EVALUATION OF
ENVIRONMENTAL EDUCATION AND AWARENESS PROGRAMS
OF THE WWF-GUIANAS
IN THE SMALL- & MEDIUM-SCALE GOLD MINING INDUSTRY
IN GUYANA

Sherwood Lowe
Evaluation of Environmental Education and Awareness Programs of WWF-Guianas in the Small-& Medium-Scale Gold Mining Industry in Guyana.

Sherwood Lowe
Department of Geological Engineering, Faculty of Technology
UNIVERSITY OF GUYANA.

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Notes on terminology

The literature on evaluation research and public programs is replete with different terms that refer to the same thing, and with the same terms that have different meanings. For clarity, this section defines key terms used in this report.

Assumptions: our beliefs about the situation, why the program will work, and how people will behave.

External factors: the broad social, cultural, economic and political environment in which the program exists and over which the program may have little or no control and which may influence or be influenced by the program.

Impact: the ultimate consequence or effects of the program (for example, less environmental degradation or fewer mining accidents). Impacts are at the end of the chain of outcomes.

Inputs: what we invest (resources and contributions, including time, partnerships, technology and research).

Logic model or framework: a simplified model that shows the relationships (the chain of reasoning) between the situation or context, inputs, outputs and outcomes or results. Used for planning, managing, evaluation and communication of programs.

Objectives: statements of intent expressed in terms of inputs and outputs only (e.g., to increase the number of projects or the area of coverage). Goals are wider in scope.

Outcomes: the direct results or benefits for individuals, groups, communities, organizations, or systems.

- short-term (or initial) outcomes: the knowledge, awareness, skills, attitudes, opinions, and motivations acquired.
- medium-term (or intermediate) outcomes: the resulting actions, behaviors, practices, policies, and decisions.
- Long-term (or final) outcomes: ultimate changes in conditions or the situation (same as impacts) Long-term outcomes are normally the program goals.

Outputs: what we do (activities and events) or what we offer (products and services) together with whom we reach or target (participants, stakeholders, policy-makers). Outputs (unlike outcomes) may not produce benefits for beneficiaries.

Program: set of human interventions organized and integrated to achieve a set of pre-determined objectives in a given period, applying financial and other resources.

---

1 Some models consider outputs as the products of activities and therefore place outputs after activities. This study agrees with the usage that such products are measurements or indicators (level of implementation) of activities.
**Program theory:** the assumptions and beliefs that program designers have about the logical relationships among the program's input, output, outcome and impact (logic model) and about cause and effect relationships (theory of change model).

**Project:** an operation, delimited in scope, schedule and resources, executed as a component of a program.

**Social marketing:** the application of commercial marketing and public communication techniques in public programs to change the behavior of a target group in ways that benefit the group itself and the larger society.

**Theory of change:** the set of assumptions that explain both the steps that lead to the long-term goal and the connections between program activities and outcomes that occur at each step of the way (Weiss, 1995). Theories may come from evaluation studies, best practices, research evidence, local wisdom and the social sciences.

**Theory-based evaluation (TBE):** assessing the program within a large social science theory. May also encompass smaller program-specific theories.
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>EE&amp;A</td>
<td>Environmental Education and Awareness</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EM</td>
<td>Environmental management</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency (of Guyana)</td>
</tr>
<tr>
<td>GGDMA</td>
<td>Guyana Gold and Diamond Miners Association</td>
</tr>
<tr>
<td>GGMC</td>
<td>Guyana Geology and Mines Commission</td>
</tr>
<tr>
<td>IAST</td>
<td>Institute of Applied Science and Technology</td>
</tr>
<tr>
<td>KAP (or KAB)</td>
<td>Knowledge, Attitude and Practice (or Behavior)</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>OH&amp;S</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>SIA</td>
<td>Social Impact Assessment</td>
</tr>
<tr>
<td>SM</td>
<td>Social marketing</td>
</tr>
<tr>
<td>SMS</td>
<td>Small and medium scale</td>
</tr>
<tr>
<td>UG</td>
<td>University of Guyana</td>
</tr>
<tr>
<td>WWF-Guianas</td>
<td>World Wildlife Fund (Guianas)</td>
</tr>
</tbody>
</table>
Executive summary

The WWF-Guianas, in an attempt to support the governments of the region in promoting sustainable development, has intervened in the SMS gold mining sector with the objective of alleviating some of its negative environmental and human impacts. Over the past decade, the organization has provided technical and financial resources and has worked with a range of sector stakeholders, such as the Guyana Geology and Mines Commission (GGMC), mining communities and small and medium-scale gold miners.

The WWF-Guianas has commissioned this study to evaluate the impact of one of the major components of its involvement, viz., its environmental education and awareness (EE&A) programs for small and medium-scale gold miners and other stakeholders.

The evaluation study is to be used by the WWF-Guianas to judge the worth of completed EE&A programs so as to either make a decision about their continuation (a “go/no-go” decision), or provide guidance for the redesign of programs to make them more effective.

In terms of overall research strategy, this study adopted both a measurement approach (comparing performance against stated or implied criteria and indictors) and an explanatory approach (with its emphasis on cause-and-effect relationships). Specific steps included data collection, generation and review; construction and description of program theories (models) and indicator systems; and evaluations based on the results of the previous steps.

Main findings include:

i) Evaluation (as measurement of effects) of the programs of the WWF-Guianas was impractical due to several reasons, foremost among which were the involvement of other organizations in the EE&A field (producing a global effect) and the difficulties of using quasi-experimental social science measurement techniques.

ii) Evaluation (as explanation of effects) suggested that the information-deficit model (the “knowledge to attitudes to behavior” linear chain) commonly used in WWF programs was unlikely to produce the desired pro-environmental and pro-health behaviors in SMS miners.

iii) Analysis of combined or global effects (from programs of all stakeholders) highlighted likely progress in the knowledge and attitudes of miners with regards to environmental and health issues. The high awareness, for example, among miners of the harmful effects of mercury (and the measures of protection) suggests that EE&A programs have had an effect.

iv) Field evidence and theory suggest that some of the key assumptions in the logic models of programs may not hold to a significant extent. Foremost among these is that GGMC field staff pass on knowledge learnt at training of trainers workshops to miners.

v) Given the scope of the problem, WWF programs over the years may not have generated the critical mass of outputs required to produce and sustain meaningful behavior changes among SMS miners.
vi) Project activities that involved WWF personnel (full-time and consultants) directly conducting education and awareness sessions for miners likely would have produced little impact because of insignificant coverage and participation.

vii) New programs will require substantial redesign to deliver better results.

Fourteen recommendations are made at specific points in the text of the report. Examples include:

**RECOMMENDATIONS - 2**

A review of WWF programs suggests that attention is given mainly to summative evaluations, covering several programs over a span of years. It is recommended that formative evaluations be integrated into individual projects to guide program implementation.

**RECOMMENDATIONS - 3**

We strongly recommend that:

- evaluation of programs includes both the measurement of outcomes/impacts and the identification of cause and effect relationships (explanations or theories). The latter set of information can guide the design of new programs by uncovering what works, how and for whom. In a word, the days of the so-called black box evaluation should be over.

- designers of programs must include features (e.g., measurable indicators, control groups, etc) to facilitate the evaluation of programs.

**RECOMMENDATIONS - 8**

Systematic formative and summative evaluations can provide much evidence for what works and what does not. One of the main recommendations of this study is for the WWF-Guianas to include evaluation as a standard element of its EE&A programs.
**RECOMMENDATIONS - 9**

Consideration should be given to more effective impact models, such as the Health Belief Model and the Community Social Marketing approach (see chapter 4 for further discussion).

**RECOMMENDATIONS - 10**

The field testing of assumptions and beliefs in the program logic can provide a wealth of information as to if and how what works. Simple techniques like pilot testing, questionnaire surveys, focus group discussions, and quasi-experiments are recommended to reduce the guess work in project design and implementation.

**MAIN RECOMMENDATION**

This study recommends the continuation of EE&A programs, but only on the condition that programs are conceptualized and implemented differently.

A strategic framework is proposed, encompassing three core objectives and ten strategies to reach those objectives (see overleaf). The framework is aimed at increasing the quality and quantity of EE&A interventions cost-effectively. In addition, objectives and strategies are chosen that are:

- in concert with one another.
- readily implementable.
- in sync with or continue some of the current WWF efforts.
- attainable (thus avoiding the grandiose).
EVALUATION STUDY: WWF-Guianas’ Environmental Education and Awareness Programs in SMS gold mining in Guyana

**PROGRAMS and POLICIES**

1. Implement training in EE&A project design, management and implementation to increase internal and external capacities.

2. Increase the use of social science research, evaluation studies, institutional experience and good practices in the design of programs.

3. Institutionalize evaluation as a mandatory component in all WWF EE&A programs.

**OBJECTIVES**

1. To increase the effectiveness of EE&A programs in terms of demonstrated outcomes and impacts, starting from the next program cycle.

