

**Development of a Case Study Booklet to Support
Teaching of Cape Environmental Science and
Geography**

Caribbean Environments, Perspectives, Practice and Policy

July 7 – 8, 2009

Kingston, Jamaica, West Indies

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ABSTRACT

The Cropper Foundation is working with the University of the West Indies to develop a series of supportive learning materials for use by Caribbean Advanced Proficiency Examination (CAPE) science teachers and students. One of these learning materials is a case study booklet designed to meet specific needs under the CAPE environmental science and geography syllabi. These syllabi require students to support essays and deliver internal assessments (projects) with information derived from Caribbean case studies. The required information is often difficult to access because it is scattered across various government reports, and scientific and technical papers; and the manner in which the information is presented poses obstacles to effective analysis and application. Teachers have therefore expressed a need for assistance in overcoming these challenges; it is hoped that the case study booklet will meet these needs. In order to do so, the case study booklet will comprise actual case work from seven different areas in Trinidad and Tobago; a description of generic methodologies for undertaking case study-related fieldwork; and conceptual frameworks for structuring the work and analysing information. Perhaps the greatest value added by the case study booklet however is a template methodology which has been developed to help guide students and teachers in undertaking case study work. This methodology is based on the experiences of The Cropper Foundation and the University of the West Indies in compiling the case study booklet, and by reflecting on best practices and lessons learned, it is hoped that this methodology will contribute to the pedagogical transformation at the CAPE level.

INTRODUCTION

Situation Analysis

Tempora mutantur, et nos mutamur in illis – times change, and we change with them (Grenfall 1998). The nature of pedagogy has evolved on a global scale over the last five decades, and the education systems in the Caribbean region have been working to keep pace with these rapid changes (ibid). In Trinidad and Tobago (T&T) and the English-speaking Caribbean, there have been enormous changes in the way that we think and act in education (Grenfall 1998; CARICOM 1993; King 1987). Delivery of curricula has been transforming from conventional top-down delivery, to one which requires the teacher to be more interactive with students (Grenfall 1998; CARICOM 1993). Our assessment structures have also changed as part of the evolution of education systems.

Since 1998, many Caribbean countries and territories have been phasing out the General Certificate of Education (GCE) Advanced level examinations administered by the University of Cambridge in favour of the Caribbean Advanced Proficiency Examinations (CAPE). The CAPE curriculum, administered by the Caribbean Examinations Council (CXC) is designed to provide certification to students who, having attained a Caribbean Secondary School Certificate (CSEC), wish to pursue two additional years of study at the secondary school level. This curriculum benefits teachers and students because it gives more focus to topics related to the Caribbean region, particularly the nature and scope of issues that affect this region. This is especially important because of the ever-growing challenges to sustainable development being faced in the Region, and the high rate of emigration of highly qualified/skilled individuals from the

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Caribbean (Mishra 2006). CAPE's emphasis on the Caribbean does not exclude the integration of global affairs; rather, it places the Caribbean in the context of larger international topics and issues.

In the face of increasing global competitiveness, teachers are tasked not only to facilitate the acquisition of basic academic knowledge, but also to help build critical-thinking, analytical and research skills. The CAPE curriculum facilitates these by allowing teachers the flexibility to build and develop teaching plans that allow for knowledge-building, and acquiring of skills on a wide variety of issues and topics.

Background to developing the Case Study Booklet

Articulation of the need for a Case Study Booklet

In 2006, The Cropper Foundation, in collaboration with the Ministry of Education of Trinidad and Tobago (MOE) and the Environmental Management Authority of Trinidad and Tobago (EMA) held a seminar for CAPE Geography, Environmental Science and Biology teachers in Trinidad and Tobago to discuss with them their main needs in meeting curriculum requirements; and to determine how the Foundation might work with the MOE to help meet these needs.

At this seminar it was highlighted that the CAPE Environmental Science and Geography syllabi place significant emphasis on building and using case study material, which teachers generally find difficult to access. Some of the challenges that teachers face with meeting these requirements include, *inter alia*:

- i. How to decide what information needs to be included in a case study. What stories can be told, what issues can be highlighted, and what conclusions can be made from the available data? Is there a framework to guide this process?
- ii. Accessing information to build case studies. Information is often scattered across various government reports, scientific and technical papers making data collection difficult. In some cases, acquiring the data also poses problems because of the bureaucratic processes required by some agencies/organisations to make such data publicly available.
- iii. Where information is available it may be very technical and difficult to understand and assess.

