (CRB) in Trinidad, is the largest drainage basin of Trinidad and Tobago with a basin area of 915 km2 and home to approximately 400,000 persons (WRA, 2005; Central Statistical Office, 2011). The Caroni River is the major river system spanning the area of the CRB, flowing in an east to west direction with 19 tributaries (WRA, 2008). The CRB, according to Trinidad and Tobago's Water and Sewerage Authority (WASA), serves as the source of approximately 30% of Trinidad's water supply, with this supply of water mainly coming from the twelve rivers draining from the Northern Range. The Northern Range area of the CRB is a very special area in Trinidad. According to Agard et al. (2005), the Northern Range covers approximately 25% of the land mass of Trinidad and it is very significant to the environmental, economic and socio-cultural life of the island. Apart from its important contribution towards the country's potable water supply and recreation, the Northern Range area is one of the most multi-used areas on the island, with the predominant land uses being housing, agricultural/ farming activities, commercial and industrial processing plants. Most times, these activities have been considered as being contributing factors toward the decline of the surface water quality of the Caroni River (WRA, 2001; Agard et al., 2005; WRA, 2008).

Seven out of the total 19 catchments of the Northern Range were considered for this study. These were; Santa Cruz, St Joseph, Tunapuna, Caura/ Tacarigua, Arouca, Mausica and Arima. These catchments were deliberately chosen because they covered a significant portion of the Northern Range, and are a good representation of what happens overall in the watershed.

Sampling Procedure
Two purposive samples were taken from within the study area to be able to accomplish this paper's objective. Purposive sampling was used to ensure that stakeholders from each of the identified stakeholder categories were included. As such, 266 stakeholders participated in the stakeholders' perception survey on watershed management problems, causes and related solutions and a subset of this sample (n=141 stakeholders) participated in the willingness to collaborate aspect of this study. For the willingness to collaborate survey participants were chosen from the primary, secondary and external stakeholder categories only, as these are the categories that the study sought to determine willingness to collaborate with the institutional stakeholders.

Stakeholder Perception Scale
A five-point importance rating scale was used to assess the perceptions of stakeholders as it related to various watershed management problems, causes and solutions. Respondents were asked to rate on a scale of 1 to 5, the level of importance they would place (1-no importance, 2- weak importance, 3- neutral, 4- moderate importance and 5- strong importance) on ten watershed management problems presented to them and 18 suggested causes to these problems. Respondents were also given the opportunity to list and rate, using similar ratings, any other problems and causes that may not have been previously mentioned in the list. For the solutions, respondents were asked to rate, again using a similar scale, the level of importance 10 suggested solutions would have in terms of addressing the watershed management problems. Similarly, to the problems and causes, respondents were also given an opportunity to list and rate additional solutions which may not have been suggested.

Willingness to Collaborate Survey
The Wilder Collaboration Factors Inventory (WCFI), which has been used by organisations to assess their collaborative strengths and weaknesses (Mattessich, 2001), was used in this study to assess willingness to collaborate. Mattessich (2001) posited that the WCFI is a practical tool for discovering how organizational collaboration is doing. It is based on twenty factors that research has shown influences collaboration success. For the purpose of this study, the WCFI was adapted to reflect a more socio-community purpose particularly with respect to watershed management. Respondents

were asked to rate on a scale of 1 to 5, their level of agreement with the suggested item statements presented to them. Responses were scored; 1-strongly disagree, 2- disagree, 3- no opinion, 4- agree and 5- strongly agree. Table 1, highlights the collaboration factors respondents were required to rate.

Table 1 Modified Wilder Collaboration Factors Inventory. Validation of the research scales

Collaboration Factors	
Environment for Collaboration	I am aware that my community already has a group working together to solve watershed management problems
Structure and Process	I am willing to compromise on important aspects of a community group effort
Communication	I would like to be informed as often as possible about what goes on in a community group
Mutual Respect, Understanding and Trust	I have great respect for others involved in community group work
Group Structure	Everyone who wants to be a member of a community group should be able to join the group
Concrete, Attainable Goals and Objectives	If I am involved in a community group I should clearly understand what the group is trying to accomplish
Shared Vision	When people are involved in community groups, they should expect that their ideas would be the same as those of others in the group
Unique Purpose 1	There is no other community group working together to solve watershed management issues in this community
Unique Purpose 2	Identifying and solving watershed management problems is easier with a group