2. To increase the number and regularity of EE&A interventions, starting from the next program cycle.

3. To support and coordinate EE&A efforts with other stakeholders.

**GOAL**

To increase the effectiveness of EE&A programs in terms of demonstrated outcomes and impacts, starting from the next program cycle.

**STRATEGIES**

1. Implement training in EE&A project design, management and implementation to increase internal and external capacities.

2. Increase the use of social science research, evaluation studies, institutional experience and good practices in the design of programs.

3. Institutionalize evaluation as a mandatory component in all WWF EE&A programs.

**POLICIES**

1. Support and coordinate EE&A efforts with other stakeholders.

2. Emphasize training of trainers in programs.

3. Build capacity at the community level to plan, execute or evaluate interventions.
In selecting and designing programs and activities to execute strategies within the proposed strategic framework, several recommendations have been made at key points in the report, most of which can be used as policy guidelines. For emphasis, we rephrase a few key recommendations in terms of what WWF-Guianas should emphasize and de-emphasize in its choice of programs and activities.

The WWF-Guianas should **emphasize** programs/activities that:

i) promote sustainability of impacts (such as training of trainers; production of codes of practice, manuals, and social marketing products; capacity building);

ii) have a high effort-to-result ratio (working in partnerships or through better-resourced stakeholders);

iii) are built on best practices, sound program theory, local wisdom and institutional experiences.

The WWF-Guianas should **de-emphasize** programs that are:

i) one-off and stand-alone in scope (such as some demonstrations and site visits). These activities should be integrated into a larger program;
ii) too ambitious or complex in scope. Given the difficulty in changing human behavior, a more effective approach may be to set program objectives that are intermediate steps along the pathway to the ultimate behavior change.

iii) limited in coverage because they rely on too few internal staff or outside consultants to conduct field operations, such as visiting mine sites. Better to continue to work through organizations, such as the GGMC, that have greater reach.

Specific guidelines for program designers include:

i) select programs and activities that exploit external opportunities and reduce drawbacks

ii) become more acquainted with the current trends in the design of social and education programs, especially with the use of theory-based models and social marketing techniques.

iii) provide detailed reports and records to build a shared repository of experiences, wisdoms and practices.

iv) use findings from relevant research and evaluations to make designs more evidence-based.

v) make underlying assumptions and beliefs explicit.

vi) use a general approach as suggested below.
They do not do

so

we must understand why

through

Could be based on grand socio-psychological theories and/or local wisdom.

- meetings with miners.
- focus groups.
- questionnaires.
- research findings.
- experiences of others.
- program evaluations.
- social sciences theories.

to determine whether miners don't do because they

explicitly address causal links and show credible impact pathways or program theories.

Traditional education methods not enough. More complex approaches needed.

- lack information/ awareness.
- lack desire.
- lack resources.
- lack skills and self-efficacy.
- see no net benefits.
- see no problem.
- do not remember.
- do not care.
- do not agree.

we design intervention programs

then

Evaluations required to provide feedback on program performance.

design programs

they do.
CHAPTER 1: Introduction

A. Background

B. Intended use of evaluation results

C. Scope of evaluation

D. Methodology
A. BACKGROUND

Over the past decades, the negative consequences of small and medium scale (SMS) gold mining in the Guianas have caused widespread concerns, especially with regards the harmful effects of mercury on the human and physical environments. These concerns have intensified as the environmental footprint of SMS gold mining has increased, more so with the currently persistent high world price for the commodity.

The WWF-Guianas, in an attempt to support the governments of the region in promoting sustainable development, has intervened in the SMS gold mining sector with the objective of mitigating its damaging impacts. With the commencement, for example, of the Guianas Sustainable Natural Resources Management Program (GSMRMP) in 2007, WWF-Guianas increased its technical capacity to implement programs with the objective of abating gold mining pollution.

As its main approaches, the organization has provided technical and financial resources and has worked with a range of sector stakeholders, such as the Guyana Geology and Mines Commission (GGMC), and with mining communities and gold miners themselves.

The WWF-Guianas, however, believes that, despite its huge commitments, significant environmental and health problems still confront the sector. As a program funder, planner and manager, the organization is keen to determine what impact its programs and activities have had on alleviating the problem. The WWF-Guianas has therefore commissioned this study to evaluate the effects of one of the major components of its involvement, viz., its environmental education and awareness (EE&A) programs for small and medium-scale gold miners and other stakeholders.

B. INTENDED USE OF EVALUATION FINDINGS

Evaluation is the application of social research methods for assessing the conceptualization, design, implementation and utility of intervention programs (Rossi & Freeman, 1993). It can be used for several purposes, including deciding on program continuation; determining legitimation and accountability; improving policies and programs; and producing new knowledge. According to the Terms of Reference, the evaluation study is to be used by the WWF-Guianas to judge the worth of completed EE&A programs so as to either

i) make a decision about their continuation (a “go/no-go" decision), or

ii) provide guidance for the redesign of programs to increase their effectiveness.

The evaluation design is therefore tailored to these requirements.
C. SCOPE OF EVALUATION

The study extended to:

(i) environmental education and awareness programs targeting SMS gold miners and other sector stakeholders in Guyana funded, designed or conducted by the WWF-Guianas in the last decade;

(ii) all stages of the intervention process (from conceptualization to implementation).

As regards (i), the evaluation encompassed several programs over a span of years, designed and conducted by different persons, incorporating different emphases and activities. This report provides a separate assessment of the major programs, but focuses more on providing a general overview.

These programs and their EE&A components are\(^2\):

   - Improvement of environmental management and occupational health and safety practices (4 reports).
   - Demonstrating and testing more environmentally-friendly methods of gold recovery (1 report).

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\(^2\) Two requested EE&A reports were not received; one on a WWF/ GGDMA project, the other on a WWF/MoH project.
• Mercury Sensitization program for jewelers (1 report).


• Environmental Management Training (6 reports).

In addition, the study reviewed two documents that propose an EE&A strategy for the WWF-Guianas. These are:

i) Environmental Education and Awareness Assessment of Small- and Medium-scale Sector in Guyana. WWF-Guianas Regional program (Sparman, 2009).

ii) An Environmental and Education Awareness Strategy for the Small- to Medium-Scale Gold Mining Sector in Guyana (Vieira, 2007).

The study also gave due consideration to smaller or one-off EE&A activities of the WWF-Guianas, such as workshops for university students, distribution of retorts to miners, and technical assistance to miners.

E. METHODOLOGY

General characteristics

Two conceptually distinct sets of questions can be posed in evaluating the effects of public programs: one set deals primarily with the measurement of effects, the other with the explanation of effects. This study adopted both a measurement approach (comparing actual performance against stated or implied criteria and indicators) and an explanatory approach (with its emphasis on cause-and-effect relationships).

Research strategy

The overall strategy of the study involved constructing models of the EE&A programs under review, followed by an analysis and evaluation of critical components, links and assumptions of the models.
Specific tasks

i) Data collection, generation and review

- A review of EE&A project reports to determine their input-output-outcome-impact chain (logic model) and implicit and explicit program theories.
- A review of research on the local mining sector, especially those that included questionnaire surveys of gold miners.
- A review of scientific literature on human attitudes and behavior from the fields of sociology, psychology and environmental science.
- Questionnaire survey and interview of GGMC field staff (done for this study).
- Questionnaire survey and interview of EE&A program funders, designers and managers (done for this study).
- Focus group discussion with SMS miners in the field. (done for this study).
- Questionnaire survey of university students, trained at WWF workshops (done for this study).
- Street-view assessment of visibility of EE&A campaigns in mining communities (done for this study).

ii) Construction and description of program theories (models) and indicator systems.

- logic models.
- theory of change models.
- summary tables of performance indicators.

iii) Evaluation of programs, based on (i) on (ii).

- process evaluation
- evaluation of external factors
- outcomes and impacts evaluation
- sustainability evaluation.

Limitations to methodology

Several limitations were encountered in choosing a design for the evaluation:
(i) No longitudinal research method was possible to measure the impact of interventions. Most of the participants of EE&A programs would be difficult or impossible to find because no record was kept of their identities and whereabouts at the time, or they would have since relocated.

(ii) Likewise, cross-sectional studies were ruled out because of the anticipated difficulties of finding two populations for comparisons (one previously exposed to EE&A programs of the WWF-Guianas alone, and the other exposed to none from any provider).

(iii) None of the projects included an evaluation component of their own (at least, to measure outcomes beyond the short term).

(iv) Programs did not include an extensive indicator (performance measurement) system.

(v) The education and awareness work of other organizations, such as the GGMC and the Ministry of Health, made it difficult to determine the net effect caused by the programs of the WWF-Guianas.