In addition to case studies, the syllabi also call for a heavier fieldwork component, for which some teachers feel unprepared.

While there is great merit in CAPE's transformative approach to pedagogy, it is evident that there are still inadequate support systems in place to allow for effective delivery of the curriculum: teachers appear insufficiently trained to deliver on key aspects of the syllabi, and materials to support the syllabus requirements are largely scarce. The emerging challenge is to therefore figure out what measures need to be taken to ensure that this approach to pedagogy is successful?

About the Lead Organisation

The Cropper Foundation, the lead organisation in preparing the Case Study Booklet, is a not-for-profit non-governmental organisation which provides a framework for individuals and organisations to pool their expertise and experience in order to 'give something back' to the public interest (TCF 2009). The framework is provided through three programme areas: Public

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Policy and Governance for Sustainable Development; Environment and Resource Education; and Capacity Development (TCF 2009).

In 2005, The Foundation formally launched a Programme in Environment and Resource Education called IERE. IERE uses the knowledge gained from the results of completed and ongoing research, and transforms these into various products and activities in order to develop capacity and generate awareness among a wide range of stakeholders. The IERE programme is guided by an Advisory Committee whose members provide technical leadership and support to the programme. Recognising its limitations in capacity and expertise, the Foundation collaborates with a number of individuals, institutions and organisations such as the University of the West Indies (UWI) and CXC.

The emphasis of IERE to date has been on the formal school system. By considering the needs of the teachers, and balancing these with capacity and resource availability/limitations, the Foundation has been working to address some of the needs of teachers (as articulated), and thereby contribute to the CAPE pedagogical approach. In 2007, the Foundation in collaboration with the MOE embarked on a three-year joint programme that includes the delivery of a set of products and activities designed to develop teacher capacity and make relevant materials available, including a handbook on sustainable development terms and concepts; a brochure and accompanying series of posters on the main findings and conclusions of an assessment of the Northern Range of Trinidad; a series of capacity-development workshops and tutorials for teachers; and a case study booklet. This paper focuses on the Case Study Booklet, reflecting on the experiences of The Cropper Foundation in this project and describing an approach that has been designed based on these experiences.

DEVELOPING THE CASE STUDY BOOKLET

The principal goal of the case study booklet is provide a guide to developing case study material for teachers, students and other practitioners. It is hoped that the use of this guide by teachers will facilitate the CAPE approach to pedagogy.

The process of developing the case study booklet occurred over a period of ten months. The booklet draws heavily on the design and content of several case studies already developed by Dr. Mary Alkins-Koo for undergraduate courses in the Department of Life Sciences at the University of the West Indies, St. Augustine campus. Throughout the process, the Foundation worked quite closely with teachers and students – as key stakeholders - to ensure that the output responded directly to their needs. The interaction with teachers and students provided inputs to developing the case study in terms of issues that could be covered and how the information could be packaged. The work with teachers and students also provided inputs for developing the methodology, particularly for helping the Foundation to understand time constraints and capacity of teachers and students.

Using the experiences gained from developing case studies on select areas, and from working with teachers and students, a template – in the form of a concept map – was designed for developing case studies (Figure 1). This template is not meant to act as a cook book or recipe guide, but is meant to be adapted based on needs of the user, context, situation or other considerations.

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METHODOLOGY

A template methodology for designing case studies to meet the needs of the CAPE Environmental Sciences and Geography syllabi is provided in Figure 1. The various steps and considerations are included in the section which follows.

