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Science, Technology, and The Dilemmas Related to Sustainable Tourism Development in the Caribbean

An Interactive Qualifying Project Report
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by

Justin Braveboy-Wagner

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Michael J Radzicki Approved:
Professor Michael J Radzicki, Major Advisor

Table of Contents

Figures and Tables

Chapter One

A General Introduction to Sustainability

Jarred by the effects of a worldwide depression and hardened by a world war, the economic landscape in the latter half of the twentieth century was drastically different than that which came before. With the emergence of diverse nations capable of influencing global affairs and the end of formal imperialism and colonialism, the stage was set for a new development paradigm. Taking the experiences and events of those years as a failure of classical conventional economic theory, numerous economists in the 1950s set about searching for a new dynamic theory (or theories) specifically tailored for the new Third World, and this led to the emergence of so-called development economics.

Under this umbrella, various theories and ideas were analyzed, discarded or adopted, all seeking to help the third world. Economists talked of: improving the "dual economy" (rural-urban gap); addressing the issue of unequal exchange (between northern nations and the south), and redistributing wealth (both within and between nations); adoption by the southern nations of a strategy of import substitution industrialization (enforced industrialization to improve the "terms of trade," that is, the import-export prices between industrial and developing nations); methods to reduce the third world's "dependency" on the industrial world (for aid, trade and investment); and others.

Most economic ideas of the 1960s were based on an optimistic belief that continued expansion and boundless growth would, or could, eventually lead to the elimination of world poverty. Such thoughts did not well survive the next decade, when unemployment and growing inequality and inequity, as well as a slowdown in overall global development, crushed hopes for

perpetual growth as a cure-all. Instead, concerns about growth with equity and the pursuit of basic human needs independent of market uncertainty replaced the old optimism with a new, more desperate outlook. Dramatic differences emerged between those who continued to favor market-oriented growth that would "trickle down" to the masses and those who did not think that the market could do the job – that the state needed to intervene to take care of people's basic needs. These arguments split the developed and developing worlds, as well as the developed capitalist "first" and socialist "second" worlds.

In the 1970s another issue was thrown into the fire in the form of the first hints of resource depletion. Food shortages, oil shortages (induced by conflict in the Middle East), and high population growth in the developing countries were so troubling that a series of global conferences were convened by the United Nations to discuss food, population, social development and so on. There was a growing concern that the world was reaching what could be termed the "limits to growth," a concept that originated from the title of a report by Donella and Dennis Meadows and collaborators (in 1972), including a team from the Massachusetts Institute of Technology (MIT), which was the principal fuel for the debate. According to the report, "The most probable result [of reaching the limits of growth] would be a rather sudden and uncontrollable decline in both population and industrial capacity" (Meadows et al 1972: 23).

In the Meadows model, it was assumed that population and industrial capital (production as measured by GNP) would grow exponentially, resulting in an identically exponential growth in demand for consumable resources, non-renewable resources, and an increase in pollution. Unsurprisingly, this exponential growth within a system of finite limits resulted in a breakdown. The Meadows model was highly criticized by some scientists and economists, who questioned

the assumptions under which it operated (see Figure 1.1. for the basic model.), but as we will see, it still contained elements of "truth."

In the 1980s and 1990s, despite some easing of concerns about resource depletion in the wake of technological developments, the global community coalesced around the need to link economic growth to environmental sustainability, that is to ensure that all countries, including (today) the now-transitional former Eastern bloc countries, could take advantage of the market even while minimizing the negative ecological consequences that the industrial countries had already witnessed. "Sustainable development" became the new focus or mantra, a concept that expanded to include not just environmental sustainability but, subsumed in it, poverty alleviation and social development that would complement the economic imperative for growth.

As noted earlier, the *Limits to Growth* by the Meadows husband and wife team was a landmark study greeted with great interest by both the academic and policy community, primarily because it seemed to give scientific validity to the incipient debate on environmental sustainability. Dennis and Donnella Meadows had taken over a study begun by M.I.T's Jay Forrester for the *Club of Rome*, a group of independent and influential thinkers. Forrester had developed a system dynamics model which he applied to the issue of global ecological sustainability (World2 model), predicting on the basis of that model that continued patterns of unrestrained growth would eventually lead to resource depletion and environmental decay.

The Meadows team essentially confirmed this in their more detailed model (termed World 3), generating debate that continues to this very day. The three charts attached (Figures 1.1-1.3) are samples from their model showing, in particular, the relationship between population growth and resource depletion. The first shows that if the rate of industrial growth and exponential population growth went unchecked, there would be a downward spiral in resource

and food availability. Population and pollution would continue to increase for some time after the peak of industrialization but the population increase would finally be halted due to the increase in the death rate, itself attributable to the decreased food availability.

In Figure 1.2, we see a modified prognosis based on the assumption that resources are "unlimited," pollution checked, agricultural productivity increased, and birth control widely effective. This, the authors contend, would actually only delay the inevitable depletion of resources, food declines, pollution increases and death. In Figure 1.3, the scenario is stabilized via certain technological as well as value solutions, including resource recycling, pollution control, capital expansion, measures to restore soil erosion, and emphasis on food and services rather than on industrial production. Births are set equal to deaths. Overall, the complex World 3 model takes into consideration the effect of generation and regeneration time and activity on the world's carrying capacity (how long resources can last all things being equal), and the voluntary and involuntary responses made by us humans and our governments to the resulting pressure on the physical environment (Figure 1.4).

In the next chapter, I will discuss the debate that followed the publication of the Forrester/Meadows models, in particular the argument between those who adopted the model's claims (some attracted to the scientific reasoning, others caring more for the value dimension), and those termed "technological optimists" who argued that the models did not take proper account of technological advances which could in theory lead to limitless growth.

This IQP will take a closer look at the sometimes confusing concepts of sustainable development. It will analyze its importance and applicability to a selected group of countries, namely, the small states of the Caribbean, in a selected industry, tourism. Specifically, I will discuss the various arguments about sustainability of these predominantly tourism-based

economies – what aspects of tourism can be viewed as sustainable, and how science and technology helps or can help in inducing sustainability. In the end I will offer some general comments about whether tourism sustainability can indeed be achieved.

As a budding engineer rather than an economist, I will focus more on the use of science and technology than on the economic dynamics of relying on tourism. It is accepted that were it not for technological developments, the world would have reached the "limits to growth" before now, but we need to ask, with respect to tourism development, whether developments in science and technology are benign for these economies, helping them to achieve both growth and sustainability.

I will first review what "sustainable development" is, before I move on to describe the general role of science and technology in development (chapters 2 and 3). Chapter Four will give some background on the Caribbean countries and the role tourism plays in their economies, Chapter Five will discuss the use of science and technology to tackle some issues and problems in tourism development. Finally Chapter Six will sum up and briefly assess whether tourism can be ecologically sustainable.

I would like to thank Prof. Radzicki for his unfailing support, patience and guidance in the writing of this report and my eccentric mother, Prof. J. Braveboy-Wagner, for much help in pointing me in the right direction, providing/identifying literature and offering useful comments and much editorial assistance on this paper (and the occasional wrist slapping to keep me on track).

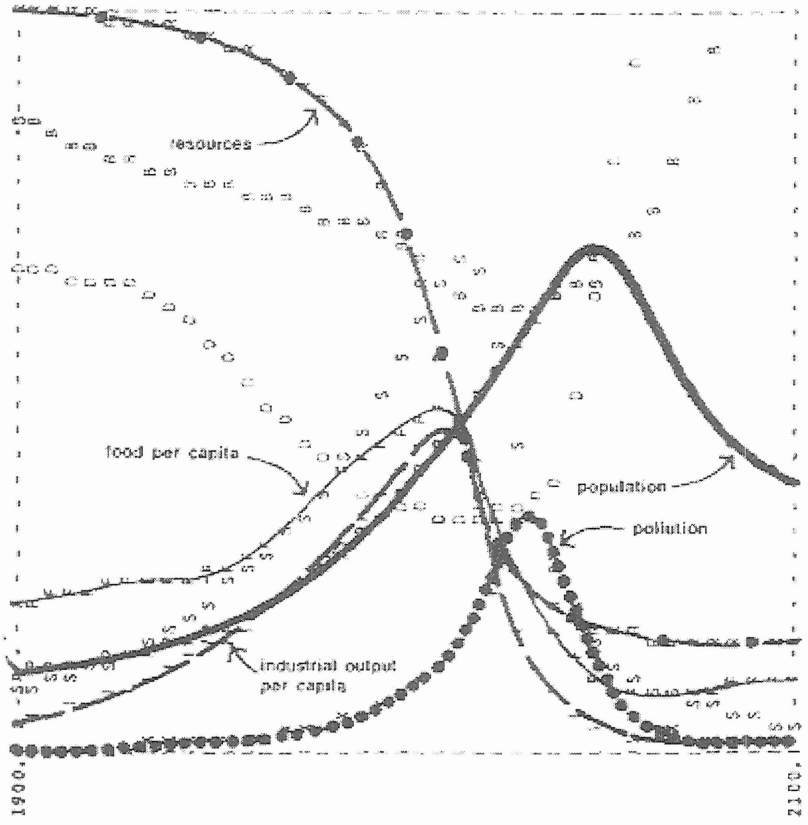
Notes

1. Many of these economic ideas are discussed in Jameson and Wilbur (1996) and Seligson and Passé-Smith (1993), among other books.

Figure 1.1

GROWTH IN THE WORLD SYSTEM

WORLD MODEL STANDARD RUN



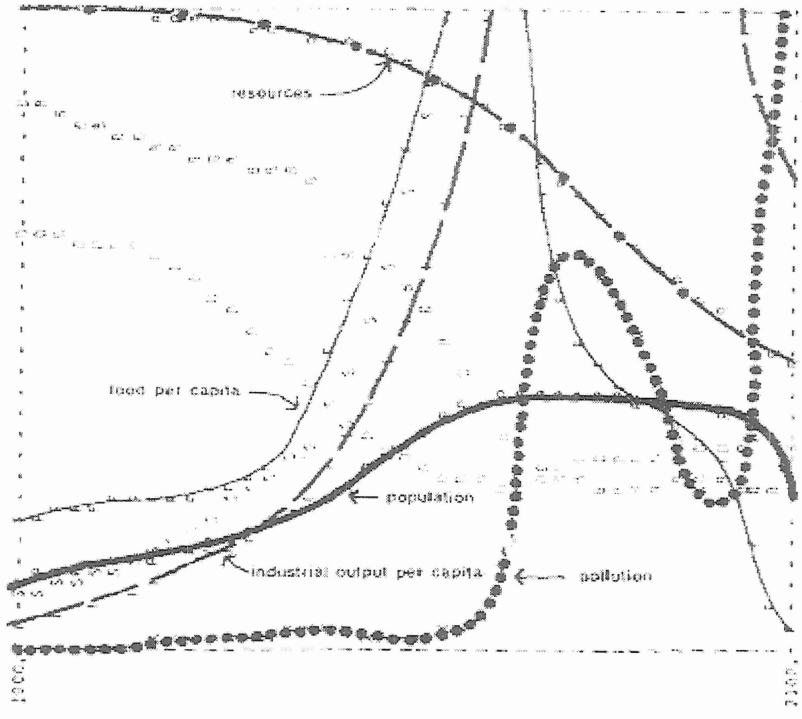
The "standard" world model run assumes no major change in the physical, economic, or social relationships that have historically governed the development of the world system. All variables plotted here follow historical values from 1900 to 1970. Food, industrial output, and population grow exponentially until the rapidly diminishing resource base forces a slowdown in industrial growth. Because of natural delays in the system, both population and pollution continue to increase for some time after the peak of industrialization. Population growth is finally halted by a rise in the death rate due to decreased food and medical services.

Source: Meadows et al., *The Limits to Growth* (1972), p.129.