Because of these factors, little practical scope existed to implement a useful measurement-of-impact design in line with the demand of the Terms of Reference. It is in this context that one secondary purpose set for this study is to identify those conditions needed to improve the quality and usability of evaluations in future (see Recommendations -1).

**Design considerations to mitigate limitations**

The evaluation relied on several measures to compensate for the stated limitations and thereby ensure the evaluation results still remained useful and usable.

(i) The global or combined impact of EE&A programs in the SMS gold sector from all program sponsors (the WWF-Guianas, the GGMC, etc), was assessed through the findings of questionnaire surveys, field visits and interviews of key informants. This assessment allowed progress and challenges to be identified and measured. Future interventions could therefore be planned against this evidence base.

(ii) The possibility that programs delivered on their stated outcomes and impacts was gauged by testing the validity of key assumptions in the program theories or models (a theory-based evaluation approach).
RECOMMENDATIONS - 3

We strongly recommend that:

- evaluation of programs includes both the measurement of outcomes/impacts and the identification of cause and effect relationships (explanations or theories). The latter set of information can guide the design of new programs by uncovering what works, how and for whom. In a word, the days of the so-called black box evaluation should be over.

- designers of programs must include features (e.g., measureable indicators, control groups, etc) to facilitate the evaluation of programs.
CHAPTER 2: Description and analysis of projects

A. Introduction

B. Description of individual projects
A. INTRODUCTION

This chapter reconstructs and describes each of the projects under the following headings:

- parent programs.
- stated project objectives.
- logic models in graphical form.
- theory of change models in graphical form.
- stated and implied performance indicators.

These elements are used in the following chapters as the basis of the evaluation study. The four programs under consideration are:

1. Improvement of environmental management and occupational health and safety practices.
2. Demonstrating and testing more environmentally-friendly methods of gold recovery.

B. DESCRIPTION OF INDIVIDUAL PROJECTS

<table>
<thead>
<tr>
<th>Name of project</th>
<th>Name of WWF program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designing an environmental education and awareness program using the techniques of social marketing.</td>
<td>The Guyana Small- and Medium-scale Gold Mining Management Improvement Project (GGMMIP). WWF/GGMC. (May 1, 2004 to March 31, 2007).</td>
</tr>
</tbody>
</table>

Objectives of project

- Conduct a workshop for GGMC, EPA and the IAST staff to improve the capacity in Environmental Education and Awareness program design and execution.
- Prepare brochure for distribution to miners and mining community members on the new mining regulations and the environment, tailings management occupational health and safety, and Vector Borne Diseases frequently occurring in the mining areas.
- Reach miners in the mining areas for face to face dialogue in Environmental Management and Occupational Health and Safety as it relates to Small and Medium Scale Gold Mining.
Project logic model

FIGURE 2-1: Project logic model #1.
Theory of change model

FIGURE 2-2: Theory of change model #1.
Performance indicators

<table>
<thead>
<tr>
<th>ACTIVITIES (SERVICES + PRODUCTS)</th>
<th>PARTICIPANTS/BENEFICIARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Indicators (stated or implied)</td>
</tr>
<tr>
<td>Training workshop on SM</td>
<td>1</td>
</tr>
<tr>
<td>EE&amp;A workshops in the mining districts</td>
<td>Not stated</td>
</tr>
<tr>
<td>Site visits</td>
<td>Not stated</td>
</tr>
<tr>
<td>Production of posters and pamphlets</td>
<td>Several thousands</td>
</tr>
<tr>
<td>Production of program mascot “Smithy” (Appendix I)</td>
<td>1</td>
</tr>
<tr>
<td>Production of T-shirts, caps, calendars, stickers, songs and other SM products</td>
<td>Not stated</td>
</tr>
</tbody>
</table>

Objectives of program

- train GGMC officers, as trainers, in specific aspects of environmental impact assessment, social impact assessment and environmental management systems, as related to the Prospecting and Mining Permits, Claim License, the Environmental Management Agreement and the Mining Amendment Regulations (2005), emphasizing improvement of the ability of GGMC officers to transfer their knowledge in this area to miners effectively to bring about necessary change in attitude and behavior.
• sensitise SMS miners on issues related to Environmental Impact Assessment and Social Impact assessment of mining activities.

• train miners in Environmental Management and in developing appropriate Environmental Management Systems for small and medium scale mining operations considering the need to meet the requirements of the Environmental Management Agreement and the Mining Amendment Regulations (2005), thus promoting responsible and environmentally friendly mining.

• recommend training required to raise their knowledge to the standard acceptable for all parties to function effectively as managers of the environment in their respective capacities.

Project logic model

![Project logic model #2.](image-url)
Theory of change model

FIGURE 2-4: Theory of change model #2.
### Performance indicators

**TABLE 2-2** Stated and implied indicators, with level of achievement

<table>
<thead>
<tr>
<th>ACTIVITIES (SERVICES + PRODUCTS)</th>
<th>PARTICIPANTS/BENEFICIARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Indicators (stated or implied)</strong></td>
</tr>
<tr>
<td>Training workshop on EIA, SIA and EM</td>
<td>1</td>
</tr>
<tr>
<td>Workshops in the mining districts</td>
<td>Not stated</td>
</tr>
<tr>
<td>Production of training manuals</td>
<td>2</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>1</td>
</tr>
<tr>
<td>Production of EM plan</td>
<td>1</td>
</tr>
<tr>
<td>Post-workshop test</td>
<td>1</td>
</tr>
</tbody>
</table>
**Objectives of project**

- to demonstrate mercury free technology to local miners in Guyana in an effort to alleviate mercury pollution.

**Project logic model**

![Project logic model](image)

**Theory of change model**

This is in the form of a basic KAP structure (see Figure 2-1).

**Performance indicators**

```
<table>
<thead>
<tr>
<th>ACTIVITIES (SERVICES + PRODUCTS)</th>
<th>PARTICIPANTS/BENEFICIARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Indicators (stated or implied)</td>
</tr>
<tr>
<td>Demonstrations</td>
<td>Not stated</td>
</tr>
<tr>
<td>SMS miners</td>
<td>Not stated</td>
</tr>
</tbody>
</table>
```
EVALUATION STUDY: WWF-Guianas’ Environmental Education and Awareness Programs in SMS gold mining in Guyana

Name of project: Mercury Sensitization Program for Jewelers

Objectives of project

- minimizing exposure of jewelers and the environment to mercury.

Project logic model

Theory of change

This is in the form of a basic KAP structure (see Figure 2-1).

Performance indicators

<table>
<thead>
<tr>
<th>ACTIVITIES (SERVICES + PRODUCTS)</th>
<th>PARTICIPANTS/BENEFICIARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Indicators (stated or implied)</td>
</tr>
<tr>
<td>Training sessions</td>
<td>Not stated</td>
</tr>
<tr>
<td>Visits to workshops</td>
<td>Not stated</td>
</tr>
</tbody>
</table>
RECOMMENDATIONS - 4

Project proposals must include:

- a useful set of measurable performance indicators to allow for monitoring and evaluation.
- clear statements on the assumptions and beliefs behind the internal workings of the design. In a word, implicit and hidden assumptions must be made explicit.
CHAPTER 3: Evaluation of programs

A. Introduction

B. Process evaluation

C. Evaluation of program theories

D. Evaluation of external factors

E. Outcomes and impact evaluation

F. Sustainability evaluation
A. INTRODUCTION

Evaluation is not an end in itself. The time, money and effort in evaluation have to be justified in terms of the improvements it brings to public programs, by delivering more benefits to people and their environment (EVALSED, 2008). From the Terms of Reference for this study, the findings are to be used to inform future policy-making and program design. The following sections are therefore descriptive as well as prescriptive. Projects are evaluated collectively as a group.

B. PROCESS EVALUATION

Process evaluation (summative, in this study) looked at the outputs (activities and participants) of programs in terms of (i) their type, (ii) their effectiveness and suitability (in theory and as-used) for project goals, and (iii) their degree of attainment. With regards to (ii), the self-explanatory terms “impact-facilitating” and “impact-mitigating” are used to provide judgments on each type of activity and participant based on the experiences reported by program administrators and on the opinion of the evaluator.

Degree of attainment is evaluated against implied and stated indicators as discerned from project reports. The results are shown in the tables in the previous chapter under Performance Indicators.