Cronbach's alpha test statistic was used to assess the internal reliability of the three perception scales and the WCIF. This statistic measures how well the items on the test measure the same construct or idea being considered, and a rating of ≥0.6 is considered to be acceptable (Gliem and Gliem, 2003). All scales therefore returned with acceptable ratings: problems ($\alpha=0.89$), causes ($\alpha=0.92$), solutions ($\alpha=0.92$) and WCFI ($\alpha= 0.60$).

Data Analysis

Responses gathered from the purposive samples, were summarised and analysed using the Statistical Package for the Social Sciences (SPSS) version 20 and Microsoft Excel 2010.

Descriptive statistics, including frequencies were presented to communicate the results. Means were utilised to rank the watershed management problems, causes and solutions from most important to least important. One-way ANOVA was done to assess similarities and differences in perceptions among the four stakeholder groups. Reporting focussed on similarities of perceptions. One- way ANOVA is

typically used to determine whether or not there are any statistically significant differences between the means of three or more independent (unrelated) groups.

In order to assess stakeholders' level of willingness to collaborate, a summated scale was derived by summing each respondent's rating for each of the 9 WCFI. Given that each of the 9 used WCFI were rated using a 5-point rating scale, the level of willingness to collaborate was obtained by multiplying each of the 5 ratings by 9 (i.e. 1*9= 9, 2*9= 18, 3*9= 27, 4*9= 36, 5*9= 45. These results were subsequently converted into the level of willingness to collaborate continuum and interpreted: scores between 9 and 18 were considered as low levels of willingness to collaborate, scores between 19 and 27 were considered as moderate levels of willingness to collaborate and scores between 28 and 45 as high levels of willingness to collaborate.

RESULTS
Description of survey respondents

The majority of respondents were female (57%), within the 18-35 age group (58%) and from the primary stakeholder category (48%).

STATISTICS AND DATA ANALYSIS
Rank order of stakeholders' perceptions of problems

Table 2 presents the ranking of problems as perceived by stakeholders. Based on the calculated mean responses, pollution, because of dumping garbage into rivers and at the roadsides and flooding were perceived to be the most serious watershed management problem. This was followed pollution of sewage directly and indirectly into rivers or streams and unplanned physical development in the area. Squatting, silting of rivers due to quarrying and construction, excessive application of fertilizers and pesticides and over-cultivation of the land were perceived as moderate importance problems. Pollution of waterways by industries and slash and burn agriculture were perceived as low in importance as problems affecting the watershed (Table 2).

Table 2 Ranking of watershed management problems

Rank	Problem	Mean Score	Std Dev.
1	Pollution (dumping of garbage in rivers and side of roads)	3.45	1.306
2	Flooding	3.16	1.449
3	Pollution of sewage directly and indirectly into rivers or streams	2.83	1.429
4	Unplanned physical development in the area	2.69	1.473
5	Squatting (illegal occupation of land)	2.61	1.477
6	Silting of rivers due to quarrying and construction	2.56	1.470
7	Excessive application of fertilizers and pesticides	2.49	1.320
8	Over-cultivation of the land	2.48	1.314
9	Pollution of waterways from industries	2.44	1.417
10	Slash and burn Agriculture	2.41	1.342

Rank order of stakeholders' perceptions of causes

Table 3 presents the results of the ranking of stakeholders' perceptions of causes of watershed problems. The results showed that general public disregard for the environment, the concern that legislation was not being properly enforced and legislation not being properly enforced were perceived and thus ranked by stakeholders as the most important causes of the watershed management problems. This was followed by specific environmental concerns, inadequate education and legislation and laws issues. Uncontrolled urbanisation, deforestation, quarrying and climate change were perceived as low -importance causes of watershed management problems.