.Figure 1.2

TECHNOLOGY AND THE LIMITS TO GROWTH

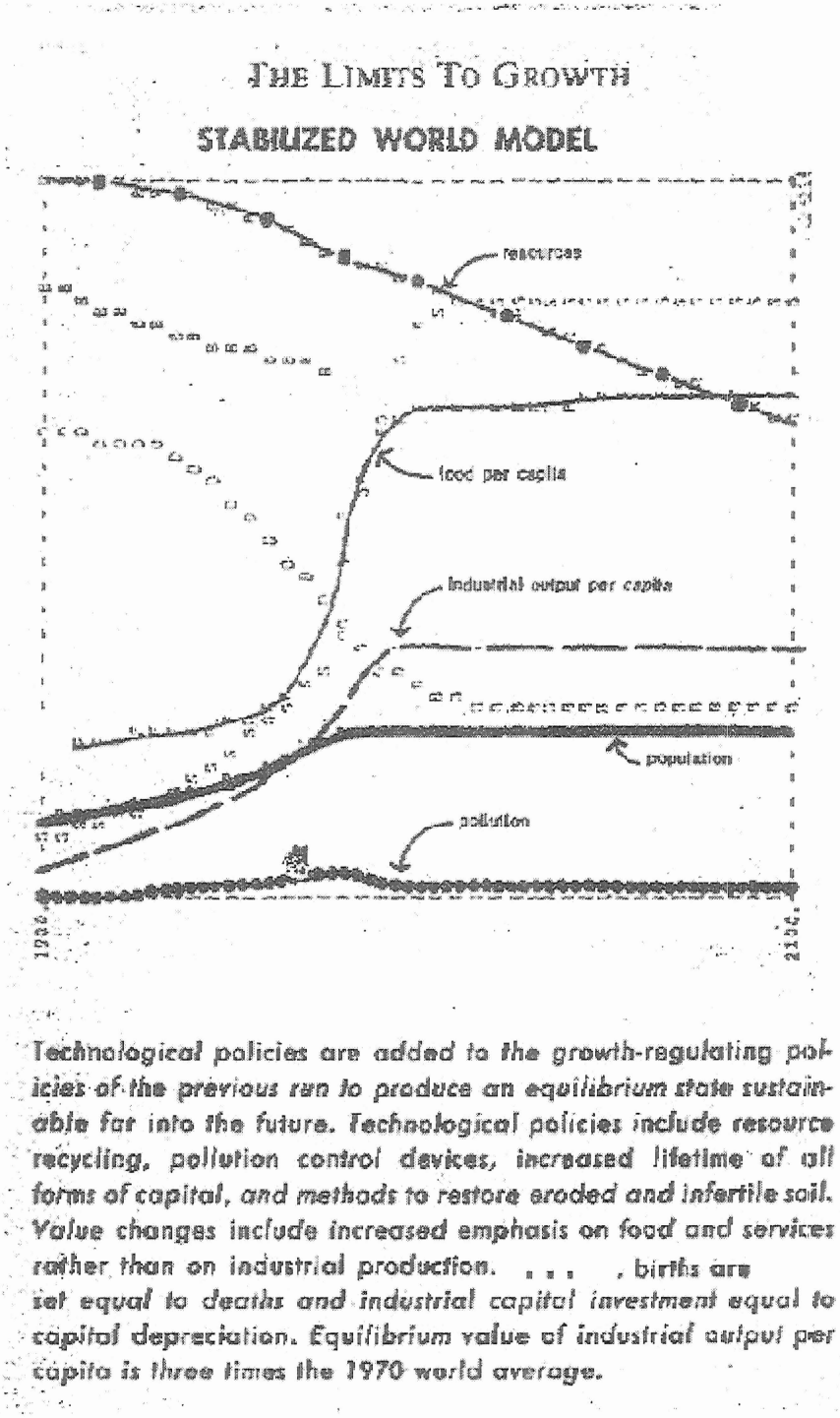
WORLD MODEL WITH "UNLIMITED" RESOURCES, POLLUTION CONTROLS, INCREASED AGRICULTURAL PRODUCTIVITY, AND "PERFECT" BIRTH CONTROL



Four simultaneous technological policies are introduced in the world model in an attempt to avoid the growth-and-collapse behavior of previous runs. Resources are fully exploited, and 75 percent of those used are recycled. Pollution generation is reduced to one-fourth of its 1970 value. Land yields are doubled, and effective methods of birth control are made available to the world population. The result is a temporary achievement of a constant population with a world average income per capita that reaches nearly the present US level. Finally, though, industrial growth is halted, and the death rate rises as resources are depleted, pollution accumulates, and food production declines.

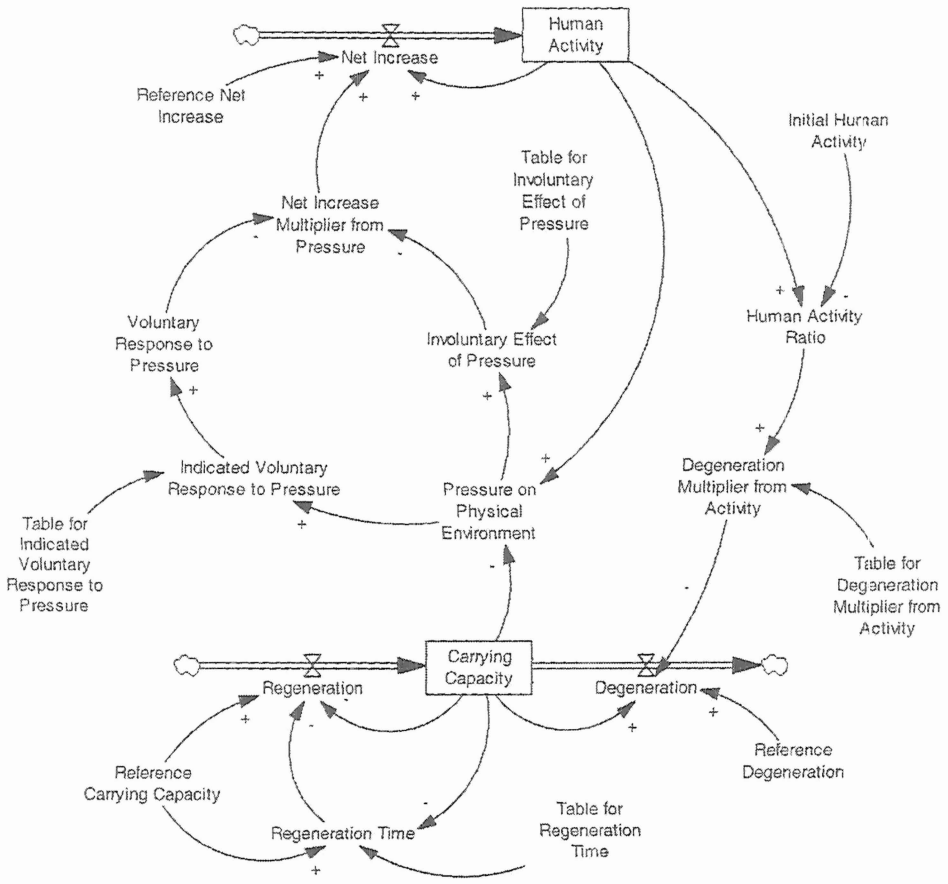
Source: Meadows et al. *The Limits to Growth* (1972), p.147.

Fig 1.3



Source: Meadows et. al, *The Limits to Growth* (1972), p. 168.

Figure 1.4: Mini World3 Model



Source: M. Radzicki

Chapter Two

Definitions and Arguments About Sustainability

The concept of sustainable development is applied in a diverse number of ways. To economists, development specialists, and most policy makers the priority is to maintain economic growth and a revenue stream that allows a country to pay for its own costs (not running "in the red"). This may, and can, imply a preference for the implementation of programs with lower short-term costs despite some negative effects in the longer term that prove not to be always environmentally friendly.

To ecologists and conservationists, sustainable development means steady state management so as not to deplete the natural resource base. Taken to an extreme, this can imply the undesirability of any potentially "risky" or damaging development project, regardless of economic value, initial importance or scale. The Brundtland Commission's definition of sustainable development is relevant here. This Commission was an appointed group of numerous civil servants, policy makers, and environmental experts, who in 1987 published a work called *Our Common Future* or as it is commonly called, "The Brundtland Report." It included a definition of sustainability, and though hardly the only one and open to interpretation, it is widely quoted: "(Development) that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Laurenti and Lyman 1990: 42). This definition, like many others, emphasized the importance of keeping a system viable into the foreseeable future, but also typified the equal importance of meeting "present needs."

Regardless of exact wording, however, all definitions of sustainable development aim to describe systems capable of extending the useful lifespan of the elements of production. From an efficiency standpoint, sustainability systems seek to maximize profit (in sector development)

while also minimizing loss (that is, depletion or exhaustion of resources or markets). Growth, typically seen as the amount of production increase over time, becomes a more complex function when a factor like minimal loss attains ever-increasing importance in maintaining systems of production. Additionally, because growth is seen as a *quantitative* increase, contrasted with development – a *qualitative* increase – there is a more complex non-linear relation between the two.

Put more simply: at the point where effective use of resources impacts the development of those resources, sustainability of a system becomes increasingly important. While the extent of global resource depletion varies and is widely debated (and has been for decades), there is a broad consensus that such depletion can and does occur when growth and development reach levels that are incompatible with the existing environment. This is especially important in respect to so-called open-air resources, like air, water, and biodiversity elements. In such a situation the redefinition of growth as a factor not only of production and time but also elemental manageability, becomes necessary.

The roots of this mode of thought prioritizing manageability as opposed to the old belief of total or near inexhaustibility--a no limits fallacy common in Industrial and Pre-Industrial Era thinking--lie in the original "limits to growth" theory presented by Thomas Malthus in his *An Essay on the Principle of Population* (1798). Malthus studied mathematics and philosophy at St John's College, Cambridge. After achieving his Fellowship at that institution, he became Professor of History and Political Economy at Hailingbury College (in Essex). In *An Essay on the Principle of Population* he predicted that, because population increases at a geometric rate whereas the food supply grows at the slower arithmetical rate, the demand for food would

inevitably surpass its supply. This scenario is now known as the *Malthusian catastrophe*, in which population growth exceeds the capacity of the world to sustain that population.

Such a scenario has been avoided to date, almost entirely because of improved organization and technological development, as well as ease in transportation infrastructure, over the centuries (and over mere decades, in recent times). It was that very capacity of humans to willingly forecast and manage ecological systems that made a Malthusian catastrophe unlikely. Still, by the 1960s, especially with the publication of *The Population Bomb* by Paul Ehrlich in 1968, the scenario of overpopulation and overuse of limited natural systems was revived as a public concern.

Predictions by Ehrlich and others that consumption levels three decades ago were unsustainable even in the short term were counter-pointed by thinkers like Julian Simon, author of the article "Resources, Population, Environment: An Oversupply of False Bad News" appearing in *Science* 208 (1980), and by history itself. But the threat remains. This is because, while optimists see increased growth as increased opportunities, there has yet to be found concrete evidence that technological advancement can continue to account for or accommodate a limitless projection. That is to say, it cannot be assumed, with hindsight, that a *certain* percentage increase in resource consumption can be counterbalanced by a similar increase in the *likelihood* of a technical solution to that consumption, in a closed system in which no energy is added or taken away.

An influential, though controversial, account of the study of environmental decline was undertaken by a group of leading think-tankers in 1972. The "Club of Rome" Report (published as the already mentioned *The Limits to Growth*) wove a net of interdependencies between social factors and their economic and environmental counterparts, across multinational borders.

Importantly, the authors maintained that there was indeed a threat of physical exhaustion of natural resources as well as to the viability of local, regional, and, eventually, global ecosystems. In the end, many would argue, the exact predictions of the Club of Rome were proven to be inaccurate (thanks especially to the Green Revolution and other unforeseen variables), but the basic idea of resource limitations, and thus growth and development limitations, has largely been seen by as sound. (See Figures 1-3 at the end of Chapter 1 for some basic Club of Rome predictions.) The authors (minus one) updated their predictions and system dynamics model in *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future* 1992. They arrived at much the same conclusion, adding that that the world had actually overreached sustainability in several areas.