<table>
<thead>
<tr>
<th>TABLE 3-1</th>
<th>Activities (the services and products of a program)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impact facilitating features</td>
</tr>
</tbody>
</table>
| Training workshop (Georgetown) | • High sustainability possible through training of GGMC staff.  
• Easy to monitor and evaluate.  
• High attendance. | • Some participants not in the position to use knowledge gained for the benefit of SMS miners (see Table 3-2). |
| Training workshop (Interior) | • Direct contact with miners and other Interior stakeholders. | • Relatively low turnouts of miners.  
• Attendance limited only to “the willing”.  
• Inadequate teaching methods and facilities in cases.  
• Impact hard to evaluate in the medium to long term, as miners are hard to relocate or their behavior influenced by other factors. |
**EVALUATION STUDY: WWF-Guianas’ Environmental Education and Awareness Programs in SMS gold mining in Guyana**

### Priority Consideration

Priority consideration should be given to activities that:

- promote sustainability of impacts (such as production of training manuals and codes of practice).
- increase the capacity of institutions, communities and beneficiaries (training, donation of equipment, networking).
- are cost-effective or provide more bang for the buck (e.g., distribution of pamphlets and posters, working in partnerships).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Priorities</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field visits by project staff</td>
<td>• Direct contact with miners and other Interior stakeholders.</td>
<td>• Low coverage of mining operations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Effort-to-benefit ratio oft-times high (the field visits in the 2005 SM project, for instance, involved long travel distances to Aremu and White Creek to meet only a small number of miners).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Timing may be inopportune for miners, given their work schedule.</td>
</tr>
<tr>
<td>Posters, pamphlets.</td>
<td>• Potentially facilitate awareness, retention, recall, visibility and sustainability.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ease of distribution.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Easy to pilot test and evaluate.</td>
<td></td>
</tr>
<tr>
<td>Training manuals and codes of practice.</td>
<td>• Sustainability of impact potentially high.</td>
<td>• Less effective if not user-friendly and pedagogically-based.</td>
</tr>
<tr>
<td></td>
<td>• Facilitate consistency in training.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Costs effective.</td>
<td></td>
</tr>
<tr>
<td>Demonstrations</td>
<td>• Effective as a teaching method.</td>
<td>• Low coverage of target population.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Difficulties in staging many events due to size and weight of equipment.</td>
</tr>
<tr>
<td>Distribution of retorts to miners</td>
<td>•</td>
<td>• Wrongly assumes barrier to retort use has to do with its availability.</td>
</tr>
<tr>
<td>Donation of equipment to GGMC, UG and others</td>
<td>• Increases institutional capacity.</td>
<td></td>
</tr>
</tbody>
</table>

**RECOMMENDATIONS - 5**

Field visits by project staff...
## TABLE 3-2 Participants

<table>
<thead>
<tr>
<th>Participants</th>
<th>Impact facilitating features</th>
<th>Impact mitigating features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SMS gold miners</strong></td>
<td>• Primary target.</td>
<td>• Low geographic coverage.</td>
</tr>
<tr>
<td></td>
<td>• Educated.</td>
<td>• Low attendance at workshops.</td>
</tr>
<tr>
<td></td>
<td>• Mostly licensed and thus easily defined and targeted.</td>
<td>• Participation limited to “the willing”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No differentiation done into labourers, managers, and owners.</td>
</tr>
<tr>
<td><strong>GGMC field staff</strong></td>
<td>• High coverage.</td>
<td>• Secondary target.</td>
</tr>
<tr>
<td></td>
<td>• Potential for high sustainability.</td>
<td>• Sub-optimal selection of participants for workshops based on their regular duties (6 of the 17 participants of the EIA/SIA workshop were attached to the Mineral Processing Lab in Linden and, therefore, were unlikely to regularly interface with SMS miners).</td>
</tr>
<tr>
<td></td>
<td>• Low to medium staff turnover (13 of the 18 staff members at the 2005 SM workshop, and 13 of the 17 at the 2009 EIA/SIA workshop, still work at the GGMC).</td>
<td></td>
</tr>
<tr>
<td><strong>Jewelers</strong></td>
<td>• Primary target.</td>
<td>• Participation limited to “the willing”.</td>
</tr>
<tr>
<td></td>
<td>• Mostly registered and thus easily defined and targeted.</td>
<td>• Low attendance.</td>
</tr>
<tr>
<td><strong>UG students (Department of Geological Engineering)</strong></td>
<td>• Based on proven assumption that most students will work in mining industry after graduation.</td>
<td>• Long and uncertain impact pathway to SMS miners (questionnaire survey of attendees suggests knowledge from workshops has not been used outside of school environment. See Appendix II).</td>
</tr>
<tr>
<td><strong>Families of SMS miners</strong></td>
<td>•</td>
<td>• Several social and cultural variables involved; impact pathway needs to be tested.</td>
</tr>
</tbody>
</table>
The synoptic view provided by this process evaluation provokes a critical question for program sponsors, such as the WWF-Guianas, to consider: what is the critical mass of input resources, activities and participants (on an annual basis) necessary for any one organization to produce meaningful improvements to the lives of people and their environment? Are, for instance, four demonstrations or workshops a year impacting enough? Given the huge undertaking of persuading several thousands of gold miners to adopt pro-environmental, pro-health and pro-social behaviors, the question is more than academic.

**Performance indicators**

Ideally, indicators provide direct information on the measure of success of a program. When applied to the key components of a program (input resources, outputs, outcomes and impacts), they could facilitate an assessment of key attributes such as its effectiveness, efficiency, performance and relevance.

Tables 2-1, 2-2, 2-3 and 2-4 in chapter 2 present in summary form the program indicators (stated and implied in the reports) and their level of attainment. Note that:

- indicators are sparsely used.
- indicators are overwhelmingly linked to activities.
- as such, outcome and impact indicators are rarely used.
- indicators are biased towards measurement of output effectiveness (as opposed to efficiency, etc).

In addition, programs can target participants such as:

- formal and informal community leaders.
- subsets among SMS miners, viz., owners, managers, and labourers.
- newly-formed miners associations in the various districts.
- women.

Low attendance severely affected the impact of several meetings and training sessions with miners in the fields. Incentives should be offered to encourage attendance.
For the few indicators that are reported the corresponding activities were implemented fully (100%) in most cases. For the above-stated reasons, however, we cannot form firm conclusions for evaluation purposes.

**RECOMMENDATIONS**

- Indicators must be measureable where possible, more wide-ranging and focus on outcomes and impacts.
- Indicators must measure not only effectiveness but also efficiency and utility.
- Indicators should be standardized across WWF programs to facilitate comparisons across projects, areas, participants and time.

**C. EVALUATION OF THEORY OF CHANGE MODELS**

**Introduction**

Among the fundamental questions that could be asked of a program are those that probe the assumptions and beliefs sponsors and designers hold about how people will behave and why activities will work. Weiss (1995) calls this a program’s “theory of change”. Rossi and Freeman (1993) use the broader term impact model. These underlying assumptions and beliefs are mostly implicit or hidden. In practice, their veracity and value are commonly taken for granted during the design and implementation of programs. Nevertheless, they can be the main causes for program under-achievement or failure.

According to Pawson and Tilley (2004) “social programmes are regarded as products of the human imagination: they are hypothesis about social betterment. Programmes chart out a perceived course whereby wrongs might be put to rights, deficiencies of behaviour corrected, inequalities of condition alleviated. Programmes are thus shaped by a vision of change and they succeed or fail according to the veracity of that vision.”

The authors further assert that evaluation “has the task of testing out the underlying programme theories. When one evaluates realistically one always returns to the core theories about how a programme is supposed to work and then interrogates it - is that basic plan sound, plausible, durable, practical and, above all, valid?”

In short, the modern view of evaluation favors an approach that attempts to make these implicit assumptions explicit and to examine their veracity and effects against scientific theories and findings, evaluation studies, institutional experience, and good practices. This is evaluation as explanation of effects as opposed to measurement of effects. It is going inside the black box.
This evaluation study, given the stated difficulties with generating useful data for measurement, placed great emphasis on assessing program theories to determine whether program outcomes were actually achieved.

Data requirements

The logic models and, more particularly, the theory of change models from Chapter 2 form the basis of this level of evaluation. None of the EE&A interventions under review espoused a program theory in an explicit manner, with the mild exception of the project that incorporated social-marketing techniques. As such, the theory of change models in Chapter 2 were constructed from project reports and from the author's familiarity with some of the programs.

More than a few of the assumptions and beliefs in the models appear plausible (for example, the pamphlets used in the SM project increased retention and comprehension among miners). But whether they actually worked as envisaged can only be verified through testing. As such, a few key assumptions and expectations in the program logic were tested against field evidence and social science theory.

RECOMMENDATIONS - 8

Systematic formative and summative evaluations can provide much evidence for what works and what does not. One of the main recommendations of this study is for the WWF-Guianas to include evaluation as a standard element of its EE&A programs.

Main program theory

The assumption underlying all programs was that providing SMS gold miners with scientific knowledge (e.g., the harmful health effects of mercury) and technical know-how (e.g., how to conduct an EIA) would cause them to adopt and maintain pro-environmental behaviors by changing their abilities, attitudes and beliefs. Kollmuss and Agyeman (2002) point out that this model (described as both a rationalist and an information deficit model) assumes a linear progression from “environmental knowledge leading to environmental awareness and concern (environmental attitudes), which in turn was thought to lead to pro-environmental behavior”. In essence, the KAB or KAP progression is assumed to be powered by education and awareness.