Table 3 Ranking of perceptions of causes to watershed management problems

Rank	Cause	Mean Score	Std Dev.
1	Public generally disregards the environment	4.03	1.217
2	Unenforced fines	3.85	1.289
3	Legislation not being properly enforced	3.84	1.288
4	Unaware of who to lodge an environmental complaint with	3.71	1.257
5	Does not view environmental conservation as a personal responsibility	3.70	1.362
6	Poor environmental practices by householders, businesses, Gov't	3.69	1.349
7	Poor coordination between agencies when addressing environmental problems	3.67	1.252
8	Inadequate education and awareness campaigns	3.64	1.29
9	Legislation has not been updated to address current issues	3.56	1.295
10	Ineffective laws/ regulations	3.55	1.362
11	Inadequate garbage disposal and treatment systems	3.46	1.369
12	Overlap of institutional roles and responsibilities	3.41	1.318
13	Climate change	3.33	1.353
14	Environmental laws/ legislations are confusing	3.16	1.375
15	Indiscriminate construction of houses	3.08	1.446
16	Uncontrolled urbanisation	2.94	1.438
17	Deforestation	2.86	1.487
18	Quarrying	2.49	1.49

Rank order of stakeholders' perceptions of solutions

Table 4 presents the ranking of solutions to watershed management problems. It showed similar high perceptions to all solutions presented to stakeholders. Mean responses showed that respondents held the perception that penalties should be properly enforced on those who do not comply with the laws and legislation being properly enforced were ranked as the most important solutions. Having more public education and awareness campaigns, ensuring that a land and water management policy is properly enacted and more coordination among government agencies were also perceived as important solutions. Having more up-to date and applicable regulations and clear legislation, although very important, were lowest ranked solutions as perceived by stakeholders.

Table 4 Ranking of solutions to watershed management problems

Rank	Solutions	Mean Score	Std Dev.
1	Penalties should be properly enforced to those who do not comply with the laws	4.52	0.925
2	Legislation should be properly enforced	4.36	0.936
3	Public education and awareness campaigns	4.30	0.963
4	Ensuring land and water management policy is properly enacted	4.27	0.956
5	More coordination among government agencies	4.26	0.964
6	Institutional roles and responsibilities should be clear when it comes to environmental management	4.26	0.960
7	Having a land and water management policy for the country	4.23	0.965
8	More coordination between government agencies and NGOs	4.20	1.006
9	Legislation should be clearly stated and specific	4.20	1.002
10	More up-to-date and applicable regulations	4.06	1.075

Similarities and differences of stakeholders' perceptions of problems relating to main watershed management

The results of the One-Way ANOVA indicated that stakeholders, despite the category they belonged to, rated five out of the ten suggested watershed management problems as similarly important. The problems for which similar perceptions were held included; flooding (p= 0.194), pollution as a result

of dumping of garbage in rivers and road sides (p=0.459), over-cultivation of the land (p= 0.153), pollution due to sewage entering water courses either from a direct or indirect source (p= 0.141) and pollution of waterways due to industrial activities (p= 0.081).

Stakeholder perceptions on problems of watershed management differed on concerns related to; slash and burn agriculture (p= 0.001), squatting (p= 0.001), excessive application of fertilizers and pesticides (0.010), silting of rivers due to quarrying and construction (p= 0.038) and unplanned urban development (p= 0.005).

Table 5 ANOVA results showing similarities and differences of stakeholder perceptions of watershed management problems

Problem	F	Sig.
Flooding	1.581	0.194
Slash & Burn Agriculture	7.530	**0.001****
Squatting	6.686	**0.001****
Pollution (dumping of garbage in rivers and side of roads)	0.867	0.459
Over-cultivation of the land	1.772	0.153
Excessive application of fertilizers and pesticides	3.823	**0.010****
Pollution of sewage directly and indirectly into rivers or streams	1.837	0.141
Silting of rivers due to quarrying and construction	2.842	**0.038****
Unplanned physical development planning in the area	4.324	**0.005****
Pollution of waterways from paint, other chemical manufacturing and metal fabrication industries	2.272	0.081

**Significant (P-value ≤0.05) differences among the four stakeholder groups in their perceptions related to watershed management problems.