> 1. Human use of essential resources and generation of pollutants has already surpassed rates that are physically sustainable. Without significant reductions in material and energy flows, there will be in the coming decades an uncontrolled decline in per capita food output, energy use, and industrial production.
>
> 2. This decline is not inevitable. To avoid it two changes are necessary. The first is a comprehensive revision of policies and practices that perpetuate growth in material consumption and in population. The second is a rapid, drastic increase in the efficiency with which materials and energy are used.
>
> 3. A sustainable society is still technically and economically possible. It could be much more desirable than a society that tries to solve its problems by constant expansion. The transition to a sustainable society requires a careful balance between long-term and short-term goals and an emphasis on sufficiency, equity, and quality of life rather than on quantity of output. It requires more than productivity and more than technology; it also requires maturity, compassion, and wisdom. (Preface, Meadows et. al., 1992)

Overall, to be considered successful, a system that is characterized as "sustainably developed" must be able to promote both economic growth *and* intergenerational equity (or at least parity). By intergenerational equity we mean welfare in both the present and future. The basis of our argument is as follows: Because population growth in developing countries is

increasing steadily, and will continue to do so into the foreseeable future due to demographics (a high percentage of the population being young and reproducing), it is necessary to increase the corresponding wealth of a country to maintain equivalence in standard of living. Today, the total fertility rate in developed countries is 1.6 children per woman; however, it is still 3.1 children per woman in developing countries despite regional variations (World Resources Institute, 2003). The populations of most countries in the "developed" world, with a few exceptions like the United States (factoring in immigration) are either stable or in decline with a fertility rate at or below 2.1 children per woman (*ibid.*). In the developing world, however, even where rates of increase of population are in decline, the absolute level of population continues to grow. At a minimum, then, economic growth must equal or exceed the level of population increase if countries are to continue to maintain *previous* levels of wealth and standard of living. To achieve the anticipated increase in standard of living, simply matching the projected upswing in need is not enough. To many analysts, myself included, there must be overall growth to facilitate sustainability, at least in the developing world. (This is not to endorse the idea of infinite growth. I deal briefly with the idea that "sustainable growth" is an oxymoron below.)

Without accountable growth, the needs of an increased population even in a "steady state" economy impinge on the natural resources and environment of an area. Shorter term and highly specialized means of sustenance, such as monoculture cropping, deforestation without reforestation, and soil and water overuse (erosion in particular) are the result. When long term projects and resource management schemes are seen as an unaffordable luxury due to scarce land and high demand for food, a cycle of depreciation can occur, with devastating effect.

For there to be a reasonable level of intergenerational equity it is necessary that improved welfare for the present not be made at the expense of future prospects and developments. Non-

sustainable definitions of development stress the present values of development benefits and discount future values. Maximization of present values tends to lead toward strategies of optimal use that deplete resources and degrade the natural environment. Of course some traditional economists would argue (that) "environmental degradation *should* take place if the gains from the activities causing the degradation (example: agricultural clearing of forests, development of wetlands) are greater than the benefits of preserving the areas in their present form" (Pearce, Barbier and Markandya 1990: 2). However, sustainable development theorists beg to differ.

Despite the seeming clarity of the arguments above (that sustainability equals accountable growth), it should be noted that the term "sustainable development" has over the years been used to mean many things and has become rather fuzzy. As noted in a critical review by Lélé (1991), some use it to focus on ecological (environmental) sustainability, in which case discussion usually centers on the use of and rate of depletion of biological and scientific elements. Some incorporate basic needs and poverty alleviation strategies (essentially the definition used by the United Nations and its agencies). More rarely, some focus on social aspects such as maintenance of cultural values (Barbier 1987), a connotation that arguably is important in discussing such aspects outlined in Agenda 21 as the role of indigenous populations. The most commonly accepted definition is the one I have already cited, used by the Brundtland Commission, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." But while this definition is succinct, it admittedly does tell us much about specifics.

Many authors have tried to make the concept clearer (and therefore more amenable to policy solutions). Lélé, for example, points to contradictions and inconsistencies in the concept both at the theoretical and policy level (for instance, while many proponents of sustainable

development make the case for tackling poverty as a cause of environmental degradation, some object that the poor are being unduly blamed for what are really corporate and governmental sins). He suggests rejection of attempts to make the concept compatible with neoclassical economic notions of growth, acceptance of the existence of structural, technological, and cultural causes of both poverty and environmental degradation, developing criteria to address the multiple dimensions of sustainability, and exploring "what patterns and levels of resource demand and use would be compatible with different forms or levels of ecological and social sustainability, and with different notions of equity and social justice" (1991: 618).

Herman Daly has drawn much attention with his specific arguments about the use of the concept in an economic context (Daly 1994). Neoclassical economists have used the term "sustainable growth" as the near equivalent (if not the complete equivalent) of "sustainable development," with the implication that growth can continue and somehow be "sustainable." Daly argues that the term "sustainable growth" is an oxymoron in the first place (note: he does not argue that "sustainable development," is, when "development" is used in the proper sense of *evolution* or, as social scientists use it, socioeconomic change. Social scientists have, by the way, often pointed out that such change can occur in an upward or downward pattern, that is, positive development or decay). Although he perhaps overreacts by assuming that the growth proponents argue for limitless, never-ending growth, he is correct in opposing those who think that an economy can *grow forever* without severe environmental consequences.

To accept this, non-economists need not delve too deeply into his concept of "optimal scale" (the argument that economists, while always concerned about scale of production as it affects efficiency at the micro level, completely ignore the macro level of the ultimate limit of the eco-system within which global economic activities take place). After all, statistics are

produced and disseminated daily to show that environmental harm is in fact occurring world wide from industrial and social activity – statistics on the effect of deforestation, greenhouse gases/global warming etc. Daly properly outlines the dilemma behind his advocated "no growth" policy – the dilemma is distributional: how to let some grow (developing countries) at the expense of others. Still, he does not offer specific plausible solutions to this social dilemma though he does propose an overall technological "fix":

1. renewable resources should be depleted no faster than they can be renewed;
2. nonrenewable resources should be depleted no faster than substitutes can be found;
3. pollutants should be emitted no faster than the environment can absorb them.

This is sensible from the technological point of view but not at all easy to put into practice. Measurement and allocation problems are but one issue (as can be seen in the varied "scientific" viewpoints of the effect of greenhouse gases and the difficulties encountered in implementing the Kyoto Protocol which seeks to reduce harmful emissions by specific percentages; Europe, the U.S., and Japan all have had differing views about the amount and pace of these reductions, and so far the U.S. has refused to adhere to the protocol.) Other issues are far more complex – I refer to the extensive political and economic implications of a no-growth or limited growth policy even for countries that can afford it!

For the small island tourist economies we are dealing with in this study, Daly's solutions are not wholly applicable, largely because island states that rely on tourism do not have the level of control (management) over it as one would with an extraction-type resource like oil, tin or lumber. Basically, almost all the inputs into tourism are renewable in a basic sense -- climate, physical endowments such as beaches, waterfalls, forests, flora and fauna unless driven to extinction by bad practices, even coral reefs unless so badly harmed by pollutants, or disease that

they completely die off. On the other hand, pollutants are perhaps the main issue in tourism – pollution from oil, sewerage, trash, industrial effluents, excessive and carelessly planned hotel construction, cruise ships, too many eco-tourists etc. It is the *interaction* of these pollutant-causing activities and the renewables that is important in analyzing tourism. While clearly caution has to be exercised in ensuring that natural endowments that attract tourists are not overrun and harmed by these same tourists, the issue is less a matter of technical ways to bring about equilibrium in renewability than how to successfully manage the paradoxes of tourism (specifically the "paradox of attraction" that is discussed later).

To sum up, my own view is that sustainable development cannot be viewed in purely quantititative terms (growth) but must accommodate the need for growth of the majority of nations that are developing/emerging economies and societies. Sustainable development is also as much a qualitative as a quantitative issue, meaning that value considerations (culture, distributional issues, policy and political considerations) must be taken into account. I basically agree with the Brundtland definition of controlled development with an eye on future generations (intergenerational equity which I discussed earlier). Growth cannot continue unabated forever, even with technological advances (which themselves can have harmful physical and social effects, as seen in the Green Revolution which I have already mentioned.) However, too may authors seem to naively ignore the practical realities: third world countries and other emerging economies (Eastern Europe) need to exploit resources relatively quickly to meet their people's needs, Though often posed in such terms, this is not really a case of some fruitless attempt at "catching up" with North America and Europe since everyone knows that these developed regions are not going to stand still. It is rather a matter of the most urgent survival. Ignoring their need to grow (responsibly) is not helpful, whatever the doomsday figures say.

Therefore sustainable development must be viewed as an ideal that is not necessarily achievable in an overall global sense though specific countries may come closer to achieving it than others. In the final analysis, true sustainable development is a theory or an abstraction - a theory in which a balance is struck between quantitative improvement and qualitative improvement, in sharp contrast to the previous and well-established historical doctrines of rapid and early industrialization. In a sense, the present is devalued in favor of the future, so that economic and political decisions and projects are consistently evaluated through the lens of sustainability. But for it to be effectively put into *practice*, it requires a measure of foresight, an efficient and accurate means of projection and forecasting, and a realistic allowance for social and economic growth in countries not yet sufficiently developed. What this compromised view means in terms of the ultimate Armageddon scenario of Meadows et al (that is, how to stave it off and how long we can continue to do so) probably has to be determined periodically as we go along, as we find more resources, advance our technology and so on.

In the rest of this study, I am using this piecemeal realistic approach to sustainability in asking the question: what are the problems found in matching the need for economic growth with those of environmental sustainability in small island tourist economies?

Notes

1. The "Club of Rome" originated as "a group of thirty individuals from ten countries—scientists, educators, economists, humanists, industrialists, and national and international civil servants—gathered at the Accademia del Lincei in Rome… to discuss … the present and future predicament of man." Meadows et al., 1972: ix). The "limits to growth" project was based on a model developed by Professor Jay Forrester at MIT and others in the field of Systems Dynamics (p. xi).

Chapter Three

Role of Science and Technology: Malthusian Pessimist vs. Technological Optimist

As mentioned previously, global anxiety over the issue of the Malthusian inspired Limits to Growth was lessened somewhat as unprecedented technological advancement allowed for greater location and exploitation of resources worldwide. In one of the better-known examples, the global supply of oil has been given greater longevity with advances in robotic drilling, exploration and intensification in the use of "deep sea" supplies of crude, as well as improved methods of refining and improved fuel efficiency in internal combustion engines. This, along with technological advances in many other areas allowed actual rates of resource depletion (and population growth) to be less than expected.

In the prognoses of the Limits to Growth analyses, the position of the technological optimists was extensively explored. The authors of the report made two important sets of calculations and conclusions. One set was purely mathematical, the other social. The analysis of the first set led to the following conclusion:

> …the application of technology to apparent problems of resource depletion or pollution or food shortage has no impact on the essential problem, which is exponential growth in a finite and complex system. Our attempts to use even the most optimistic estimates of the benefits of technology in the model did not prevent the ultimate decline of population and industry, and in fact did not in any case postpone the collapse beyond the year 2100. (Meadows et al, 1972: 152).

Recall that the initial Limits argument was that present amounts of growth could not be maintained, and that resource depletion was for the first time in history a distinct possibility. The counter argument was that the Meadows model was flawed in its basic assumptions, and that it did not properly factor in technological development and refinement. Meadows et al were

adamant, however, that no matter the level of advancement, in any finite system (which the earth undoubtedly is), growth *cannot* be maintained indefinitely.

But again, despite the pessimism and debatable mathematical specifics of the Limits to Growth report, its conclusions with regard to the need to carefully manage existing resources remains a core doctrine of sustainable development. That the advancement of technology can delay depletion is acknowledged, so that the principles of adopting and adapting technologies to normally un-sustainable situations have underlain all the concerns since about proper management policy.

Beyond the strictly mathematical calculations, there is also the concern about technological application and advancement without due regard to social and other effects. In regards to the Green Revolution, for example: it is well known now that the introduction of new enriched grains to the developing states (especially Mexico and the Philippines) led to widening inequality (with large farmers adopting the grains more), increased rural unemployment, and resulting migration to the cities. The report also cited rampant and unregulated growth in cities, increased social problems, and ever-expanding suburbanization as the result of technical applications to problems that engendered new problems with no technical solutions (Meadows et al, pp.155-6).