Testing of program assumptions against socio-psychological theories

What is the evidence from the fields of sociology and psychology on the effectiveness of this model? Much research since the 1970s has shown this assumption to be wrong. Only a small fraction of pro-environmental behavior can be explained by increases in environmental knowledge and
environmental awareness (Kollmuss and Agyeman, 2002; Contento, 2010). The difficulties in explaining and changing behavior are reflected by the substantial number of competing scientific theories that has sprung up over the decades. Nevertheless, information-centred interventions still remain the popular approach of governments and NGOs, probably because of their simplicity and ease of execution. Figure 2-1 depicts this basic approach.

We here hypothesize that the KAB linear model of EE&A programs may not have produced hoped-for impacts, even assuming that the education process was effectively conducted. The environmental actions of miners are influenced by a complexity of factors. Outside of contextual
Consideration should be given to more effective impact models, such as the Health Belief Model and the Community Social Marketing approach (see chapter 4 for further discussion).

**Testing of program assumptions against field data.**

To specifically test a few of the assumptions and beliefs in the program models, a focus group discussion was conducted among managers and managers/owners of mining operations in the Port Kaituma area, North-West District. The focus group technique was chosen to facilitate an in-depth and full-ranging discourse, an opportunity not normally enjoyed by questionnaires. Twelve persons were invited; eight attended. The session was frank and lasted for two hours.

The specific assumptions under assessment were:

i) GGMC field staff (after training) pass on knowledge to SMS miners in the fields as a regular part of their duties.

ii) Miners receive and read pamphlets and posters.

iii) Miners are applying pro-environmental behaviors.
ASSUMPTION: GGMC field staff, after training, pass on knowledge to SMS miners in the fields as a regular part of their duties.

Focus group unanimously expressed the view that GGMC field staff do interface with miners but do not pass on information on pro-environmental and pro-health behaviors.

Findings by King (2012; pp. 51-53) also suggest that GGMC field staff do not conduct enough training activities, at least to the satisfaction of miners.

A close review of the lists of GGMC attendees of the SM workshop in 2005 and the EIA/SIA workshop in 2009 reveals two interesting facts:

- 28 of the approximately 35 persons trained still work at the organization, a circumstance conducive for high sustainability of program outcomes.
- a significant number of persons, however, in the 2009 workshop were chemical engineers and mineral processing technicians, all assigned to the GGMC Mineral Processing Lab in Linden and therefore not likely positioned to pass on their training to SMS miners in a regular manner.

Training of trainers is one of the main fulcrums of EE&A programs in Guyana. If information is not reaching miners as expected, then program designers and managers have to unearth and inspect their assumptions and make necessary adjustments to program design.
ASSUMPTION: Miners receive and read pamphlets and posters.

Focus group unanimously expressed the view that miners do receive pamphlets and posters, but irregularly. They find such material useful, but impact could be increased by more frequent distribution.

Apart from this finding, one key informant posited that distribution of pamphlets, etc is among the most sustainable of activities of EE&A programs of the WWF-Guianas.

The stated assumption therefore holds to a limited extent.

ASSUMPTION: Miners are applying pro-environmental behaviors based on knowledge received.

Focus group unanimously expressed the view that pro-environmental behaviors are the exception rather than the norm, due mainly to lack of knowledge and care.

Questionnaire results (Bynoe, 2009; King, 2012), for example, show that over 90% of miners are aware of the harmful effects of mercury. They are also aware of the appropriate protective gear. Likewise, over 88% of jewelers claimed to know of the dangers of mercury (SEES, 2012). Yet these and other surveys (and personal observations) also confirm that the use of protective gear (retorts, gloves and respirators) is not widespread.

The stated assumption does not hold to a significant extent.
Also tested during the focus group discussion was whether the free distribution of retorts would encourage miners to use them. From the answers, it remains clear that perceived and actual barriers have to be surmounted before retorts are used more widely. These include: slow production rate of retorts; the difficulty of finding an intense heat source; and the security risk of a prolonged refining process.

While these results cannot be extended to all mining areas, they are indicative of the weaknesses of some key assumptions.

The field testing of assumptions and beliefs in the program logic can provide a wealth of information as to if and how what works. Simple techniques like pilot testing, questionnaire surveys, focus group discussions, and quasi-experiments are recommended to reduce the guess work in project design and implementation.

### D. EVALUATION OF EXTERNAL FACTORS

External factors refer to the broader social, cultural, economic and political environment in which the program exists and over which the program may have little or no control. They exert much influence on program outcomes and are considered to be the greatest factor in changing behavior (Kollmuss and Agyeman, 2002). For the SMS gold industry, five of the main external influences are:

i) government policies and legislation on mining, the environment and related matters.
ii) institutional and regulatory structure, capacity and activities.
iii) quality of transportation and communication infrastructure in the mining districts.
iv) community and national values and norms.
v) technical and financial capacity of SMS miners.

To varying degrees, the first four factors are facilitative of successful program outcomes in Guyana. The country, for example, has a modern set of environmental protection policies, laws and regulations on mining. In the GGMC, we have a public mining institution that continues to increase its capacity to administer the SMS gold industry, particularly in terms of providing technical support and enforcing regulations. Access to mining areas (and to target populations) poses challenges in many cases, but a network of airstrips, dry-weather roads and rivers allows for potentially wide program coverage. In terms of social norms, public acceptance is low but growing that protecting the environment is an essential goal of national development.

As regards the fifth factor, miners and their associations have claimed lack of capacity to be a major hindrance to the adoption of environmentally-friendly practices. This argument will likely acquire more potency should the industry be asked to shift to mercury-free technologies. In selecting EE&A
interventions, the WWF-Guianas should determine upfront if this factor would seriously undermine the impact of programs in the long term.

While the external environment mostly influences social interventions, the reverse has also proven to be true; programs can try to change the environment. Within the WWF-Guianas ambit, we can point to several such attempts:

- support for the development of institutional capacity and activities of the GGMC through funding, training of staff and donation of equipment.
- submission of proposals on environment regulations and codes.
- participation in the national discussion on environment and mining matters.

**RECOMMENDATIONS - 11**

- The WWF-Guianas should continue to work with the government and other stakeholders to improve policy and legislation.
- In light of the movement towards mercury-free mining, the technical and financial capabilities of miners must be addressed more urgently than previously.

**E. OUTCOMES AND IMPACT EVALUATION**

The purpose of impact evaluation is to measure, interpret and judge to what extent improvement efforts have met their short and long-term goals (Stufflebeam, 1983). The terms “outcome” and “impact” relate to actual changes achieved by or within the target population. In this report, impact is at the end of “the outcome chain” that starts from short-term outcomes (knowledge, skills, etc), through to medium-term outcomes (practices, actions, etc) to long-term outcomes or impacts (the desired or unplanned changes in conditions).

The net impact of EE&A programs sponsored or managed by the WWF-Guianas was impossible to determine because, as already pointed out in Section 1E,

i) programs report mostly outputs (number of attendees or workshops, etc),

ii) none of the project designs included a strong evaluation component to allow for a direct or quantitative assessment of medium to long-term impacts.

iii) the presence of education and awareness programs sponsored by organizations other than the WWF-Guianas (such as the GGMC and the Ministry of Health) made it difficult to determine the net effect of WWF-Guianas programs.

iv) no longitudinal evaluation method could be employed because participants of EE&A programs would be difficult or impossible to find because either no record was kept of their identities and whereabouts, or they would have long since relocated.
v) cross-sectional studies likewise could not be undertaken because of the anticipated difficulties of finding two populations for comparison (one previously exposed to WWF-Guianas EE&A programs alone, and the other exposed to none from whatever source).

As an alternative, we analysed the results of questionnaires and other data collection techniques done for this and other studies to form conclusions with regards the knowledge, attitude and practice of SMS gold miners on environmental and health matters. Table 3-3 presents the main results of the surveys used.

Given the complexity of factors that influence the behavior of miners, it would be purely speculative to draw conclusions about the contribution of EE&A programs in general.

**TABLE 3-3** Description and main findings of questionnaire surveys

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sample population</th>
<th>Sample number</th>
<th>Sample location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Bynoe et al</td>
<td>2009</td>
<td>SMS gold miners</td>
<td>160*</td>
<td>Mining districts 2,3,4, 5</td>
</tr>
<tr>
<td>2  King</td>
<td>2012</td>
<td>SMS gold miners</td>
<td>80</td>
<td>Mahdia</td>
</tr>
<tr>
<td>3  Lowe (this study)</td>
<td>2013</td>
<td>GGMC field staff</td>
<td>51</td>
<td>GGMC, Brickdam</td>
</tr>
</tbody>
</table>

* for some questions, n = 136.