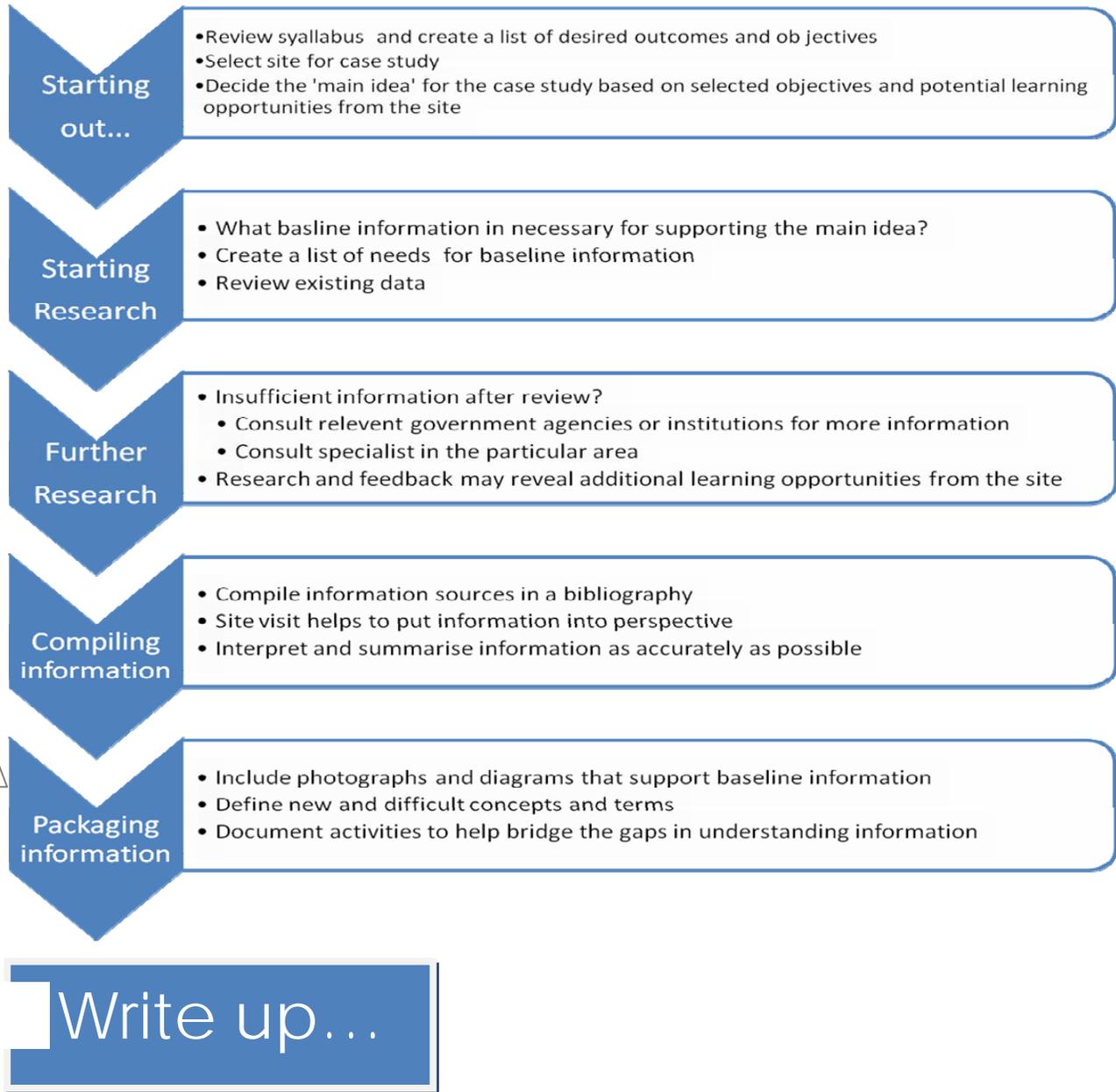


Figure 1: Template for developing case studies

Starting out: The “main idea” of the case study is really the focus of the case study. This can be based on the selected teaching objectives of the syllabi and any potential learning opportunities of each site. Conceptualizing the “main idea” and deciding how to develop the main idea is a difficult task; this can be made easier by applying a conceptual framework to the situation.

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Conceptual frameworks such as the Millennium Ecosystem Assessment Conceptual Framework or the Driver-Pressure-State-Impact-Response framework help to connect various aspects of any one issue, so that the 'big picture' becomes clear. It is not practical to make the main idea too broad, for example land use management is a very broad topic and teachers may find that in trying to develop a case study around this that they run out of time, or that the case study is very vague and generally poorly developed. The broad topic could be subdivided into a number of smaller topics such as user conflict management in this case, and the case study developed around the smaller topic.