Technology can relieve the symptoms of a problem temporarily *without* affecting the underlying causes and it can also produce undesirable side effects. Faith in technology as the ultimate solution to all problems can thus divert our attention from the most fundamental problem - that of rampant growth in a finite system - and prevent us from taking effective action to solve it. An anecdote illustrates this fact:

> Suppose that, at a given moment, a certain number of people are engaged in the manufacture of pins. They make as many pins as the world needs, working (say) eight hours a day. Someone makes an invention by which the same number of men can make twice as many pins as before. But the world does not need twice as many pins. Pins are already so cheap that hardly any more will be bought at a lower price. In a sensible world, everybody concerned in the manufacture of pins would take to working four hours instead of eight, and everything else would go on as before. But in the actual world this would be thought of as demoralizing. The men still work eight hours, there are too many pins, some employers go bankrupt, and half the men previously concerned in the making of pins are thrown out of work. There is, in the end, just as much leisure as in the other plan, but half the men are totally idle while the other half are still overworked. (Meadows et al.1972: 181)

Finally, when considering even the cautious application of technology, it should be noted that scientific advancement is as important and sometimes more important than as technological advancement in dealing with core issues of sustainability. The two are not synonymous. As Ruttan points out, advances in technology have often preceded or not been ultimately linked with advances in science. Still, there is often an intimate relationship between the two, for example between advances in biological science and agricultural technology. (Ruttan 2001: 79-80)

Historically, advances in technology have not been necessarily tied to survivalist pressures. Atomic energy was discovered by individuals because of pure science research unconnected to the possible future depletion of fossil fuels. Actual practical applications of these scientific theories and discoveries came later and under different circumstances with different stimuli. As Ruttan notes (quoting partly from Layton 1974):

> Instead of a single path running from scientific discovery or innovation through applied research to development, it is more accurate to think of science-oriented and technology-oriented research as two interacting paths that both lead from, and feed back into, a common pool of scientific and technical knowledge.... In some cases the path leads from technical change back to science. The invention of the steam engine preceeded [sic] and contributed to advances in knowledge in metallurgy and thermodynamics that had previously not been considered necessary or feasible. The link to the common pool of existing knowledge, however, is not the only channel of interaction. In many instances, there are direct linkages or interactions that occur at the leading edge of both paths. The linkage between science and technology varies greatly among fields. (Ruttan 2001: 80)

In sum, when we talk about the uses/applications of technology, we need to be aware that some technological applications are science-based, others not. In looking at tourism-based issues, some useful applications come from the scientific field, others are technological. Clearly both aspects can be applied to discussions of development. In the next few chapters, I try to highlight aspects of both.

Chapter Four

The Caribbean Region

The Caribbean region is a heterogeneous one, comprised of a diverse group of English, Spanish, French, and Dutch speaking territories. In its broadest definition, which happens to be both a geographical and political one, the Caribbean includes not only the islands of the Caribbean Sea but the non-island territories that surround the sea: from Venezuela, Colombia and the Guyanas in the south to Central American states, except for El Salvador which does not have a Caribbean coastline. These so-called "Caribbean Basin" states feel similar enough to be all linked in an economic grouping called the Association of Caribbean States (ACS), established in 1994. Nevertheless, there are obvious serious size, economic and cultural differences among them. As a result, it is common to divide these states by language and culture and to subdivide them even further, usually by size.

Caribbean analysts usually divide the region linguistically into the Hispanic (Dominican Republic, Cuba), the French (Haiti and the DOM – *départments d'outre-mer,* French overseas departments), the Dutch (the Netherlands Antilles, Aruba, Sint Maarten which also has a French side: Saint Martin, Saba, St. Eustatius, and continental Suriname) and English-speaking Caribbean (Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Jamaica, Montserrat, St. Kitts-Nevis, St. Lucia, St.Vincent and the Grenadines, Trinidad and Tobago, and a few other smaller dependencies, the British Virgin Islands, the Cayman Islands and Bermuda). The English-speaking group of states are normally linked to two English-speaking continental states Belize and Guyana. They are the core states in an economic grouping The Caribbean Community (CARICOM) which has also expanded recently to include Suriname and, nominally, Haiti. The English-speaking region is also itself subdivided into the smaller "less developed states" (the

small Eastern Caribbean islands) and the larger more developed states (MDCs) Jamaica, Trinidad and Tobago, Barbados and Guyana. In this IQP I will speak about the region as a general unit (islands plus continental states), but sometimes refer to examples from specific states from various linguistic and size groupings.

Development levels

An idea of the development levels of the Caribbean states can be gleaned from published statistics on the major countries. Statistics from the local regional bank, the Caribbean Development Bank, are given in Table 4.1. As of the year 2001, the Gross Domestic Product (GDP) per capita at current prices varied from more than $40,000 (Cayman Islands: $44,571) to more than $10,000 (The Bahamas: $16,250), and down to $920 for Guyana. However, except for the Guyanese aberration (Guyana is still coming out of a period of authoritarian socialist rule), all these countries are middle-income or high-income by World Bank standards. In terms of Purchasing Power Parity (see Table 4.2), a GDP calculation developed by the United Nations Development Program as a more accurate comparative measure, the English-speaking Caribbean states—with only the politically independent ones included--range from Barbados at: $15,560 to Guyana at $4,690). The two non-English CARICOM members, Suriname and Haiti, are at the lower end of the scale: Suriname has a GDP per capita (PPP) of $4,599, and Haiti only $1,860 or about $480 at current prices (that is, non-PPP).

The latest United Nations Human Development Report, which looks at social development factors beyond just GDP, places Barbados as the top developing country in the world (27th overall), Bahamas at 49, Saint Kitts-Nevis 51, and Trinidad and Tobago as number 54. Suriname and Jamaica come in at 77 and 78 respectively. Guyana comes in at 92 and Haiti at 150 (for comparison, the United States ranked 7th). However, the apparent level of

development of these countries might prevent the visitor from understanding the underlying issues at hand.

With respect to the independent states, which unlike the dependencies cannot rely on colonial/metropolitan help, Trinidad and Tobago is the only one with an advanced economy, at a higher level of industrialization. Along with the oil on which it has long relied for revenues, Trinidad and Tobago has one of the world's largest reserves of natural gas and is currently focused on becoming a developed state by the year 2020. Nevertheless, it still seeks to boost tourism, especially in the island of Tobago. Nearby Guyana is still struggling to emerge from decades of misrule and economic decay. With its dense forests bordering the Amazon, high waterfalls, and Amerindian villages, Guyana is strongly promoting eco-tourism. Jamaica, the best known of the countries internationally, has emerged with modest growth from a long period of economic stagnation. Like the smaller Eastern Caribbean countries, Jamaica has depended on income from agriculture (sugar, bananas) and tourism, though its manufacturing and tertiary industries are more developed than those of the smaller islands. Barbados has managed its economy and society well but on a foundation that is highly vulnerable: so-called "sun sea sand" tourism, light manufacturing, and today some technological services.

The most economically vulnerable countries have been those of the Eastern Caribbean. St. Kitts-Nevis does well enough with its main export (sugar), and Antigua-Barbuda with tourism but most of the others--St. Vincent, St. Lucia, Dominica and less so, Grenada (which also depends on spices)--export a single crop, bananas, which after decades of preferential treatment on the European market, is now threatened by new freer rules conforming to the World Trade Organization's mandate. Tourism is vital to all of these countries. It is also vital for The Bahamas which profits from its location conveniently close to the United States and is thriving

as a financial center and a tax haven as well. Finally, on the Central American continent lies Belize, which bridges the divide between the Spanish and English Caribbean. Its exports are agricultural, primarily citrus, but it has been doing very well in recent times from tourism, particularly eco-tourism.

Almost all of these countries find predictions about *sustained* development to be difficult, let alone *sustainable* development. With respect to the latter, it was as a result of CARICOM initiatives in the preparatory period leading up to the United Nations Conference on the Environment (UNCED) 1972 that special focus was placed by the global community on the problems of small-island developing states (SIDS). CARICOM and other states (see list Table 4.3), formed the Alliance of Small Island States (AOSIS) to help deal with their particular issues. AOSIS describes itself as "a coalition of small island and low-lying coastal countries that share similar development challenges and concerns about the environment, especially their vulnerability to the adverse effects of global climate change" (AOSIS website: www.sidsnet.org). "Vulnerability" is an important concept to these countries. At a special follow-up environmental conference for SIDS held in Barbados in 1994, SIDS were described as having a range of problems:

> Although they are afflicted by economic difficulties and confronted by development imperatives similar to those of developing countries generally, small island developing states also have their own peculiar vulnerabilities and characteristics, so that the difficulties they face in the pursuit of sustainable development are particularly severe and complex.
> There are many disadvantages which derive from small size. These are magnified by the fact that many island states are not only small but are themselves made up of a number of small islands. Disadvantages include a narrow range of resources, which forces undue specialization; excessive dependence on international trade and hence vulnerability to global development; high population density, which increases the pressure on already limited resources; overuse of resources and premature depletion; relatively small watersheds and threatened supplies of fresh water; costly public administration and infrastructure, including transportation and communication; and limited institutional

> capacities and domestic markets which are too small to provide significant scale economies, while their limited export volumes, sometimes from remote locations, lead to high freight costs and reduced competitiveness. Small islands tend to have high degrees of endemism and levels of biodiversity, but the relatively small numbers of the various species impose high risks of extinction and create a need for protection. (U.N. 1994: Preamble, Articles 3,4).

Types of Tourism

As can be gleaned from the earlier descriptions, all of the Caribbean countries in one degree or another promote tourism, either the more recent eco-tourism or traditional beach tourism. In this respect, experts in the field of tourism have divided the region into four groups:

> The first group comprises countries in which tourism is largely undeveloped. Such places are visited by small numbers of adventurous travellers using scheduled services or yacht facilities. Generally, these are the less accessible islands and include St Vincent and Dominica.
>
> In the second category of countries, visitor numbers demonstrate a distinct level of growth and overseas operators are beginning to have a presence, promoting "up-market" forms of tourism. Anguilla and the British Virgin islands are examples of these still fashionable destinations that so far remain the haunts of the adventurous.
>
> A relatively large group of countries that have experienced rapidly growing visitor arrivals comprise the third group of countries. Multinational firms within these territories are heavily involved in the construction and running of hotels and the provision of infrastructure, and through the presence of tour operators, the mass market is beginning to discover these destinations. Examples here include Aruba, Martinique, St Kitts and Nevis, and St Lucia.
>
> The last group of countries is characterized by the maturity of tourism development; which is achieved through large numbers of visitor arrivals, the existence of a well-organized industry in which tour operators play a significant role, a range of types of accommodation and a large and diverse support sector. The mass market has become well established at these destinations. Included in this group are islands such as Antigua, The Bahamas, Barbados and Jamaica. (France and Wheeller 1995: 62-63).

According to France and Wheeller, prospects for changes toward sustainable development models depend on the level of tourist development already reached. Eco-tourism, for example "may not be a such a realistic proposition in the more developed parts of individual islands where mass package tourism has emerged and dominates. These geographical areas show evidence of irreversible change as charter air travel and the tour operators have organized large number of visitor movements from America and Europe." (p. 63).

I will now focus on some of the environmental problems associated especially with this type of (mass market) tourism development, as well as other environmental problems affecting these states. I will also look at how science and technology has been or can be used to further tourist development in a sustainable manner.

Table 4.1

Selected Economic Indicators For CDB's Borrowing Member Countries

Country	SDF [1/] Classi-fication	Area (km^2)	Mid-Year Population 2001 ('000)	Annual Rate of Population Increase 1998-2001 (%)	Annual Change in Consumer Prices 2001 (%)	GDP at Current Market Prices 2000 ($ mn)	GDP at Current Market Prices 2001 ($ mn)	GDP Per Capita at Current Prices 2001 ($)	Real Rate of Growth in GDP 2001 (%)
MDCs (Total/Average)		**245,459**	**5,223.7**	**0.5**	**...**	**23,902.2**	**24,979.4**	**4,782**	**...**
Bahamas, The	1	13,939	307.4	1.6	1.0	4,920.0	4,995.0	16,250	...
Barbados	1	431	269.9	0.4	3.0	2,591.4	2,548.9	9,444	(2.8)
Guyana	4	214,970	774.8	0.1	2.4	704.6	712.8	920	1.9
Jamaica	3	10,991	2,604.8	0.5	7.0	7,598.6	7,768.2	2,982	1.7
Trinidad and Tobago	1	5,128	1,266.8	0.3	5.5	8,087.7	8,954.5	7,069	3.3
LDCs (Total/Average)		**26,796**	**919.3**	**1.7**	**...**	**6,269.3**	**6,457.1**	**7,024**	**...**
Belize	3	22,960	256.0	2.4	1.1	773.0	805.0	3,144	4.6
OECS (Total/Average)		**2,913**	**569.8**	**1.1**	**...**	**2,729.3**	**2,734.9**	**4,799**	**(2.5)**
Antigua and Barbuda	2	442	75.8	2.6	1.5	661.7	686.4	9,055	1.5
Dominica	3	750	71.2	(0.4)	2.5	269.6	263.2	3,696	(4.3)
Grenada	3	345	102.6	0.8	2.0	406.6	398.2	3,880	(3.4)
Montserrat	3	103	4.3	6.6	4.7	34.8	34.7	8,063	(4.2)
St. Kitts and Nevis	3	269	46.1	3.8	2.1	330.1	343.5	7,450	2.4
St. Lucia	3	616	157.8	1.2	3.0	689.2	660.3	4,185	(5.4)
St. Vincent and the Grenadines	3	388	112.0	0.1	0.8	337.3	348.5	3,112	0.2
Other LDCs (Total/Average)		**923**	**93.5**	**3.4**	**...**	**2,767.1**	**2,917.3**	**31,201**	**...**
Anguilla	2	91	11.6	2.1	2.9	108.0	110.2	9,502	2.0
British Virgin Islands	2	151	20.6	1.9	3.0	682.9	742.3	36,034	...
Cayman Islands	1	264	41.4	2.8	2.1	1,773.8	1,845.2	44,571	1.5
Turks and Caicos Islands	3	417	19.9	7.4	...	202.4	219.5	11,030	0.1
All Countries (Total/Average)		**272,255**	**6,143.0**	**0.7**	**...**	**30,171.5**	**31,436.5**	**5,117**	**...**