**GENERAL INFORMATION**
- 87% of miners have at least primary education.
- 65% of miners involved in mining for over 10 yrs.
- 9.4% worked less than 5 yrs.
- 83.7% of miners have at least primary education (including 27.5% secondary).
- 81.3% of miners come from areas other than Mahdia, mostly from the coast.
- 41.2% started mining less than 5 yrs ago.
- The vast majority of GGMC field officers believed that miners have easy access to official information on environmental matters.
- Most officers rated the quality of relationship between themselves and miners as high.

**KNOWLEDGE**
- 14.4% of miners felt their operations had no environmental impact.
- 50.5% identified mercury and turbidity as impacts.
- 77.2% of miners were aware of both the mercury retort and settling ponds as measures to reduce negative environmental impacts.
- Approx. 79% of miners understood the necessity of wearing protective gear to handle mercury.
- Only 34% of miners were aware of the EU ban on mercury trade.
- 92.5% believed mercury is dangerous.
- 93.8% of miners were unaware of mercury-free recovery technologies.
- 90% claimed not to have received information from relevant authorities.
- 36% of officers rated miners’ knowledge of environmental regulations as high (above average).
EVALUATION STUDY: WWF-Guianas’ Environmental Education and Awareness Programs in SMS gold mining in Guyana

- 91.3% of miners thought mercury harmful to humans and other life forms.

### ATTITUDES

- Approx. 65% of miners agreed that mining significantly impacts the environment.
- Approx. 21% disagreed with the above statement.
- approx. 89% of miners accepted personal responsibility for mining impacts.
- 65% of miners saw a need to adopt mercury-free alternatives.
- Only 16% of officers rated as high the sense of personal responsibility of miners towards environmental protection.

### PRACTICES/BEHAVIOR

- 79.3% of miners indicated they took some action to protect the environment.
- The vast majority use mercury during the final stages of recovery.
- 72.2% of miners do not use protective gear mainly because of discomfort.
- 75.5% of miners claimed to use a retort, mainly to prevent wastage of mercury.
- 88% of GGMC field officers rated the extent of retort use by miners as medium to high.
- They rated the use of respirators and gloves by miners much lower.
- 84% of officers reported seeing negligible use of mercury-free technologies by miners.
- most officers rated as average to low the extent to which miners discharge slurry into streams directly from sluices.

### Tentative conclusions from data

- the use of mercury retorts among SMS miners has significantly increased. The situation is likely due to the expected increase in the price of mercury occasioned by the international restrictions/ban of mercury trade.
- awareness of the health hazard posed by mercury and the required protective measures appears high.
- high awareness does not produce marked changes in practices.
- low awareness of environmental regulations among SMS miners (as reported by GGMC field staff) suggests more interventions are required to improve the situation.
- the lack of awareness and use of mercury-free technologies among SMS miners suggests one area of immediate focus for EE&A programs.
In addition, the focus group discussion among SMS managers in the Port Kaituma area (described in section 3C) also highlighted that:

- the surrounding communities exert no or little influence on the actions of miners.
- miners in the area have attempted to self-organise into an association, but efforts have floundered.
- the higher price for mercury has not motivated the use of retorts (which contradicts the questionnaire finding).
- little knowledge exists of mercury-free processing technologies (which supports the questionnaire finding).
- miners are very receptive to future EE&A initiatives.

**Street-view assessment of visibility of EE&A campaigns**

While in Port Kaituma, the evaluator used the opportunity to conduct a street-view assessment of the visibility of EE&A campaigns by searching for education posters on the walls of shops, hotels, offices and other structures. Only one poster was found (Appendix IV).

One of the major shortcomings of EE&A programs in the local mining sector is its lack of visibility. Unlike high-intensity campaigns, such as that for HIV/AIDS, messages on pro-environmental behaviors are hidden, sporadic or incomplete. Little use is made of posters, banners, stickers, billboards, TV and other forms of mass communication.

**Programs should incorporate marketing techniques for product and service design, placement and promotion to make campaigns visible and to raise critical awareness of issues among target audiences.**
F. Sustainability Evaluation

Several factors point to the possibility that programs have had some degree of sustainability. In principle, WWF programs could have achieved sustainability by way of (i) the training of trainers component involving GGMC staff, (ii) the production and dissemination of written material, such as training manuals and pamphlets, (iii) the donation of equipment to stakeholders, and (iv) environmental workshops for UG students from appropriate departments.

In reality, however, sustainability has been undermined by several circumstances. As earlier pointed out, trainers have not, or could not, performed as expected. Pamphlets and posters continue to be distributed, but not to the satisfaction of some miners. The use of donated equipment has had a few setbacks. Encouraging, however, is the continued use of the donated LUMEX RA915 plus mercury analyser by the GGMC. As regards workshops for UG students, the evidence from a questionnaire survey suggests that they have not made much use of the acquired knowledge outside of academic studies (see Appendix II).

RECOMMENDATIONS - 14

Other achievable facilitative factors that should be considered in future interventions include:

- developing hinterland community residents and stakeholders as monitors, inspectors, first responders and environmental scanners.
- developing the capacity of communities to initiate, plan or execute EE&A programs and other social interventions.
- emphasizing social marketing techniques.
- targeting dredge owners and managers (as opposed to laborers) as the persons better positioned to transfer knowledge and enforce practices.

3 For example, the instrument is used by GGMC-sponsored university students for final-year research on the SMS sector.
CHAPTER 4: Main findings and guidelines

A. Main findings

B. Main way forward recommendations for the WWF-Guianas

C. Strategic framework for EE&A programs

D. Policy and operational guidelines

E. Guidelines for program designers
A. MAIN FINDINGS

i) Evaluation (as measurement of effects) of the programs of the WWF-Guianas was impractical due to several reasons, foremost among which were the involvement of other organizations in the EE&A field (producing a global effect) and the difficulties of using quasi-experimental social science measurement techniques.

ii) Evaluation (as explanation of effects) suggested that the information-deficit model (the “knowledge to attitudes to behavior” linear chain) commonly used in WWF programs was unlikely to produce the desired pro-environmental and pro-health behaviors in SMS miners.

iii) Analysis of combined or global effects (from programs of all stakeholders) highlighted likely progress in the knowledge and attitudes of miners with regards to environmental and health issues. The high awareness, for example, among miners of the harmful effects of mercury (and the measures of protection) suggests that EE&A programs have had an effect.

iv) Field evidence and theory suggest that some of the key assumptions in the logic models of programs may not hold to a significant extent. Foremost among these is that GGMC field staff pass on knowledge learnt at training of trainers workshops to miners.

v) Given the scope of the problem, WWF programs over the years may not have generated the critical mass of outputs required to produce and sustain meaningful behavior changes among SMS miners.

vi) Project activities that involved WWF personnel (full-time and consultants) directly conducting education and awareness sessions for miners likely would have produced little impact because of insignificant coverage and participation.

vii) New programs will require substantial redesign to deliver better results.

B. WAY FORWARD RECOMMENDATIONS FOR THE WWF-GUIANAS

As pointed out in Section B of Chapter 1, the evaluation of programs is to be used by the WWF-Guianas to:

i) make a decision about their continuation (a “go/no-go” decision), or

ii) provide guidance for the redesign of programs to make them more effective.

MAIN RECOMMENDATION

This study recommends the continuation of EE&A programs, but only on the condition that programs are conceptualized and implemented differently.
In this regard, the following sections propose some of the required approaches (in addition to those already recommended in the body of the text). We note here that some suggestions support the continuation of good practices by the WWF-Guianas.

Recommendations in this chapter are subdivided into three parts based on their scope and intended primary audience:

i) a strategic framework for the EE&A programs of the WWF-Guianas.

ii) operational policy guidelines to circumscribe the scope of programs and activities.

iii) program design guidelines for sponsors, designers, and managers.

C. STRATEGIC FRAMEWORK FOR EE&A PROGRAMS OF THE WWF-GUIANAS

The WWF-Guianas must define its role in terms of where it can have effective reach or impact and de-emphasize strategies or programs where returns are likely to be limited or fleeting.

In devising an overarching strategic framework, we reviewed two earlier strategy documents on EE&A programs, commissioned by the WWF-Guianas. These are:

i) An Environmental and Education Awareness Strategy for the Small- to Medium-Scale Gold Mining Sector in Guyana (Vieira, 2007).

ii) Environmental Education and Awareness Assessment of Small- and Medium-scale Sector in Guyana. WWF-Guianas Regional program (Sparman, 2009).

The first strategy document was launched by the WWF-Guianas in April 2008 and covered a four-year period from 2007-2011. Its stated goal was to develop a long-term approach for public environmental awareness in the small and medium scale goldmining sector. The strategy identified ways for improving the design, coordination and delivery of education and training activities to support the achievement of the specific targets in the areas of:

- Degradation, loss and fragmentation of native vegetation cover and terrestrial, riverine, estuarine, habitat and biodiversity;
- High levels of induced mercury in rivers, creeks and soil;
- High turbidity of rivers and creeks due to the direct dumping of tailings and soil erosion;
- Socio cultural issues such as HIV/AIDS, malaria, drugs and crime; and
- Small paths of deforestation geographically scattered.