Similarities and Differences of stakeholders' perceptions of the main causes of watershed management problems

Table 6 presents the ANOVA results assessing similarities and differences amongst stakeholders' perceptions of the main causes of watershed management problems. Results indicate that stakeholders shared similar perceptions of importance on seven of the eighteen possible causes to watershed management problems. These similarities were related to: inadequate education and awareness campaigns (p= 0.729); the poor coordination among agencies when addressing environmental problems (p= 0.144); the inadequate garbage disposal and treatment systems (p= 0.499); the apparent confusion when it comes to understanding environmental laws and legislation (p=0.047); being unaware of where to lodge an environmental complaint (p= 0.433); general public disregard for the environment (p=0.834) and climate change as an issue (p= 0.733).

There were several observed differences perceptions of causes. These included issues such as the indiscriminate construction of houses, uncontrolled urbanisation, quarrying, deforestation, the ineffectiveness of laws, unenforced fines poor environmental practices, outdated and unenforced legislation, overlap of roles and responsibilities and environmental conservation not being seen as a personal responsibility.

Table 6 ANOVA results showing similarities and differences in stakeholder perceptions of the causes of watershed management problems

Causes	F	Sig.
Inadequate education and awareness campaigns	0.434	0.729
Poor coordination between agencies when addressing environmental problems	1.819	0.144
Inadequate garbage disposal and treatment systems	0.793	0.499
Indiscriminate construction of houses	4.876	**0.003****
Uncontrolled urbanization	9.757	**0.001****
Quarrying	7.898	**0.001****
Deforestation	9.660	**0.001****
Ineffective laws/ regulations	6.184	**0.001****
Unenforced fines	3.549	**0.015****
Poor environmental practices by householders, businesses, Gov't	3.691	**0.013****
Environmental laws/ legislations confusing	2.683	0.047
Legislation has not been updated to address current issues	4.586	**0.004****
Legislation not being properly enforced	5.148	**0.002****
Overlap of institutional roles and responsibilities	6.620	**0.001****
Unaware of where to lodge an environmental complaint	0.917	0.433
Does not view environmental conservation as a personal responsibility	4.213	**0.006****
Public generally disregards the environment	0.288	0.834
Climate change	0.429	0.733

**Significant results (P-value ≤0.05), indicating differences among the four stakeholder groups in their perceptions to the causes of watershed management problems

Similarities and differences of stakeholders' perceptions on solutions to the watershed management problems

Results in table 7 show a fair amount of similar perceptions on possible solutions to watershed management problems. Respondents showed similar perceptions of importance to six out of the ten possible solutions presented to them. These were related to; the need for more public education and awareness campaigns, better coordination among government agencies and NGOs, the need for legislation to be properly enforced, having a land and water management policy for the country, ensuring land and water management policy is properly enacted, clarity of institutional roles and responsibilities, and enforced policies.

Stakeholders differed on issues such as; the need for increased coordination among government agencies, the need for legislation needed to be updated, that legislation should be clearer and more specific and having a land and water management policy for the country.

Table 7 ANOVA results of similarities and differences of stakeholders' perceptions of solutions to watershed management problems

Solution	F	Sig.
More Public education and awareness campaigns	2.106	0.100
Increased coordination among government agencies	4.660	**0.003****
Better coordination between government agencies and NGOs	2.407	0.068
Up-to-date and applicable regulations	3.163	**0.025****
Legislation should be clearly stated and specific	2.874	**0.037****
Legislation should be properly enforced	2.182	0.091
Having a land and water management policy for the country	2.649	**0.049****
Ensuring land and water management policy is properly enacted	0.528	0.664
Institutional roles and responsibilities should be clear when it comes to environmental management	2.231	0.085
Penalties should be properly enforced to those who do not comply with the laws	0.993	0.397

**Significant results (P-value ≤0.05), indicating differences among the four stakeholder groups in their perceptions to the solutions related to watershed management problems.

STAKEHOLDERS' LEVEL OF WILLINGNESS TO COLLABORATE

Summated scores on the Wilder Collaboration Factor Inventory were categorised and interpreted as three levels of willingness to collaborate on watershed management actions. Categories and scores are as follows: low level of willingness (score 9-18); moderate level of willingness (score 19-27); and high level of willingness (score 28-45).