From Caribbean Development Bank, *Annual Report* 2002 (CDB 2003)

Table 4.2

1 Human development index

HDI rank [a]	Life expectancy at birth (years) 2001	Adult literacy rate (% age 15 and above) 2001	Combined primary, secondary and tertiary gross enrolment ratio (%) 2000-01 [b]	GDP per capita (PPP US$) 2001	Life expectancy index	Education index	GDP index	*Human development index (HDI) value* 2001	*GDP per capita (PPP US$) rank minus HDI rank* [c]
51 Saint Kitts and Nevis	70.0 [s]	97.8 [s]	70 [s]	11,300	0.75	0.89	0.79	0.808	-5
52 Cuba	76.5	96.8	76	5,259 [g,r]	0.86	0.90	0.66	0.806	38
53 Belarus	69.6	99.7 [d]	86	7,620	0.74	0.95	0.72	0.804	9
54 Trinidad and Tobago	71.5	98.4	67	9,100	0.78	0.88	0.75	0.802	1
55 Mexico	73.1	91.4	74 [e]	8,430 [f]	0.80	0.86	0.74	0.800	3
Medium human development									
56 Antigua and Barbuda	73.9 [s]	86.6 [s]	69 [s]	10,170	0.82	0.81	0.77	0.798	-8
57 Bulgaria	70.9	98.5	77	6,890	0.76	0.91	0.71	0.795	12
58 Malaysia	72.8	87.9	72 [e]	8,750 [f]	0.80	0.83	0.75	0.790	-2
59 Panama	74.4	92.1	75 [g]	5,750	0.82	0.86	0.68	0.788	23
60 Macedonia, TFYR	73.3	94.0 [q,i]	70	6,110	0.81	0.86	0.69	0.784	15
61 Libyan Arab Jamahiriya	72.4	80.8	89 [e]	7,570 [g,u]	0.79	0.84	0.72	0.783	2
62 Mauritius	71.6	84.8	69	9,860	0.78	0.80	0.77	0.779	-12
63 Russian Federation	66.6	99.6 [d]	82 [e]	7,100	0.69	0.93	0.71	0.779	3
64 Colombia	71.8	91.9	71	7,040	0.78	0.85	0.71	0.779	3
65 Brazil	67.8	87.3	95 [e]	7,360	0.71	0.90	0.72	0.777	-1
66 Bosnia and Herzegovina	73.8	93.0 [p,q]	64 [e]	5,970	0.81	0.83	0.68	0.777	13
67 Belize	71.7	93.4	76 [e]	5,690	0.78	0.88	0.67	0.776	16
68 Dominica	72.9 [s]	96.4 [s]	65 [s]	5,520	0.80	0.86	0.67	0.776	18
69 Venezuela	73.5	92.8	68	5,670	0.81	0.84	0.67	0.775	15
70 Samoa (Western)	69.5	98.7	71	6,180	0.74	0.89	0.69	0.775	4
71 Saint Lucia	72.2	90.2 [s]	82 [g]	5,260	0.79	0.88	0.66	0.775	17
72 Romania	70.5	98.2	68	5,830	0.76	0.88	0.68	0.773	9
73 Saudi Arabia	71.9	77.1	58 [g]	13,330	0.78	0.71	0.82	0.769	-33
74 Thailand	68.9	95.7	72 [e]	6,400	0.73	0.88	0.69	0.768	-2
75 Ukraine	69.2	99.6 [d]	81 [g]	4,350	0.74	0.93	0.63	0.766	23
76 Kazakhstan	65.8	99.4 [d]	78	6,500	0.68	0.92	0.70	0.765	-5
77 Suriname	70.8	94.0 [p,q]	77 [e]	4,599 [i,o]	0.76	0.88	0.64	0.762	18
78 Jamaica	75.5	87.3	74 [e]	3,720	0.84	0.83	0.60	0.757	27
79 Oman	72.2	73.0	58 [g]	12,040 [g]	0.79	0.68	0.80	0.755	-36
80 St. Vincent & the Grenadines	73.8	88.9 [s]	58 [s]	5,330	0.81	0.79	0.66	0.755	7
81 Fiji	69.3	93.2	76 [e,g]	4,850	0.74	0.88	0.65	0.754	11
82 Peru	69.4	90.2	83 [e,g]	4,570	0.74	0.88	0.64	0.752	14
83 Lebanon	73.3	86.5	76	4,170	0.80	0.83	0.62	0.752	18
84 Paraguay	70.5	93.5	64 [e,h]	5,210	0.76	0.84	0.66	0.751	7
85 Philippines	69.5	95.1	80 [e]	3,840	0.74	0.90	0.61	0.751	19
86 Maldives	66.8	97.0	79	4,798 [i,o]	0.70	0.91	0.65	0.751	7
87 Turkmenistan	66.6	98.0 [q,t]	81 [h]	4,320	0.69	0.92	0.63	0.748	13
88 Georgia	73.4	100.0 [d,p,q]	69	2,560	0.81	0.89	0.54	0.746	33
89 Azerbaijan	71.8	97.0 [p,q]	69 [g]	3,090	0.78	0.88	0.57	0.744	24
90 Jordan	70.6	90.3	77 [e,g]	3,870	0.76	0.86	0.61	0.743	13
91 Tunisia	72.5	72.1	76 [e]	6,390	0.79	0.73	0.69	0.740	-18
92 Guyana	63.3	98.6	84 [e,g]	4,690	0.64	0.94	0.64	0.740	2
93 Grenada	65.3 [s]	94.4 [s]	63	6,740	0.67	0.84	0.70	0.738	-23
94 Dominican Republic	66.7	84.0	74 [e]	7,020	0.70	0.81	0.71	0.737	-26
95 Albania	73.4	85.3	69	3,680	0.81	0.80	0.60	0.735	11
96 Turkey	70.1	85.5	60 [e,g]	5,890	0.75	0.77	0.68	0.734	-16
97 Ecuador	70.5	91.8	72 [e]	3,280	0.76	0.85	0.58	0.731	12
98 Occupied Palestinian Territories	72.1	89.2 [w]	77 [g]	.. [x]	0.79	0.85	0.56	0.731	19
99 Sri Lanka	72.3	91.9	63 [e,g]	3,180	0.79	0.82	0.58	0.730	13
100 Armenia	72.1	98.5	60	2,650	0.78	0.86	0.55	0.729	19

1 Human development index

HDI rank [a]		Life expectancy at birth (years) 2001	Adult literacy rate (% age 15 and above) 2001	Combined primary, secondary and tertiary gross enrolment ratio (%) 2000-01 [b]	GDP per capita (PPP US$) 2001	Life expectancy index	Education index	GDP index	Human development index (HDI) value 2001	GDP per capita (PPP US$) rank minus HDI rank [c]
101	Uzbekistan	69.3	99.2 [d]	76 [h]	2,460	0.74	0.91	0.53	0.729	21
102	Kyrgyzstan	68.1	97.0 [b,g]	79	2,750	0.72	0.91	0.55	0.727	16
103	Cape Verde	69.7	74.9	80 [e]	5,570 [i]	0.75	0.77	0.67	0.727	-18
104	China	70.6	85.8	64 [c,g]	4,020	0.76	0.79	0.62	0.727	-2
105	El Salvador	70.4	79.2	64	5,260	0.76	0.74	0.66	0.719	-17
106	Iran, Islamic Rep. of	69.8	77.1	64	6,000	0.75	0.73	0.68	0.719	-29
107	Algeria	69.2	67.8	71 [e]	6,090 [i]	0.74	0.69	0.69	0.704	-31
108	Moldova, Rep. of	68.5	99.0	61	2,150	0.72	0.86	0.51	0.700	21
109	Viet Nam	68.6	92.7	64	2,070	0.73	0.83	0.51	0.688	21
110	Syrian Arab Republic	71.5	75.3	59 [g]	3,280	0.77	0.70	0.58	0.685	-1
111	South Africa	50.9	85.6	78	11,290 [i]	0.43	0.83	0.79	0.684	-64
112	Indonesia	66.2	87.3	64 [e]	2,940	0.69	0.80	0.56	0.682	2
113	Tajikistan	68.3	99.3 [d]	71	1,170	0.72	0.90	0.41	0.677	41
114	Bolivia	63.3	86.0	84 [e]	2,300	0.64	0.85	0.52	0.672	12
115	Honduras	68.8	75.6	62 [e]	2,830	0.73	0.71	0.56	0.667	1
116	Equatorial Guinea	49.0	84.2	58 [g]	15,073 [g,y]	0.40	0.76	0.84	0.664	-78
117	Mongolia	63.3	98.5	64	1,740	0.64	0.87	0.48	0.661	25
118	Gabon	56.6	71.0 [b,g]	83 [e]	5,990	0.53	0.75	0.68	0.653	-40
119	Guatemala	65.3	69.2	57 [c]	4,400	0.67	0.65	0.63	0.652	-22
120	Egypt	68.3	56.1	76 [c,h]	3,520	0.72	0.63	0.59	0.648	-12
121	Nicaragua	69.1	66.8	65 [c,g]	2,450 [g,i]	0.73	0.66	0.53	0.643	2
122	São Tomé and Principe	69.4	83.1 [m]	58 [m]	1,317 [g,r]	0.74	0.75	0.43	0.639	28
123	Solomon Islands	68.7	76.6 [m]	50 [m]	1,910 [i]	0.73	0.68	0.49	0.632	13
124	Namibia	47.4	82.7	74 [g]	7,120 [i]	0.37	0.80	0.71	0.627	-59
125	Botswana	44.7	78.1	80	7,820	0.33	0.79	0.73	0.614	-65
126	Morocco	68.1	49.8	51 [g]	3,600	0.72	0.50	0.60	0.606	-19
127	India	63.3	58.0	56 [c,g]	2,840	0.64	0.57	0.56	0.590	-12
128	Vanuatu	68.3	34.0 [m]	54 [g]	3,190 [i]	0.72	0.41	0.58	0.568	-17
129	Ghana	57.7	72.7	46	2,250 [i]	0.54	0.64	0.52	0.567	-1
130	Cambodia	57.4	68.7	55	1,860	0.54	0.64	0.49	0.556	9
131	Myanmar	57.0	85.0	47	1,027 [g,u]	0.53	0.72	0.39	0.549	28
132	Papua New Guinea	57.0	64.6	41 [g]	2,570 [i]	0.53	0.57	0.54	0.548	-12
133	Swaziland	38.2	80.3	77 [g]	4,330	0.22	0.79	0.63	0.547	-34
134	Comoros	60.2	56.0	40 [g]	1,870 [i]	0.59	0.51	0.49	0.528	4
135	Lao People's Dem. Rep.	53.9	65.6	57	1,620 [i]	0.48	0.63	0.46	0.525	10
136	Bhutan	62.5	47.0 [b,g]	33 [h]	1,833 [e]	0.62	0.42	0.49	0.511	5
137	Lesotho	38.6	83.9	63	2,420 [i]	0.23	0.77	0.53	0.510	-13
138	Sudan	55.4	58.8	34 [g]	1,970	0.51	0.51	0.50	0.503	-4
139	Bangladesh	60.5	40.6	54	1,610	0.59	0.45	0.46	0.502	7
140	Congo	48.5	81.8	57 [e]	970	0.39	0.73	0.38	0.502	22
141	Togo	50.3	58.4	67 [g]	1,650	0.42	0.61	0.47	0.501	3
Low human development										
142	Cameroon	48.0	72.4	48 [c,g]	1,680	0.38	0.64	0.47	0.499	1
143	Nepal	59.1	42.9	64	1,310	0.57	0.50	0.43	0.499	8
144	Pakistan	60.4	44.0	36	1,890	0.59	0.41	0.49	0.498	-7
145	Zimbabwe	35.4	89.3	59 [e]	2,280	0.17	0.79	0.52	0.496	-18
146	Kenya	46.4	83.3	52	980	0.36	0.73	0.38	0.489	14
147	Uganda	44.7	68.0	71	1,490 [i]	0.33	0.69	0.45	0.489	1
148	Yemen	59.4	47.7	52 [g]	790	0.57	0.49	0.34	0.470	21
149	Madagascar	53.0	67.3	41 [g]	830	0.47	0.58	0.35	0.468	17
150	Haiti	49.1	50.8	52 [h]	1,860 [i]	0.40	0.51	0.49	0.467	-11
151	Gambia	53.7	37.8	47 [e]	2,050 [i]	0.48	0.41	0.50	0.463	-20