Baseline or background information is absolutely necessary for explaining various aspects of the main idea, particularly where complex issues such as management are concerned. For example, to fully understand the links between ecosystem services provided by the Buccoo Reef, Tobago, and human well-being, it is necessary to have information on the coral species in the reef; the fish and marine species that live on the reefs; human interactions with the reef; livelihoods provided by the reef; and the factors that affect the reef ecosystem.

Deciding on what baseline information is necessary is not always clear cut, and in this early stage it may not be possible to determine all of the specific information needed. The experience of creating the case study booklet has found that the process of adding or deleting baseline information is iterative through the development of each case study. An initial approach is to start with some basic categories of information that are common to all case studies. These basic categories for land-based areas may include location, topography, geology, soils, biodiversity, hydrological characteristics, land cover, human social and economic uses.

Accessing a large information store is one of the most efficient ways to start *reviewing existing information*. The internet or general libraries are good examples of large stores of information. However, one can easily get lost in the vast amount of information available. Creating a list of questions based on information needs helps to guide, and improve the overall efficiency of the research process. For example, if information is needed for 'Location', the questions that can be formulated include,

- Using cardinal references where in the country is this site located?
- What are the latitudinal coordinates of the site?
- Are there any landmarks close to this site?
- What is the area of the site?

Additional learning opportunities from the sites continue to emerge as more research is undertaken. Using one site to meet multiple teaching objectives of the syllabi has its merits in that it allows for greater development of a wide information base to understand more complex, larger issues. The downside of this is that it does not expose the students to as wide a range of environments and issues. It can be left to the teacher to adjust their approach according to their own capabilities and resources to consider multiple areas for breadth of coverage or alternatively, consider one single area at greater depth.

A review of materials that contain information that has already been analysed and packaged is quite useful and time-saving. For example, the Environmental Management Authority of Trinidad and Tobago produces an annual State of Environment Report (SOER) which provides a significant amount of analysed data on the conditions and trends of ecosystems, and also some

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recommendations for addressing some of the drivers that are affecting ecosystems. The Foundation drew on information from these SOERs to build some of the case studies.

After reviewing existing information, more likely than not, there will be *information gaps*. The ‘missing information’ may be contained in *government reports and consultations, and in people’s heads*. One way to start the process of accessing information through the public sector is to determine which government ministry or agency or institute is responsible for the issue(s) that you are interested in. Perusing bibliographies of resources that were previously used is one way to help determine the relevant government ministry. Contacting the ministries can be a tedious process, as PBX lines often do not work; the person you need to speak to may be out; or the operators simply do not know how to assist you. *Don’t get frustrated!* Accessing information through the public sector is time-consuming, and this time should be factored into the information-gathering process. Interviews with public sector officers provide information that is otherwise undocumented, helps fill information gaps with up-to-date information, as well as assists in identifying current issues and ongoing solutions.

Consulting specialists in the area is another avenue for information particularly for evaluating situations based on their extensive experience and broader local or regional contexts. They may also assist in suggesting potential workable studies and approaches. Identifying specialists can be difficult, and it may be helpful to do this on a referral basis.

Note, it is important to realise when you have *enough information* or when *information simply does not exist* because research has not been done to gather information. Time is wasted through chasing information that does not exist, or through gathering unnecessary information. One way to keep on track is to ‘keep an eye’ on the list of information needs.

Documenting all of the references used is a very important step in the research process. Decide on a referencing style and maintain this style throughout your research. It is important to help students understand the importance of referencing, plagiarism, and its ethical basis in fairness and equity.

Packaging information in a useful and accurate way is the next major step in building the case study. Create a list of questions that would guide the packaging of information. For example,

- Who is the case study for? For example is it for biology students or geography students or both? This will influence the terms and concepts used in presenting information.
- Are there new terms and concepts that need to be defined? For example, what is a ‘formation’ in the context of geology?
- Do the students respond to highly visual material, or do they prefer text? This would influence the use of photographs, diagrams, charts and graphics.
- What tools do I use to explain this complicated concept?