The second document emphasizes the role and practical scope of using the mass media in environmental awareness campaigns in the mining districts.

Not much of these plans seems to have been implemented. Nevertheless, as conceptual frameworks, they put forward important suggestions, several of which are supported by this study.
This study has attempted to propose objectives and strategies that are:

- in concert with one another.
- readily implementable.
- in sync with or continue some of the current WWF efforts.
- attainable (thus avoiding the grandiose).

Three objectives and ten strategies are proposed. Collectively, they aim to produce a higher quality and quantity of interventions without substantial additional resources.

**FIGURE 4-1: Proposed strategic framework for EE&A programs.**
Programs and events should be crafted or reformed to match specific strategies.

D. POLICY GUIDELINES

In selecting and designing programs and activities to execute strategies within the proposed strategic framework, several recommendations have been made at key points in the report, most of which can be used as policy guidelines. For emphasis, we rephrase a few key recommendations in terms of what WWF-Guianas should emphasize and de-emphasize in its choice of programs and activities.

The WWF-Guianas should emphasize programs/activities that:

iv) promote sustainability of impacts (such as training of trainers; production of codes of practice, manuals, and social marketing products; capacity building);
v) have a high effort-to-result ratio (working in partnerships or through better-resourced stakeholders);

vi) are built on best practices, sound program theory, local wisdom and institutional experiences.

The WWF-Guianas should de-emphasize programs that are:

iv) one-off and stand-alone in scope (such as some demonstrations and site visits). These activities should be integrated into a larger program;

v) too ambitious or complex in scope. Given the difficulty in changing human behavior, a more effective approach may be to set program objectives that are intermediate steps along the pathway to the ultimate behavior change.

vi) limited in coverage because they rely on too few internal staff or outside consultants to conduct field operations, such as visiting mine sites. Better to continue to work through organizations, such as the GGMC, that have greater reach.

E. GUIDELINES FOR PROGRAM DESIGNERS

In general, program designers must:

i) select programs and activities that exploit external opportunities and avoid or reduce drawbacks (Table 4-1).

ii) become more acquainted with the current trends in the design of social and education programs, especially with the use of theory-based models and social marketing techniques (see below for recommendations).

iii) provide detailed reports and records to build a shared repository of experiences, wisdoms and practices.

iv) use findings from relevant research and evaluations to make designs more evidence-based.

v) make underlying assumptions and beliefs explicit.

vi) employ the general approach suggested in Figure 4-2.
### SWOT analysis of WWF-Guiana

<table>
<thead>
<tr>
<th>Internal</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Education level at basic and above for most miners.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open-mindedness among miners to new technology and methods.</td>
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</tr>
<tr>
<td></td>
<td>Organized into associations (GGDMA, WMA, etc).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Growing number of GGMC field staff.</td>
<td></td>
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<tr>
<td></td>
<td>Presence of several organizations with interest in the industry.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>University with research capacity.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supportive government policies on environmental mining.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reachable through mass communication channels (SW radio, TV, newspapers, video halls, etc).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Imminent and current international ban and restrictions on mercury trade.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>External</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wide geographic spread of target population.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low public scrutiny and visibility of mining activity.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Culture of machismo in male-dominated sphere.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weak community influence.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Influx of Brazilian (non-English-speaking) miners.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Influx of new local persons into mining.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Illegal mining on the rise.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low sense of personal responsibility towards the environment.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operators–claimholders relationship.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attitude towards the hinterland as source only for money-making.</td>
<td></td>
</tr>
</tbody>
</table>
EVALUATION STUDY: WWF-Guianas’ Environmental Education and Awareness Programs in SMS gold mining in Guyana

They do not do

so

we must understand why

through

- meetings with miners.
- focus groups.
- questionnaires.
- research findings.
- experiences of others.
- program evaluations.
- social sciences theories.

to determine whether miners don’t do because they

- lack information/ awareness.
- lack desire.
- lack resources.
- lack skills and self-efficacy.
- see no net benefits.
- see no problem.
- do not remember.
- do not care.
- do not agree.

Could be based on grand socio-psychological theories and/or local wisdom.

explicitly address causal links and show credible impact pathways or program theories.

Traditional education methods not enough. More complex approaches needed.

we design intervention programs

that

Evaluations required to provide feedback on program performance.

they do.

FIGURE 4-2: Generic program conceptualization model for EE&A interventions.
**Designs based on scientific theories: the deduction approach**

As the study advocates the use of theory-based approaches in the design and implementation of EE&A programs, it would be remiss of us not to recommend a few. The selection is based on a review of those commonly in use in efforts to change human behaviors in areas such as health and lifestyles (smoking and drug abuse, nutrition and eating habits, sanitation and waste disposal, etc). In proposing approaches, it is recognised that the field of environmental education has its own models. Our suggestions, however, are limited to broader theories from sociology and psychology on human behavior (many of which serve as the basis on models on pro-environmental behavior).

We start by proposing that it may be of practical value to segregate the behaviors of SMS gold miners into three intrinsic components based on who or what suffers the consequences of the behavior. First, there are the behaviors that bring self-inflicted harm to the miner himself. Harms are mostly health related and include mercury poisoning, malaria, and STDs. Secondly, there are behaviors that damage the physical environment, leading to, for example, turbidity in rivers, deforestation and mercury-contaminated ground. The third component in behaviors involves those that affect others in the surrounding communities. Examples of such socially-impacting behaviors include crime and pollution.

Figure 4-3 depicts this model. The shaded bands emphasize that overlap exists among the three components.

### Figure 4-3: Components of behavior among SMS miners.

<table>
<thead>
<tr>
<th>Behaviors among SMS gold miners</th>
<th>Targeted behaviors of SMS miners</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrinsic components</strong></td>
<td></td>
</tr>
<tr>
<td>Personal health and risk (behaviors that directly affect one’s own health and health risk)</td>
<td>Environmental (behaviors that affect the physical environment)</td>
</tr>
<tr>
<td>Mercury handling. Sexual conduct. Using mosquito nets.</td>
<td>Social (behaviors that affect other people)</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td></td>
</tr>
</tbody>
</table>

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57
We suggest that there is conceptual and operational value for EE&A interventions to be cognizant of which component is dominant in the behavior targeted for change. Different components may be responsive to different approaches. Messages, for example, that encourage miners to reduce river turbidity may require a different slant from those that try to change their use of mercury. Mercury may be seen as more of concern by the miner (and the jeweler) because of its potential direct impact on his own health. Likewise, efforts to get miners to use mosquito nets and take anti-malaria medication might emphasize different strategies than those aimed at improving mining practices.

For behaviors that have a potentially direct health effect, this study recommends program designs used in the health education field. The most widely used is the Health Belief Model (HBM). Table 4-2 provides its basic structure and a proposed application in SMS gold mining in Guyana.

<table>
<thead>
<tr>
<th>Construct of Theory/Mediator Of Behavior Change</th>
<th>Definition</th>
<th>Applications to Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived severity</td>
<td>Beliefs about the seriousness of the consequences of a health condition.</td>
<td>Provide messages about the serious health effects of mercury poisoning, using visual images. If possible, arrange for afflicted persons to meet miners.</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>Chances of experiencing a risk or getting the condition.</td>
<td>Provide messages or activities to personalize risk for individuals based on self-assessment tools.</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>Beliefs about desired advantages in performing actions.</td>
<td>Literally increase benefits (may need government support); make hidden benefits explicit; increase value of known benefits.</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>Beliefs about the psychological or tangible costs or obstacles to taking the action.</td>
<td>Provide skills and services; simplify or eliminate steps; make change reachable by scaling back behavior goals; introduce SOPs and memory cues; work with suppliers to make products available; address negative consequences; reduce perceived or actual costs.</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Confidence in one’s ability to carry out the action.</td>
<td>Provide skills; simplify complex actions; create interim benchmarks; provide manuals; show evidence of similar-others performing actions.</td>
</tr>
<tr>
<td>Cues to action</td>
<td>Strategies to activate readiness to take the action.</td>
<td>Provide reminders about the behavior: posters, pamphlets, billboards, media campaign; increase visibility and critical awareness of the issue.</td>
</tr>
</tbody>
</table>

For behaviors that have a larger social and environmental component, models that emphasize changing social norms and involving communities are recommended. Community-based social marketing, as one such model, has been shown to be an effective alternative to conventional campaigns, bridging the gap between knowledge and action (McKenzie-Mohr and Smith, 1999, cited by Kollmuss and Agyeman, 2002).
Models such as the HBM and the social marketing model are favored because of their conceptual simplicity, ease of application and good track record.