1 Human development index

HDI rank [a]		Life expectancy at birth (years) 2001	Adult literacy rate (% age 15 and above) 2001	Combined primary, secondary and tertiary gross enrolment ratio (%) 2000-01 [b]	GDP per capita (PPP US$) 2001	Life expectancy index	Education index	GDP index	Human development index (HDI) value 2001	GDP per capita (PPP US$) rank minus HDI rank [c]
152	Nigeria	51.8	65.4	45 [h]	850	0.45	0.59	0.36	0.463	13
153	Djibouti	46.1	65.5	21 [g]	2,370	0.35	0.51	0.53	0.462	-28
154	Mauritania	51.9	40.7	43	1,990 [i]	0.45	0.41	0.50	0.454	-21
155	Eritrea	52.5	56.7	33	1,030	0.46	0.49	0.39	0.446	3
156	Senegal	52.3	38.3	38 [e]	1,500	0.46	0.38	0.45	0.430	-9
157	Guinea	48.5	41.0 [d,g]	34 [e]	1,960	0.39	0.39	0.50	0.425	-22
158	Rwanda	38.2	68.0	52 [g]	1,250	0.22	0.63	0.42	0.422	-5
159	Benin	50.9	38.6	49 [e]	980	0.43	0.42	0.38	0.411	1
160	Tanzania, U. Rep. of	44.0	76.0	31	520	0.32	0.61	0.28	0.400	14
161	Côte d'Ivoire	41.7	49.7	39 [g]	1,490	0.28	0.46	0.45	0.396	-13
162	Malawi	38.5	61.0	72 [e]	570	0.22	0.65	0.29	0.387	11
163	Zambia	33.4	79.0	45	780	0.14	0.68	0.34	0.386	7
164	Angola	40.2	42.0 [g,i]	29 [g]	2,040 [i]	0.25	0.38	0.50	0.377	-32
165	Chad	44.6	44.2	33 [g]	1,070 [i]	0.33	0.41	0.40	0.376	-8
166	Guinea-Bissau	45.0	39.6	43 [g]	970	0.33	0.41	0.38	0.373	-4
167	Congo, Dem. Rep. of the	40.6	62.7	27 [g]	680 [i]	0.26	0.51	0.32	0.363	5
168	Central African Republic	40.4	48.2	24 [h]	1,300 [i]	0.26	0.40	0.43	0.363	-16
169	Ethiopia	45.7	40.3	34	810	0.34	0.38	0.35	0.359	-2
170	Mozambique	39.2	45.2	37	1,140 [i]	0.24	0.43	0.41	0.356	-15
171	Burundi	40.4	49.2	31	690 [i]	0.26	0.43	0.32	0.337	0
172	Mali	48.4	26.4	29 [g]	810	0.39	0.27	0.35	0.337	-5
173	Burkina Faso	45.8	24.8	22 [e]	1,120 [i]	0.35	0.24	0.40	0.330	-17
174	Niger	45.6	16.5	17	890 [i]	0.34	0.17	0.36	0.292	-10
175	Sierra Leone	34.5	36.0 [d,g]	51	470	0.16	0.41	0.26	0.275	0
Developing countries		64.4	74.5	60	3,850	0.66	0.70	0.61	0.655	..
Least developed countries		50.4	53.3	43	1,274	0.43	0.50	0.42	0.448	..
Arab States		66.0	60.8	60	5,038	0.70	0.63	0.65	0.662	..
East Asia and the Pacific		69.5	87.1	65	4,233	0.74	0.80	0.63	0.722	..
Latin America and the Caribbean		70.3	89.2	81	7,050	0.75	0.86	0.71	0.777	..
South Asia		62.8	56.3	54	2,730	0.64	0.56	0.55	0.582	..
Sub-Saharan Africa		46.5	62.4	44	1,831	0.36	0.56	0.49	0.468	..
Central & Eastern Europe & CIS		69.3	99.3	79	6,598	0.74	0.92	0.70	0.787	..
OECD		77.0	..	87	23,363	0.87	0.94	0.91	0.905	..
High-income OECD		78.1	..	93	27,169	0.89	0.97	0.94	0.929	..
High human development		77.1	..	89	23,135	0.87	0.95	0.91	0.908	..
Medium human development		67.0	78.1	64	4,053	0.70	0.74	0.62	0.684	..
Low human development		49.4	55.0	41	1,186	0.41	0.50	0.41	0.440	..
High income		78.1	..	92	26,989	0.89	0.96	0.93	0.927	..
Middle income		69.8	86.6	70	5,519	0.75	0.82	0.67	0.744	..
Low income		59.1	63.0	51	2,230	0.57	0.59	0.52	0.561	..
World		66.7	..	64	7,376	0.70	0.75	0.72	0.722	..

Note: As a result of revisions to data and methodology and varying country coverage, human development index values and ranks are not strictly comparable with those in earlier *Human Development Reports*. The index has been calculated for UN member countries with reliable data in each of its components as well as for Hong Kong, China (SAR) and the Occupied Palestinian Territories. For data on the remaining 18 UN member countries, see table 30. Aggregates for columns 5-8 are based on all data in the table.

a. The HDI rank is determined using HDI values to the sixth decimal point. b. Data refer to the 2000/01 school year. Data for some countries may refer to national or UNESCO Institute for Statistics estimates. For details, see http://www.uis.unesco.org/. Because data are from different sources, comparisons across countries should be made with caution. c. A positive figure indicates that the HDI rank is higher than the GDP per capita (PPP US$) rank, a negative the opposite. d. For purposes of calculating the HDI, a value of 99.0% was applied. e. Preliminary UNESCO Institute for Statistics estimate, subject to further revision. f. For purposes of calculating the HDI, a value of 100% was applied. g. Data refer to a year other than that specified. h. Data refer to the 1999/2000 school year. They were provided by the UNESCO Institute for Statistics for *Human Development Report 2001* (see UNESCO Institute for Statistics 2001). i. The ratio is an underestimate, as many secondary and tertiary students pursue their studies in nearby countries. j. For purposes of calculating the HDI, a value of $40,000 (PPP US$) was applied. k. Excludes Turkish students and population. l. Estimate based on regression. m. Data are from national sources. n. Because the combined gross enrolment ratio was unavailable, the Human Development Report Office estimate of 78% was used. o. Preliminary World Bank estimate, subject to further revision. p. UNICEF 2003b. q. Data refer to a year or period other than that specified, differ from the standard definition or refer to only part of the country. r. Aten, Heston and Summers 2002. s. Data are from the Secretariat of the Organization of Eastern Caribbean States, based on national sources. t. UNICEF 2000. u. Aten, Heston and Summers 2001. v. UNDP 2002. w. Birzeit University 2002. x. In the absence of an estimate of GDP per capita (PPP US$), the Human Development Report Office estimate of $2,783, derived using the value of GDP in US dollars and the weighted average ratio of PPP US dollars to US dollars in the Arab States, was used. y. World Bank 2002.

Source: Column 1: unless otherwise noted, calculated on the basis of data on life expectancy from UN 2003d; *column 2:* unless otherwise noted, UNESCO Institute for Statistics 2003a; *column 3:* unless otherwise noted, UNESCO Institute for Statistics 2003b; *column 4:* unless otherwise noted, World Bank 2003c; aggregates calculated for the Human Development Report Office by the World Bank; *column 5:* calculated on the basis of data in column 1; *column 6:* calculated on the basis of data in columns 2 and 3; *column 7:* calculated on the basis of data in column 4; *column 8:* calculated on the basis of data in columns 5-7; see technical note 1 for details; *column 9:* calculated on the basis of data in columns 4 and 8.

Table 4.3

Alliance of Small Island States (AOSIS)

Members

- Antigua and Barbuda
- Bahamas
- Barbados
- Belize
- Cape Verde
- Comoros
- Cook Islands
- Cuba
- Cyprus
- Dominica
- Fiji
- Federated States of Micronesia
- Grenada
- Guinea-Bissau
- Guyana
- Haiti
- Jamaica
- Kiribati
- Maldives
- Malta
- Marshall Islands
- Mauritius
- Nauru
- Niue
- Palau
- Papua New Guinea
- Samoa
- Singapore
- Seychelles
- Sao Tome and Principe
- Solomon Islands
- St. Kitts and Nevis
- St. Lucia
- St. Vincent and the Grenadines
- Suriname
- Tonga
- Trinidad and Tobago
- Tuvalu
- Vanuatu

Observers

American Samoa
Guam
Netherlands Antilles
U.S. Virgin Islands

Chapter Five

Dilemmas of Sustainable Tourism

The Paradox of Attraction

Tourism as an industry is full of paradoxes. Perhaps the central paradox, applied to just about any form of tourism, is that the attractiveness of a spot to tourists depends on certain factors that are likely to be changed or ruined in some way with the increase in tourism. This is why in most tourist areas locals are torn between welcoming the money and contacts coming from tourism and decrying the loss of charm, pristine nature, privacy, culture, local identities and so on that come from being overrun by tourists. Ian Knowd gives pertinent examples in the context of the "new" attractiveness of rural tourism (including ecotourism). According to him:

> Tourism academics have long been aware of the central paradox of tourism, one that impacts most cruelly on those places that most need the benefits of tourism. For remote, isolated, thinly populated and unique tourism destinations, the worst thing that can happen is that they become popular with tourists. The *paradox of rural character of place* can be stated as follows:
> The tourists' interest stems from their perception and expectations of the rural character of a place. The rural character of a place relies on the absence of tourists, for both the host community and the tourists.(Knowd 2001: 37)

This leads him to a number of other paradoxes centering on the need to be externally oriented and professionalized in terms of tourism services, which ironically may erode the very sense of rurality and charm that makes the spot attractive in the first place.

Beach tourism is not very different. The paradox of attraction dictates that that the more attractive/unique the spot and the more it is marketed as such for economic purposes, the more likely it will bring an increase in tourists who will in turn bring overcrowding, pollution and other problems that will detract eventually from the original nature and feel of the attraction. Solutions posed by tourism experts usually focus on management: As Knowd says with respect

to his own interest, rural tourism, "if rural tourism places are to remain a niche, they must manage the market to avoid, what has been described in the literature as, killing the goose that lays the golden egg." (Ibid.) To take just one example, in rural areas, modern amenities have to be incorporated in such a way as to somehow maintain rurality on the surface. Not just economic but cultural and social interaction between local and tourists have to be similarly managed.

In the case of the Caribbean, there is no doubt that some areas have been grossly mismanaged in this regard, producing overdevelopment, as in the case of the island of St. Martin (or in the case of Cancun in Mexico) that I will allude to further below. Uncontrolled ecotourism (as in Costa Rica) has been widely pointed to as an example of how NOT to manage that sector. One could adopt the Jamaican style of keeping tourists relatively isolated on the North coast and Negril areas. This is less invasive than the Barbadian situation where almost the entire country feeds into the tourist industry but concentrated North Coast development has also generated environmental problems as well as social antagonisms.

Ironically, one of the better ways to manage the paradox of attraction seems to be to keep prices high and the product exclusive for the tourist: "Mustique"-style tourism (Mustique is an island in the Grenadines, a part of Saint Vincent, reserved for the "rich and famous."), that is tourism aimed at a very wealthy segment of the market, can keep the industry controlled by discouraging the average tourist, can limit environmental damage, and can at the same time bring in much-needed revenue. However, this type of enclave tourism also carries a high social cost (often, for example, locals are barred from using large tracts of land) and is not suitable for areas that are not unusually attractive. In the following pages, I give a bit more detail on the problems encountered in 1) ecotourism and 2) beach tourism.

