INTEGRATING CROSS-SECTORAL WATERSHED MANAGEMENT TO ADDRESS LAND-BASED SOURCES OF MARINE POLLUTION: THE CASE OF THE DEMERARA WATERSHED, GUYANA

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Land-based marine pollution from a variety of sources is an important problem worldwide. It is generally estimated that around 80% of marine pollution can be attributed to land-based sources (LBS) (UNEP/GPA 2006). Pollution from LBS includes industrial wastes, sewage, sediments, oil, pesticides, and fertilizers, and may come from direct inputs (point-sources), run-off (non-point-sources), and deposition from airborne pollutants. Activities such as agriculture, deforestation, industry, tourism, and urban development are the leading causes of water pollution and sediment runoff to coastal areas. In the small coastal nation of Guyana, concern for sustainable development has lead to an awareness of LBS pollution issues at the highest levels of the government. This has prompted the decision to join the international community in an integrated planning process to address both pollution as a source of human illness and pollution as a source of environmental degradation. Using the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) as a mechanism for garnering support, Guyana's environmental and health-related ministries and agencies have partnered with other government entities (internally and abroad), international and non-governmental organizations, and the private sector to address land-based marine pollution in the Demerara River watershed.

In 2006, the Guyanese government and the United States government entered into an agreement to address Guyana's water pollution issues. The result was that a team of U.S. Agency partners were assigned to assist the Guyanese government in developing and integrating a Water Safety Plan (WSP) under the World Health Organization's guidelines and a National Program of Action (NPA) under the GPA. The main partners of this project, per signed agreement, are: the Guyanese Ministry of Health; the Guyanese Environmental Protection Agency (EPA); the U.S. National Oceanic and Atmospheric Administration (NOAA); the U.S. Geological Survey (USGS); the U.S. Centers for Disease Control (CDC); the Pan American Health Organization (PAHO); and the Caribbean Environmental Health Institute (CEHI).

This group undertook site visits of four proposed communities during the fall of 2006. The government then selected Linden, Guyana as the demonstration site for the joint activity with the intention that the project will integrate planning for the watershed (NOAA 2006). The partners (listed below) intend to eventually expand the project to include all of the nation's watersheds and act as a model for replication in other countries of the region (NOAA 2006). Due to budget

and logistical constraints, the project has been limited to a pilot project focused on the Demerara River watershed, specifically to small sub-section of the watershed surrounding the municipality of Linden. For the purposes of this study, however, analysis is based on the watershed level because of the difficulty of acquiring sub-watershed level information.

The ultimate goals of the WSP/NPA are to reduce human health risks by providing safe drinking water and reduce land-based sources of marine pollution through an integrated approach. The main objectives of the WSP/NPA partner project are to (NOAA 2006):

- Undertake a joint NPA and WSP for the Municipality of Linden and the surrounding watershed
- Undertake a pre and post health survey to demonstrate possible health impacts
- Assist executing agencies in the implementation of the recommendations of the WSP

In order to develop and implement the WSP/NPA, it is important to understand the knowledge, perceptions, and desires of the organizations and individuals involved in the process, the stakeholders. A stakeholder is defined as, according to Freeman (1984), "any group or individual who can affect or is affected by the achievement of the organization's [plan's] objectives." Stakeholder involvement is largely accepted as important for resource management efforts, helping a process gain legitimacy and future buy-in (MacKenzie 1996). An integrated approach to management includes a wide variety of stakeholder interests. This study examines the context within which the Guyanese WSP/NPA plan is being written and implemented, focusing on an analysis of stakeholder interviews, using the results to develop a series of recommendations for better implementation of the resulting WSP/NPA. Research was conducted using qualitative interviewing; personal observation made during one Steering Committee meeting and one stakeholder workshop for the WSP/NPA during two consecutive trips to Guyana; and by examining existing publications including academic journals, books, periodicals, and agency documents released as a part of the WSP/NPA project.

Methods

In an effort to get a general sense of the perceptions and knowledge of the stakeholders involved with the WSP/NPA, a series of in-depth, face-to-face qualitative interviews were conducted with professionals involved in the field. The questions revolved around three central issues that were deemed important for the WSP/NPA process and implementation: pollution priorities; organizations and public interactions; and issues with integration. Participants were selected using a stratified and non-random sampling method, identifying individuals who are involved in the WSP/NPA project, or are representatives of stakeholders of this project, and limited to those who were available and willing

to participate. Initial participants were identified through meeting invitation lists while additional participants were identified through the snowball method, where an interviewee provides information on additional people to contact (Miles and Huberman 1994, Erlandson *et al.* 1993). Using both the invitee lists and snowball method, 85 potential individuals were contacted for this study from the Guyanese government (all levels), US government, non-governmental organizations, international organizations, and the private sector. Of these, 20 were available and willing to participate, 16 who had been invited to a WSP/NPA meeting in the past and 4 who were suggested to me by these respondents.