Photographs, maps and diagrams are quite useful in helping to understand baseline information that may be otherwise difficult to explain with text. For example, the concept of a flooded Marsh Forest in Aripo Savannas, Trinidad is easily conceptualized with a photograph or diagram. Flow charts can also be used to explain processes and complex concepts.

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Defining new and difficult terms and concepts is necessary when new information is introduced. This is an absolutely necessary step when the case study is to be used across disciplines. As part of conveying the information, it may be necessary to break down a difficult concept such as orographic precipitation using simpler terms, so that the entire case study is not about defining new terms. At the same time, students need to be introduced to the terms used within the discipline.

Interpreting information can be a difficult task but is an essential step to convert or sift raw information to a useful form that may be incorporated into activities or further studies. A word of caution though, some information may not immediately seem to relate directly to the issue or topic but in fact may be important. For example, building a cause and effect relationship between deforestation on hillsides and flooding in downstream areas is not quite so simple and flooding is usually the result of a combination of factors, of which deforestation is one. In this case, information on a range of activities in the watershed would allow students to evaluate the relative impact of each. Oversimplification of issues should be avoided and the judgement of what information is useful or not depends on the objectives, questions or activities planned.

It is also useful for students to consider the information gaps since this a real-life issue and decisions are often made in the context of what is currently known. It is good practice to avoid making definitive conclusions, particularly where information is missing. Rather, terms like low, medium, and high certainty can be used to describe situations in terms of the probability of an occurrence or outcome in the future. The nature of impacts can also be described generally in terms of direction (positive, negative) and magnitude (minor, major) without speculating on specific outcomes that may not be realistic or accurate. Interpreting information is one of the most difficult challenges of building a case study, and it may require further research or consultation for assistance. However, these difficulties and information gaps provide an opportunity to teach students to assess and deal with probabilities of outcomes and risks, as well as how to design research to answer specific questions or evaluate alternatives and options.

It may be useful to *use an activity to help the students understand complex issues or accomplish complex tasks*. The activity could be documented with some specific steps, but should be flexible enough to allow room for modification and application to other issues. In the process of interpreting and analysing information some complex tasks include problem identification, simplifying complex systems, evaluating, prioritising, considering alternatives, devising solutions, problem solving, and decision making. These are multi-step processes that are profitably broken down so that students can understand the logic of the process in order to conduct the task. Several activities can be used to assist students and useful approaches can be found in ecological assessments, for example, the Millennium Ecosystem Assessment, or environmental impact assessments like the Leopold Matrix. In addition, methods borrowed from management and business are simple and practical, for example SWOT (Strengths Weaknesses Opportunities Threats) analysis and the Five Why's technique, and can be applied in a variety of contexts. For instance, the Five Why's exercise can be used to find the root-cause of flooding in certain areas of Aripo Savannas, Trinidad and also be used to find the root-cause of sewage pollution in the Buccoo Reef, Tobago.

Activities can be considered as generic (general approaches, concepts, skills that can be applied to most case study areas) or specific (applicable only to a particular case study area or activity).

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Writing up the information should not be the final step to completing the case study booklet, but it should provide an opportunity for teachers and practitioners to start using and applying the case studies. Through using and applying the case studies, teachers may begin to develop feedback loops. In the short-term (year to year), teachers may decide to repackage information based on what worked and didn't work; the needs of the students; or because certain aspects of the information need to be highlighted or enhanced. In the longer term, as new information is generated and becomes available, teachers may decide to change the main idea of the case study, which requires a complete revision of the case study. However, much of the baseline information may remain the same.

DISCUSSION

Developing a template for designing case studies is an iterative process. Because situations, considerations, and needs of teachers change depending on geographical location; the requirements of the syllabus; the needs and interests of the students; and the availability of resources, it is well accepted that there is no cookie-cutter approach to designing and undertaking case studies. The proposed template is therefore not to be treated as static. For it to be useful, it must be adapted to the specific conditions and considerations under question. The current template was designed based on the experience of the Foundation, and it is expected that the experiences of teachers and practitioners in developing case studies will be very different. We expect that several factors including time and capacity will influence the process of developing case studies.