Ecotourism

This is the latest slant in tourism worldwide. "Adventure travel" can be intense or fairly casual; there are packages now to suit every type of traveler. However, some believe that "Ecotourism and sustainability are being manipulated by the industry and by the official tourist lobby to sell the product" (France and Wheeller 1995: 66). These authors point out that whereas the intellectual debate about whether eco-tourism and sustainable development are compatible has been quite vigorous, practitioners have tended to not see the dilemmas and to take a business standpoint that "Green is good … if can be employed to sell the product" (p. 66).

The success of eco-tourism depends on careful management of flora and fauna that, as the U.N. statement previously cited notes, have high risks of extinction. Jamaica is one island where very few indigenous species of fauna still exist. In other islands and mainland countries, local fauna are threatened by infrastructure and housing developments and by cultural norms that favor everything from hunting and killing poisonous or annoying wildlife to eating the "wild meat" of what should be protected endangered species. Laws governing these practices are of very recent vintage and prosecution is rare. In terms of biodiversity, the Caribbean region contains many rarities – among them, habitats of the Scarlet Ibis, leatherback turtle, 'oil bird' (*guacharo*), tropical macaws, humming birds, and, in the Suriname and Guyana Amazonian areas, wild boar, piranha (various species), anaconda, rare frogs and reptiles, and may others. But sadly, as I found out on a trip with my family to the still-unspoiled interior of Suriname, like the situation in Africa, more rare species are often found in private zoos or in the hands of private dealers who export wild animals than in the outer reaches of the forests themselves. The same situation applies to flora in that many indigenous plants have been driven to extinction by infrastructural and housing development and by introduction of "foreign" species. A new threat

as well as a possible savior is the thrust by some countries to develop pharmaceutical and biotechnological industries based on local flora. This can be a good thing if revenue enhancement is balanced against depletion, but can have undesirable effects if not well handled and researched beforehand.

> If an organism that interacts with the one that we are evaluating becomes extinct, molecules that are induced in one organism only in the presence of a specific other organism or that are synthesized by one organism from a precursor provided by the other organism might be missed. For example, plants respond to fungi-derived molecules by synthesizing protective compounds; fungi, in turn, have evolved to produce molecules that selectively prevent accumulation of these antifungal agents, or that can detoxify these agents by converting them into other molecules.
>
> The case of the poison dart frog, *Phyllobates terribilis*, adds weight to the argument. Although *P terribilis* is so toxic that a lethal dose of the voltage-dependant sodium channel agonist batrachotoxin can be harvested by rubbing the tip of a hollow blow dart across the frog's back, batrachotoxin could not be detected in second generation, terrarium-raised frogs. Does the batrachotoxin or an essential cofactor/precursor come from the frog's diet? Is there an environmental trigger for the synthesis? (Pan American Health Organization 1996 :86)

Finally lack of rainforest conservation (again, usually from road building and human intrusion) has also led to major structural problems--hillside erosion and floods during the rainy season—as well as fauna flight and extinction. The revenue needs of many (especially countries such as Suriname) lead to the exploitation and export of valuable timber resources such as rare mahogany that, as pointed out in a recent New York Times article, ends up as extremely high-end furniture in the stores of New York City and Long Island!

In the rush to eco-tourism, governments of the Caribbean are generally pitted against local environmental groups and concerned citizens. The projects envisaged by the governments tend to be environmentally disruptive, even when governments indicate that they will not be. As France and Wheeller point out in one case in Jamaica, the Ministry of Tourism described "opening up the South coast of the country to tourism" in terms of "small-scale, ecologically

sensitive development," whereas the concerned groups objected that the type of development envisaged would be as bad as the rampant resort growth on Jamaica's north coast (France and Wheeller 1995: 67). In a recent example in Trinidad and Tobago, the pristine North coast (home to the highest mountain in the country and some of the rarest flora and fauna as well as best beaches) has come under threat from a governmental decision to build a highway to connect certain areas that are currently inaccessible. Ironically, the prime minister called the highway an "eco-highway," a term which detractors immediately called an oxymoron. (Trinidad Express, October 5, 2003).

To avoid the problem of eco-tourist overreach, environmentalists and sensitive governments have naturally turned to scientific research. Neil Sealey gives the example of the blue holes (*cenotes*) of the Bahamas' Andros Island. These Bahamian holes have been investigated by divers such as Jacques Cousteau since the late 1950s but formal investigations began under The Andros Project led by Robert Palmer in 1987. "Diving, filming, and geological, hydrological and biological research were all included [in the scope of the project] and …the possibility of finding cultural remains was also discussed" (Sealey 1995: 37). These investigations have produced much helpful scientific material along with the discovery of some skeletons that are being analyzed by anthropologists. Fortunately, the sparse populated Andros has been off the beaten path for tourists for most of the time but it is now becoming more highly developed, with a special focus on the diving industry. Because of the threat from development, scientists would like to see the caves designated by the international community as sites of great scientific or historic interest (Sealey, p. 45). In this case, it is clear that scientists are leading the charge toward sustainable tourism.

Scientists have also been at work investigating the use of wetlands for tourism and related issues of coastal management (also relevant to traditional tourism discussed below). Bacon (1995: 46-56) notes that Caribbean wetlands and mangrove forests are generally degraded from overuse and neglect. Site rehabilitation is needed before any incorporation of ponds, lagoons and creeks into landscaping to enhance tourist venues.

One of the ways in which the Caribbean countries are tackling these and other environmental problems is by adjusting the training of environmental managers. Caribbean universities, including the USVI Marine Biology Unit, have come together to move toward an integrated political-social as well as scientific curriculum. For example, the important coastal area with its high level of biodiversity (mangrove forests and lagoons, coral reefs, beaches, estuaries, seagrass beds) is clearly a shared use area, used for industry, fishing, and waste disposal as well as for recreation/tourism (Ragster 1997: 117). To deal with the environmental issue solely from the point of view of the scientist (fisheries management/biology, coastal management/ecology, forestry management etc.) leads to narrow problem solving. A new university curriculum instead stresses an integrated approach with courses such as: resources and economic development; community-based resource management; resource policy; and parks and protected areas management; as well as much-needed dispute resolution skills, group dynamics, critical thinking and the integration of economic, ecological, political and other data (Ragster, p. 120). As Ragster puts it, the harvesting of sea urchins needs to be investigated not just in terms of the environmental and biological needs of the organism but also in terms of the socially acceptable and economically acceptable methods of harvesting. One might also add in terms of the threat to their habitat posed by the tourist influx.

Despite all this, Caribbean governments and those involved in the tourist industry are still not yet willing to spend as much as they should on environmental impact assessments and to halt the economically profitable tourist advance for "green" goals. In comparing rampant and hazardous growth in Sint Maarten/Saint Martin with the more managed growth in Bermuda, Albuquerque and McElroy note that Bermuda's "soft tourism policy" focuses on:

> …visual quality, the maintenance of natural and cultural amenities, quiet and safety, and … widespread community awareness and support to facilitate these goals.
>
> Specific ordinances were enacted preventing development that would disturb special natural vistas, open spaces and delicate areas rich in species diversity and historical memory. In addition, there are detailed and enforced regulations concerning the design and construction (for example, use of natural local materials) of tourist and residential facilities to preserve the old world ambience/colonial architectural flavour. There are also substantial guidelines for residential landscaping and retaining endemic vegetation. (Albuquerque and McElroy 1995: 85)

But few countries follow Bermuda's example. Dachary and Arnaiz Burne, for example, take an extensive look at the degradation of the coastal zone off Mexico-Belize, noting unregulated growth all along the coasts, especially in the Cancun-Cozumel and Isla Mujeres triangle. A biosphere decreed by presidential fiat in Cantoy Island had to be closed temporarily as an eco-tourist site because of "introduction of extraneous species and irrational use of the land" (Dachary and Arnaiz Burne 1997: 209). Another refuge of marine flora and fauna in the western area of Isla Mujeres has been damaged by "indiscriminate and large-scale diving activity, the transit of launches, and the discharge of sewerage" (p. 210). The Sian Ka'an Biopshere reserve bordering Cozumel is threatened by acceleration of what was intended to be "low intensity" development linked to eco-tourism (p. 213). This type of rampant development and ensuing damage can also be found in the Caribbean islands.

Beach Tourism

With respect to the traditional beach ("sun-sea-sand" tourism), the environmental threats are better known in that they have been a cause for concern for a fairly long time. They include threats to people as well as fauna from oil spills and other forms of marine pollution (cruise ship pollution, sewerage, factory effluents too close to shore, etc.), coastal erosion because of housing and hotel development as well as natural causes (hurricanes and storms), coral reef deterioration because of marine pollution as well as human behavior, and the more complex threats posed by long term depletion of the ozone layer and sea rise levels due to global warming. These last threats are the focus of much scientific research and debate. Annual reports from the southern hemisphere do indeed show that ozone "holes" are widening and it is known that this brings a radiation threat to tourists along with the other known atmospheric problems. The SIDS network interacts with scientists around the globe on this issue as well as the even more dangerous issue of a sea level rise that could submerge entire coastal regions and the development projects that have been placed precariously on reclaimed land all around the Caribbean.

One of the main debates with respect to tourism and related environmental management focuses on the ubiquitous cruise ship industry. Cruise ships are growing larger and larger and more plentiful every year as the industry caters to aging baby boomers and wealthy retirees as well as those middle income persons with somewhat less discretionary income looking for quick getaways. The Caribbean is, of course, a prime destination for both types of cruisers looking for sun-filled destinations. The economic debate on the value of cruise ship tourism is one major issue: reports have generally shown that countries benefit very little, proportionally, from cruise ship tourism inasmuch as tourists spend most of their time on the ships themselves and tend to spend little money on land. However, taxes on stopovers as well as tours organized around cruise

ship visits are seen as enhancing revenues and spreading them around to local providers to some extent. But the ecological problem is even more important: cruise ships have been a major source of marine pollution, dumping ballast and sewerage in the oceans without regard for global legislation. There has been some improvement in recent years (with rewards for whistle blowers) but it is still the case that many Caribbean waters are polluted in this way. Add to this the environmental damage caused to ancient tourist sites, flora and fauna (as noted earlier) by the sheer numbers of tourists disembarking from cruise ships and the picture gets worse. Finally, to accommodate larger and larger cruise ships, countries have taken to dredging harbors, causing further environmental deterioration and erosion.

Elaborating a bit more on this issue, the increasing importance of cruise tourism is clear from the following statement by Barbados' prime minister:

> The Caribbean not only accounts for over 50% of the world's cruise market, but in so far as it offers a special geographic arrangement of islands, each different, and interesting in their own individual respects, a night's sail away from each other, situated at the cross roads of America and Europe, the cruise industry is likely to enjoy a secure future in our region. It is the only industry in the world in which the Caribbean is the dominant market. (Barbados' prime minister Owen Arthur, speech to Caribbean Hotel Industry Conference, June 16, 2002)

In this tourism-dependent region, cruise traffic has become an essential component of tourism. The fact that the there have been recent declines in cruise passenger arrivals (matching declines in stop-over visitors since 9/11) only adds to the climate of inter-island competition. According to the Caribbean Development Bank (2003:25): "Available information showed that five of nine countries with data recorded decreases in cruise passengers, ranging from a high of 26.9% in Trinidad and Tobago to a low of 8% in Grenada. Belize (56.4%) and the Cayman Islands (29.6%) recorded strong growth in cruise arrivals, and this is largely attributed to their popularity as destinations, proximity to the US and strong marketing efforts." As the industry gears up for

the new season (2003-4), expectations are that cruise traffic will be up. At the same time, the grumbling of the Caribbean tourism industry and governments about the lack of returns from tourism are growing louder. The Caribbean hoteliers see the cruise industry as competing directly with their well-taxed and declining land-based packages and are supporting additional taxes on cruise ship passengers, which, naturally are strenuously opposed by the cruise industry (see Miami Herald, October 8, 2003). At a recent Caribbean Media Conference held in Jamaica June 2003, hoteliers complained that the cruise sector has refused to contribute to a new regional marketing campaign or any joint initiatives and has also refused to pay environmental taxes, taxes that are routinely levied by some governments on hotels in the region.