These interviews were conducted by one interviewer (the author), were confidential, and were semi-structured with open-ended questions to focus the responses for later analysis. No answers were suggested to respondents. The questions focused on knowledge of pollutants and sources in the Demerara watershed, how the individual's organization interacts with the public on these issues, and perceptions of institutional integration efforts and possibilities. Most interviews were conducted in the offices of the interviewees in Guyana or outside at the facility where a workshop for the project was taking place, each lasting an average of 45 minutes. Seven of the interviews were tape-recorded with permission, but the rest were either not recorded because participants opted out of the recording or because of location issues where wind would have rendered the recording useless. Two participants, who could not meet during my trips to Guyana, were asked to provide answers to the same questions as in the face-to-face interviews using email; however, these online interviews lacked the probes and nonverbal information gained through face-to-face interviews. Both of these online interviews were with American respondents who required little to no further explanation of the question's meanings. No compensation was offered for participants.

All interviews were transcribed and the results were sorted and re-sorted by organization type using the program Atlas.ti, checking for patterns and common themes, deviations or inconsistencies from patterns, interesting anecdotes or explanations that emerge from the responses. Each interview was binned according to a broad "organization-type" category for analysis in order to protect individual confidentiality. These four categories are: Guyanese Government (n = 5), all individuals who work for or are elected to a position in the government of Guyana at any level; Private Sector (n = 6), all individuals who work for a private company/firm, represent a specific industry, or own their own business within this watershed; Other Organizations (n = 5), all individuals who work for non-profits, international organizations, multilateral funding entities, and individuals who are independent contractors hired by government and other organizations; and U.S. Government (n = 4), all individuals who work for a U.S. government agency.

Selected Results and Discussion

The interviews resulted in a complex picture showing that pollution of the Demerara affects all stakeholders, whether rich or poor, urban or rural. There is a sense of urgency portrayed in the interviews: that without help, the state of water resources will continue to decline even while the public is becoming more aware of the issues. The respondents generally did not express concern about the environment itself being degraded, more about the relationship between environmental degradation and human needs and losses associated with that decline. Implementing the WSP/NPA will need to take into consideration several of the key issues that came up.

During the interviews, respondents frequently discussed constraints that affect their organization's ability to address pollution in the watershed, resulting in 19 distinct categories of constraints. The most common constraint is *financial* with 19 mentions out of 73 total mentions of constraints. Here finances were either lacking or an organization was felt to be very constricted in how finances could be used. Most all of the other constraints mentioned can be attributed to a lack of or constraints on finances. For instance, funding is necessary to hire, train, and keep employees, and/or pay for data collection, which were other constraints mentioned. Taken as a whole, financing is the most important constraint for sustaining an integrated effort in this watershed and most likely efforts in Guyana in general. The WSP/NPA will need to include long-term funding mechanisms and technology transfer guidelines to ensure that the organizations tasked with implementation can afford to add new tasks to their mandates and actually carry them out.

Another result of the interviews is that most of the respondents, although involved in the WSP/NPA, have a lack of knowledge about pollution and its effects in the watershed. Most all respondents preempted their answers with either an "I am not sure, but" or "I don't know, maybe." The lack of knowledge can be explained by a lack of dissemination of existing information and the lack of overall data collection taking place. Yet, even with not knowing, most all were able to list sources of pollution that match a known list from a SENES (2006) report on water quality in the Demerara. There were a total of 17 distinct types of sources of pollution mentioned in the 20 interviews. Of these, *unspecified mining* (n = 13) and *bauxite mining and infrastructure* (n = 10) are the most frequently mentioned sources. The *bauxite* category includes all issues with the processing factory and its pipes. Although mining does occur nearby the small town of Linden, it is not clear from the respondents' answers that they are fully aware of what, if any chemicals or effluents are actually being released. All mining categories, including gold mining, make up approximately 36.4% of the sources mentioned, the highest percentage of all sources. Based on these results, it seems likely that the stakeholders should be able to agree that mining of some kind is an important issue to them in the watershed and develop shared goals toward reducing mining effects. The information about what actually is

present within the watershed should be distributed to the stakeholders so that they can become better informed to be able to better participate in the process.

Fianlly, a new list of stakeholders beyond those who are currently invited to participate in the WSP/NPA development were identified, totaling 36 new entities and organizations. It is recommended that the WSP/NPA government partners examine the new list and develop an outreach strategy to include these stakeholders in development and implementation. Through increased stakeholder involvement, a more robust integrated effort can be achieved, harnessing the expertise and resources from all stakeholders while garnering buy-in for decisions.

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