The results indicated that 9.2% (n=13) of all the stakeholders expressed a low level of willingness to collaborate, 69.5% (n=98) expressed a moderate level of willingness to collaborate and 21.3% (n=30) of the stakeholders were very willing to collaborate with community activities geared toward addressing watershed management issues.

DISCUSSION

This paper identified and ranked the perceptions of different groups of stakeholders as it related to watershed management problems, causes and related solutions. A further research objective assessed similarities in the perceptions of the stakeholders. It was hypothesized that for effective collaboration to take place, most stakeholders should share as much similarity in perceptions related to watershed problems, causes and related solutions. Pollution because of persons dumping garbage into rivers and at the roadsides, Flooding and Pollution from sewage entering waterways either from a direct or indirect source were ranked as the top watershed problems. In lieu of these problems, the number one cause identified by stakeholders related to the perceived notion that there is general disregard for the environment. This coupled with institutional pitfalls such as; legislation not being properly enforced, poor coordination between agencies when addressing environmental problems and inadequate education and awareness campaigns were considered as being drivers to the most prevalent watershed management problems. The results of this study appear to be comparable to the findings of the Northern Range Assessment conducted by Agard et al. (2004). This assessment concluded that the public sees the enforcement of policies and regulations as exclusively the responsibility of the public sector; and public motivation to comply with environmental laws is very low. From the perceptions, top ranking causes were public general disregard for the environment and legislation not being properly enforced. Additionally, the perception of enforcement of penalties on those who do not comply with the law was the lowest perceived solution to address the watershed management problems, This, ties in with the major causes for the main problems of pollution due to dumping of garbage, flooding and pollution as a result of sewage entering waterways from either a direct or indirect source, which suggested that stakeholders are not intimidated by possible penalization for wrong doing. This suggests increased education efforts and improved monitoring by the environmental agency to prevent some of these problems are recommended. Bekele and Ganpat (2015) noted that ecological impacts are likely to increase especially in an era of climate change and as such, capacity has to built through education of young adults and children.

There was a 50% similarity of agreement among all stakeholders in terms of the watershed management problems (agreement on 5 out of 10 suggested factors). However, in terms of the causes of these problems, there was a lower (39%) similarity among all stakeholder groups in terms of their agreement on the causes to the problems (agreement on 7 out of 18 suggested factors). Stated another way, there were more differences in opinions of causes than similarities; stakeholders' perception differed on 11 of the 18 issues presented to them. These included issues such as the indiscriminate construction of houses, uncontrolled urbanisation, quarrying, deforestation, the ineffectiveness of laws, unenforced fines poor environmental practices, outdated and unenforced legislation, overlap of roles and responsibilities and environmental conservation not being seen as a personal responsibility. These findings suggest greater consideration should be given into examining the reasons why there was not greater consensus regarding stakeholder perception on the causes of watershed management problems. Higher levels of agreement on possible causes can help in finding appropriate solutions to problems. A further qualitative study is recommended to examine this issue.

In terms of the solutions, 60% level of agreement among all stakeholder groups with regards to the suggested solutions (agreement on 6 out of 10 suggested factors). According to Patel et al. (2012), a benefit of collaboration includes improved decision making via the sharing of insights and knowledge. The high level of importance ascribed to the solutions presented to stakeholders is a good entry point for development action.

Based on the results relating to similarities and differences in perceptions to watershed management problems, causes and related solutions, the possibility exists that primary stakeholders, although they stand to be affected mostly by the problems, may not view their actions as causes to the problems. For successful collaboration to take place, emphasis should be placed on improving the perceptions of stakeholders in terms of the causes to the problems and appropriate decisions can be made regarding addressing the problems within the watershed itself. Additionally, having improved coordination efforts from relevant institutions can serve as the main entry point for enhancing their collaboration among all stakeholders.

Attempting a collaborative approach towards watershed management in Trinidad appears to be possible in that the majority of stakeholders had moderate to high level of willingness to collaborate with each other when it comes to addressing the various watershed management problems, causes and related solutions. However, the success of such a collaborative approach relies on the stakeholders' actively collaborating with each other, sustaining the effort at collaboration and having a suitable institutional landscape whereby support is offered and available and accesible, since there appears to be bottlenecks at the institutional level which may hinder successful collaborative attempts at watershed management.

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