**Designs based on local wisdom: the inductive approach**

Enough experience and research has shown no magic bullet exists to change behavior. The search for what works when, where and for whom is therefore a continuous quest. Initiatives may work without program designers and managers utilizing or being aware of any of the grand theories of sociology and psychology. Local wisdom of what has worked must be treated as a valuable resource to inform interventions in the particular contexts. By local wisdom, we mean the collective experience and knowledge of local program sponsors, partners, beneficiaries, communities, evaluators and researchers.

Because of the importance of this resource, this study includes as one of its strategies (see Figure 4-1) the creation of an online database for the collection, archiving and retrieval of such documents as program reports, evaluation studies, research findings, case studies, guidelines and manuals, and survey results.
Appendices

I. Mascot "Smithy".

II. Poll of university student-workshop attendees

III. Poll of GGMC field staff: Summary of results.

IV. Poll of program funders and designers: Comments.

V. Poster from street-view assessment of visibility of EE&A programs.
APPENDIX I: Mascot (Smithy) for WWF-Guianas/GGMC EE&A program for SMS miners

(Art work: Sheldon Williams. Concept: Sherwood Lowe. The sketch on the left was selected for use on pamphlets and posters).
Appendix II: Questions and sample of unedited answers from survey of UG students/graduates who attended EE&A workshop in 2009 conducted by WWF-Guianas.

Survey questions

i) To what extent have you used any knowledge acquired from the workshop since attending?

ii) How often, if at all, have you since referred to the information documents given to you at the workshop?

iii) To what extent did the workshop increase your awareness of environmental issues in mining?

Seven of thirteen attendees responded. All but one are currently employed by the GGMC.

Sample of verbatim answers

(i) I have not had any cause to apply any of the knowledge while at work however, I have had cause to use it while at UG.

(ii) Apart from the above mentioned instance, I haven't had cause to refer to the information documents.

(iii) Since I had no prior training on EIA procedures and issues the workshop was very beneficial.

With regards to the questions that you have asked, I honestly cannot remember that workshop. However, I am sure that I have considered and tried to analyse and consider alternatives to environmental issues that I would have come across during my attachment period. Apart from that I can say that the knowledge of environmental issues has rarely or has not all been used.

(1) The knowledge acquired during this workshop has been helpful when doing Environmental courses. It has also been helpful for basic questions about mining and the environment people would tend to ask.

(2) I remember referring to the document a couple of times for the Environment Impact Assessment course as well as for surface mining. It was also helpful for the Literature Review aspect of my final year project.

(3) In terms of awareness, in all honesty, I was pretty familiar with the majority of the information in the document. But it did open my eyes to some issues.

Ques 1. I have used the knowledge acquired from the workshop in ENV4101 Environmental Impact Assessment and in Literature review for project proposal.

Ques 2. Information was referred to as often as possible during my 4th year 1st semester, during Mr. Emmett Alves course surface mining and am currently reviewing.

Ques 3. My knowledge of environmental issues had been greatly increased when i attended the workshop and read through the book on my own. I got to see the environmental impacts that are prevalent in the mining industry and what can be done to minimize such. Such knowledge attained, has helped me to have an holistic view and way of approaching environmental problems caused by mining.

1) I have seldom ever had to apply the knowledge gained from that workshop.

2) A few times and this was mainly to retrieve information for courses at the university.

3) The workshop was very informative and greatly increased my knowledge on environmental issues in mining.
I think the information received would be most useful to the students who pursued their degree in Geo-environmental Engineering and application of the knowledge would be most relevant in their field than in the other Geological Engineering fields.
### Evaluation of Environmental Education & Awareness Projects

#### QUESTIONNAIRE RESULTS

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Usage of retorts by gold miners</td>
<td>5</td>
<td>10%</td>
<td>15</td>
<td>30%</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>Usage of respirators by gold miners</td>
<td>1</td>
<td>2%</td>
<td>7</td>
<td>14%</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Usage of gloves by miners to handle mercury</td>
<td>4</td>
<td>8%</td>
<td>6</td>
<td>12%</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Usage of non-mercury gold recovery methods, such as concentrators and shaking tables, etc</td>
<td>2</td>
<td>4%</td>
<td>2</td>
<td>4%</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Miners' awareness of environmental regulations</td>
<td>6</td>
<td>12%</td>
<td>12</td>
<td>24%</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>Miners' sense of personal responsibility for environmental protection</td>
<td>3</td>
<td>6%</td>
<td>5</td>
<td>10%</td>
<td>23</td>
</tr>
<tr>
<td>7</td>
<td>Extent of direct discharge of slurry from sluice boxes into streams by mining operations</td>
<td>2</td>
<td>4%</td>
<td>6</td>
<td>13%</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Technical capability of miners to comply with environmental regulations</td>
<td>1</td>
<td>2%</td>
<td>12</td>
<td>24%</td>
<td>28</td>
</tr>
<tr>
<td>9</td>
<td>Involvement of hinterland communities in environmental protection</td>
<td>3</td>
<td>6%</td>
<td>15</td>
<td>30%</td>
<td>13</td>
</tr>
<tr>
<td>10</td>
<td>Ease of access by miners to official information on environmental matters</td>
<td>9</td>
<td>18%</td>
<td>21</td>
<td>41%</td>
<td>14</td>
</tr>
<tr>
<td>11</td>
<td>Quality of relationship between GGMC field staff and gold miners in general</td>
<td>14</td>
<td>27%</td>
<td>31</td>
<td>61%</td>
<td>10</td>
</tr>
</tbody>
</table>
Appendix IV: General comments on questionnaire responses of program sponsors, designers, and managers.

The questionnaire below was sent out to ten program sponsors, designers and managers. The target organizations were the WWF-Guianas, UG, the GGDMA and the GGMC. Four persons responded, of which two expressed unwillingness or incapability to provide answers.

EVALUATION OF WWF’s ENVIRONMENTAL EDUCATION AND AWARENESS (EE&A) PROGRAMS AMONG SMALL-AND MEDIUM-SCALE GOLD MINERS (SMS) IN GUYANA.

- All questions are within the context of the small and medium-scale (SMS) gold mining industry in Guyana.
- To give your views on questions Q1 to Q7, use a rating scale of 1 to 5, with 5 indicating the highest value or largest extent. Any additional comments to your answers would be appreciated.
- Questions Q8 to Q10 are open questions.

Q1. Rate the extent to which EE&A programs generally (regardless of funder/sponsor) have had the desired impact among SMS gold miners in terms of:
   i) their level of awareness of environmental issues and requirements. Score:
   ii) their level of concern for and belief in the importance of environmental compliance. Score:
   iii) their desire to make the required changes. Score:
   iv) their self-efficacy (confidence and belief they can accomplish the required changes). Score:
   v) actual changes in practice or behavior. Score:
   vi) maintenance of, or commitment to, the desired behavior changes over extended time. Score:

Q2. Rate the extent to which EE&A programs can have the desired success (especially in terms of behavior changes among SMS miners) if factors external to the programs, such as enforcement of regulations, are not fully addressed? Score:

Q3. Given the large population of SMS miners in Guyana and their geographical location and spread, how confident are you that EE&A programs can achieve effective coverage of the target population? Score:

Q4. To what extent are the views and needs of the target population known to EE&A program funders and designers? Score:

Q5. In terms of its effectiveness, how do you rate the following program model? Score:

Q6. To what extent do you think the incorporation of social science and behavioral psychology theories and techniques can improve EE&A program designs? Score:

Q7. To what extent are there opportunities for local EE&A program funders, designers and implementers to share information and experiences? Score:

Q8. What would you highlight as the two major OBSTACLES undermining the impact of EE&A programs in the SMS gold mining industry? Answer:

Q9. What would you highlight as the two major OPPORTUNITIES that could facilitate the success of EE&A programs in the SMS gold mining industry? Answer:

Q10. Are you interested in attending training workshops on designing, implementing and evaluating EE&A programs? (Yes, no or not really). Answer:
• Responders to questions Q1(iv) and Q1(v) indicated that EE&A programs were not having much impact on the stated criteria.
• Both responders rated at 4 their answers to Q4.
• On questions Q5 and Q6, opposite views were expressed.
• For Q8, stated obstacles included iterant workforce in the mining districts; inadequate funding to undertake required level of intervention; and inadequate training of regulators.
• Stated opportunities (Q9) included the establishment of the new mining school and cross-border collaboration.
Appendix V: Street-view assessment of visibility of EE&A campaign in Port Kaituma

Police Outpost at Port Kaituma airstrip (26th January, 2013). The only education and awareness poster I saw in walking through the streets of the community.
References


8. King, V.A. (2012) – An investigation into the level of preparedness of artisanal small-scale gold mining operations (ASGM) in Mahdia to transform to mercury-free mining techniques. Research done in partial fulfillment of the requirements for the BSc of Environmental Studies.


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