The Importance of Time Management

At the Foundation, staff worked full time to develop the case studies over the course of several months. Research for baseline information was the most time consuming aspect of developing the case studies. A considerable amount of time was spent visiting libraries, and government offices and agencies. For some exclusive libraries – like the Main Library of UWI, St. Augustine Campus and government agencies - permission is required to access documents, and this time needs to be factored into planning. Sifting through documents, books, websites, and papers for relevant information also required a considerable amount of time; however, efficiency of this was improved by developing specific research questions. Interviews are difficult to gauge in terms of time, because they depend on a second party. Early scheduling of interviews is one option for ensuring good time management. It is not expected that teachers or other practitioners will be able to devote as much time to developing the case study as did the Foundation, and therefore it is imperative that time management be factored into planning for developing case studies. One suggestion for teachers is that they undertake the development of case studies during the school vacation.

Developing Capacity

Realising and working within one's capacity is an important factor to be considered in developing a case study. Capacity is dependent on the abilities and resources of the teacher, student or practitioner undertaking the case study. The Cropper Foundation was able to build capacity through its involvement in several local, regional and global ecosystem assessments - the Northern Range Assessment (local); the Caribbean Sea Assessment (regional); and the

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Millennium Ecosystem Assessment (global). Limited capacity should not be a deterrent to undertaking case studies, and practitioners should focus on developing capacity. This can be done in several ways. For teachers it may involve developing case studies in collaboration with teachers of other disciplines, for example biology and environmental science teachers can work together to develop case studies in related areas. For other practitioners it may involve networking to build a bank of resource people and institutions.

The Importance of Collaboration

Collaboration between individuals, institutions, organizations or among groups of teachers is a necessary and important part of developing a case study. Collaboration has several benefits which include:

- Sharing of ideas and experiences builds on existing knowledge bases, and facilitates filling knowledge gaps quickly;
- Avoiding duplication of effort;
- Making best use of limited resources

There are several points in the process of developing a case study where collaboration is important and can be extremely beneficial. For example, in the early stages of developing the case study, one may collaborate with or seek the advice of a specialist in a particular location. The benefit of doing this at this early stage is that it can provide a clear outline of the topics or issues associated with area, and some of the lessons that can be learnt from studying these. Additionally, the specialist may be able to suggest some recommendations for addressing issues. Teachers can also pass on useful lessons in collaboration to their students, based on their experiences. The Cropper Foundation has sought to encourage collaboration, by making available to CAPE science teachers in Trinidad and Tobago its bank of resources (including people), and by building an online forum through which teachers can network amongst themselves to share information and resources. The Foundation also hopes to encourage – through efforts like these - teachers to initiate and drive some of their own activities.

Further work on the guide for developing case studies will be based on the experiences of the teachers and practitioners who use the guide that we have produced. The Cropper Foundation will design a programme of workshops, seminars and consultations on developing case studies that will occur over a period of three to five years. Through the programme, the Foundation will continue to work closely with teachers and practitioners to help them use and adapt the guide for developing case studies. It is envisaged, that the experiences of teachers and practitioners in using this guide will generate lessons that the Foundation will use to revise the guide accordingly. For example, the research experience for teachers may be significantly different from the experience of the Foundation, and in fact the teachers may have to add another step to their research process. We hope to use these lessons to revise the guide to improve its efficacy.

The Cropper Foundation hopes to continue developing capacity of the citizens of Trinidad and Tobago through the formal education system. By applying a ‘train the trainer’ approach we are able to develop individual capacity by building skills, competence, and confidence of teachers and practitioners to undertake unique approaches to curriculum delivery. It is hoped that through building capacity in this way that we also foster a sense of self-empowerment among the citizens of Trinidad and Tobago, and the wider Caribbean region.

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ENDNOTES

¹ The assessment of the Northern Range was a 3-year project led by The Cropper Foundation and The University of the West Indies, and undertaken as part of a global project known as the Millennium Ecosystem Assessment (MA). The Northern Range Assessment report is published as Trinidad and Tobago's State of Environment Report 2004.

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