The industry's penchant for polluting is well known. Here is a somewhat lengthy description of what the average cruise ship carries as pollutants:

> The most famous ship-pollution disaster involved the Exxon Valdez oil tanker, which spilled 240,000 barrels of oil into the Gulf of Alaska after running aground in 1989. But [U.S.]federal authorities have focused considerable resources on cruise ships because of the industry's rapid growth and its unique threat. Unlike a typical freighter, which might carry a dozen crewmembers, a large cruise ship typically carries at least 2,000 passengers and 1,000 crew, generating as much waste as a small city. Cruise ships also sail through fragile ecosystems like Florida's coral reefs and Alaska's Inside Passage.
>
> Cruise ships generate a wide range of man-made toxins, including perchloroethylene (PERC) from dry cleaning; benzene and toluene from paint and solvents; and oily waste from fuel and machine oil. PERC is linked to cancer and birth defects in humans, and even small amounts in water have been shown to be toxic to aquatic animals. Benzene is a known human carcinogen. Oil in even minute concentrations can kill fish. Consuming oil can kill birds and cause internal hemorrhaging or death in marine mammals.
>
> Proper disposal of waste is costly. By law, waste must be analyzed for content, packaged, documented and shipped to an authorized disposal facility. Handling a 55-gallon drum of photo waste, for example, runs about $300 a drum, says Larry Doyle, executive vice president of Cliff Berry, an environmental services firm based in Fort Lauderdale. Anywhere from a few to a dozen such drums are taken off a cruise ship after each trip.

> According to Royal Caribbean figures, a typical cruise generates 110 gallons of photo chemicals, five gallons of dry-cleaning waste and 10 gallons of used paint. Doyle, whose firm handles waste disposal for all Carnival Cruise Lines ships in South Florida, says the annual bill runs in the "high six figures." (U.S.A. Today; November 8, 2002), www.usatoday.com/usatonline/20021108/4606434s.htm

This year a new generation of cruise ships are about to be launched with even heavier tonnage, copying the British QM2 which will be the largest ship of all. In sheer size, the QM2 tops them all--377 yards long and 79 yards high — or about the height of a 21-story building and weighing over 140,000 tons. For the moment, though, as far as the Caribbean goes, Royal Caribbean Cruises Ltd.'s Voyager-class ships, about 138,000 tons, are currently the largest cruise ships in service.

Technological improvements in the building of these entertainment ships has unfortunately not been matched by either technological or political management of the environmental problems they cause. Again, the Bermuda case is instructive. To control cruising and get enough revenue from this type of tourism, Bermuda has insisted that cruise ships operating in its waters employ more Caribbean nationals, especially Bermudians, pay a contribution of US$1.5 million to an educational fund to assist young people, and that each passenger coming on shore be provided with a US$30 dollar voucher at the ship's expense. In addition, Bermuda is the only island that charges a head tax of US$60 and has introduced the restriction of no more than two ships in port at any one time (from statements at Caribbean Media Exchange Tourism Development Conference, Jamaica, June 5, 2003).

With respect to cruise tourism, environmental groups have drawn on scientific surveys that highlight the adverse effect of pollution especially in confined spaces with circular current flows, and the effects of erosion and mud accumulations caused by dredging, not to mention need to protect cultural artifacts occasionally unearthed on the seabed (usually Spanish galleons

and other ancient vessels; one such uncovered site off Tobago was finally declared a World Heritage site by UNESCO, allowing for the halting of dredging). But it is to be noted that no advanced technology exists to easily clean up oceans after spillages (low-tech detergent is used for oil spills). The solution has to lie in legislation and strict enforcement.

Natural Disasters: A Problem for all Types of Tourism

Finally, overarching all of these other problems is the constant and immediate threat to tourism posed by natural disasters. Most of the Caribbean islands lie in the hurricane zone, many are in an earthquake belt as well, and there are additional threats from volcanic eruptions such as one which has devastated Montserrat since 1995. The costs of these disasters must primarily be seen in terms of the human toll (deaths and injuries and damage to the housing stock) but secondarily in terms of the revenue losses to the country both in terms of agricultural exports and tourism. After even a Category 1 hurricane, there is damage to the tourist infrastructure, not to mention an adverse psychological effect on prospective visitors (that is, visitors have to be convinced to return.) Because of the prevalence of these natural disasters, units within both the Caribbean Community's secretariat and the Eastern Caribbean organization (OECS) are heavily focused on disaster relief and mitigation.

Braveboy-Wagner and Cassells (1998), drawing on Perry and Muskatel (1984), note that for a disaster management program to be effective, the following must be considered:

> (a) Governments and their citizens must be made aware that a hazard exists and must be convinced that there will be serious consequences if a management program is not in place; and
> (b) Governments must also believe that the hazard is manageable. In this sense members of the scientific/technical communities must provide governments with a concrete and clear-cut picture of the nature of the hazard, so that policy makers in turn can make informed decisions rather than value judgments;

> In essence for disaster management to be effective, the findings of experts and the desires of interest and social groups must be acted on by government policy makers in order to ensure the establishment of policy guidelines to deal with all phases of the disaster cycle. Thus unless government is on board, despite the best efforts of the scientific/technical experts, social and community groups, and international organizations, there can be no way of carrying out the prevention, mitigation, preparedness, response, recovery, and reconstruction phases of disaster management programs.

The scientific experts are useful in the "use of loss reduction techniques such as hazard mapping, land use controls, and building regulations, and their application in the development process," and the exchange of research results and expertise (Collymore 1995: 112). They are the ones who help develop early warning systems and communication networks which the policymakers can make use of for preventive action.

In the last decade several hurricanes of category three and four intensity (111-145 m.p.h. winds) have devastated parts of the Caribbean and in each case, the need for better building and other technology has been highlighted. Hurricane formation is usually monitored by scientific experts in the United States and broadcast widely. U.S. personnel normally fly planes into the storms to determine their intensity.

According to Braveboy-Wagner and Cassells, Hurricane Gilbert was classified as category three when it struck Jamaica on September 12 of 1988. The damage to meteorological data-recording equipment makes it difficult to pinpoint exact wind speed, and some would argue that Gilbert was a category 4 hurricane. Gilbert was accompanied by heavy rainfall and moderate tidal surges. This hurricane caused damages to all sectors of the economy. Losses in the agricultural sector amounted to over $US300 million and there was damage to some 95 percent of the health facilities. There was considerable damage to housing, public utilities were disrupted, and there was large-scale damage to school buildings.

Hurricane Hugo was a category four hurricane that struck Montserrat on September 17, 1989, and also affected a number of the other islands in the Eastern Caribbean. In Montserrat, it totally devastated crops, forests, fishing vessels beach facilities, housing, and infrastructure. In all total damage caused by Hugo equaled some $US239 million. Hurricane Luis, also a category four hurricane, devastated Antigua on September 4, 1995, and damaged 85 percent of the housing stock and 50 percent of schools. There was substantial damage to hotels, roads, utilities, and infrastructure, at a total estimated cost of $US500 million. Beyond the widespread damage to infrastructure and property, Hugo was responsible for 10 deaths in Montserrat, and Luis was responsible for two deaths in Antigua. (Note that in the case of Montserrat, its status as a British dependency places the responsibility for disaster management in the hands of the British.)

The widespread damage from these hurricanes highlighted the lack of governmental capacity in key policy areas. The substantial damage to buildings pinpointed the fact that the building codes were not as effective as they should have been. The damage resulting from flooding pointed to deficiencies in the housing policy. Braveboy-Wagner and Cassells concluded that ecological changes were most needed:

> There is a need for the development of a strict housing policy regulation outlining where and how houses are built. Efforts should be made to regulate the building of homes in areas that are prone to landslides since oftentimes it is not the hurricane but the landslides and mudslides that cause the most damage. Attention should be paid to the way hotels/tourist industry-related facilities construct along the shoreline without regard to the tidal surges that are a common feature of hurricanes. Policy makers should consider the effect of the high insurance premiums of these properties on the financial sector. At a time when international insurers are balking at doing business in the country, efforts should be made to ensure that this industry does not contribute any unnecessary burdens to the economy.

Having learnt its lessons from its brush with Hugo in 1989, Antigua was more prepared to deal with Luis in 1995. Antigua was able to achieve early warning preparedness and

mobilization of citizens at the threat of the hurricane in a matter of 38 hours. Local communities sprang into action - radio personalities translated meteorological jargon into simple language so that the population at large could be made aware of the impending danger. Having experienced Hugo, citizens of Antigua took the pre-hurricane Luis preparation very seriously. As in the case of Jamaica, these experts knew out that the real problems began after the hurricane. There were problems with telecommunications, transportation, and a scarcity of technical personnel. All these problems were reduced in the case of Luis and are continuing to be addressed today at various technical conferences dealing with disaster mitigation.

In the case of volcanic eruptions, which occasionally plague the Caribbean, early warning and monitoring are crucial. Both for volcanoes and earthquakes, experts and monitoring systems for the Anglo-Caribbean are based at the University of the West Indies in Trinidad and Tobago. Institutions in Central America, which has many active volcanoes, have advanced satellite systems for remote sensing. With earthquakes predictability is weak, despite efforts by scientists everywhere to observe geological fault movements and offer forecasts, These forecasts tend to be long term and rather vague. With respect to volcanic eruptions, predictions are both long and short term. Volcanologists know, for example, that there are a number of marine volcanoes in the Caribbean region whose magma is rising yearly to dangerous levels; yet they cannot predict exactly when these will erupt (conversations with Dr. Keith Rowley, Seismic Unit, UWI). But in the short term, after a volcano begins to rumble, they can predict what is going to happen within a reasonable space of time. The problem lies in convincing residents to leave their homes early. Also it is difficult to predict when exactly residents will be able to return.

In the most recent incidence of volcanic eruption, the eruption of Mount Soufriere in Montserrat in 1995 with continuing outbursts since, scientific expertise and technology played

(and continue to play) a major role. A scientific monitoring station with sophisticated equipment was set up on Montserrat under British and Trinidadian directorship and with U.S. help, and its personnel was responsible for information, communication, outreach, research and policy advice.

In sum, it should be clear that science and technology research and development is or should be an important component of efforts both to advance tourism and to make it less environmentally hazardous. The real problems remain the limitations of political will amid scarce economic resources. Tourism analysts ask: Do governments feel the need to invest in costly technical surveys? Do governments feel the need to listen to the experts? And even if they do, to what extent are they willing to forego much-needed revenues and re-allocate them away from much-needed short-term projects or engage in costly reworking of projects already begun, "simply" in order to accommodate environmental concerns?

There are cost-benefit analyses that are proposed to deal with the issue. Clearly for example, in the case of natural disasters, the damage to the economy is very costly. However, so is the expenditure on mitigation. As Collymore points out,

> The question arises whether this rationale [for public investment in mitigation] should be economic or social? Further, is the summation of losses associated with the impact of a disaster sufficient to justify investment of public funds in mitigation? Should public investment in disaster mitigation have an economic basis other than addressing market failures? In the final analysis, it has to be determined whether the existence of losses from disaster is evidence that there is too little mitigation and what priority, if any, should be given to mitigation activities in the allocation of scarce resources" (Collymore 1995: 115).

He goes on to analyze whether cost-benefit analysis is useful in this area, finding that there are many aspects that are difficult to measure or measure properly (deaths, social dislocation, psychological trauma) and also problems in predicting expected damage for fickle natural events

and problems with the "willingness to pay criterion" in societies where the majority of the population cannot afford the burden or are willing to accept the risk in any event (p. 120). He concludes, though, that cost-benefit analysis can provide a benchmark from which a more complete evaluation can be made. In the Caribbean where there is a high tolerance of risk, there is "a heavy reliance on information based mitigation strategies such as hurricane forecasting, warnings and preparedness information" but that "since the costs of exposure to hazards are not borne solely by those who knowingly subject themselves to the risk, the political feasibility of this strategy must be called into question because the costs of rescue, clean up, health care, and rehabilitation are shifted to the society as a whole" (Collymore 1995: 122)

There are also philosophical arguments. For example, France and Wheeller argue that "Ecotourism does indeed provide an answer. Unfortunately, it is an answer to the wrong question. Rather than effectively tackling the alarming complexities of tourism impact, what ecotourism is actually achieving is the considerably easier task of answering the question: how are we to cope with the criticisms of tourism impact, while, of course, enabling the tourism industry to continue to develop?" (France and Wheeler 1995: 68).

In sum, there are many issues for experts in the field – economists and scientists and policymakers - to consider and debate. My concern has been only to show that science and technology play a fundamental role in the promotion of sustainable tourism development. Indeed these also play a role in *un-sustainable* development as can be seen in the development of larger and larger cruise ships, excessive housing and hotel development etc. It is also important to note that science and technology cannot stand alone. Many of the problems of tourism economies are social and cultural and the need for integrated management is necessary. In the last chapter, I will sum up and make some general points about tourism-based economic development as a whole.

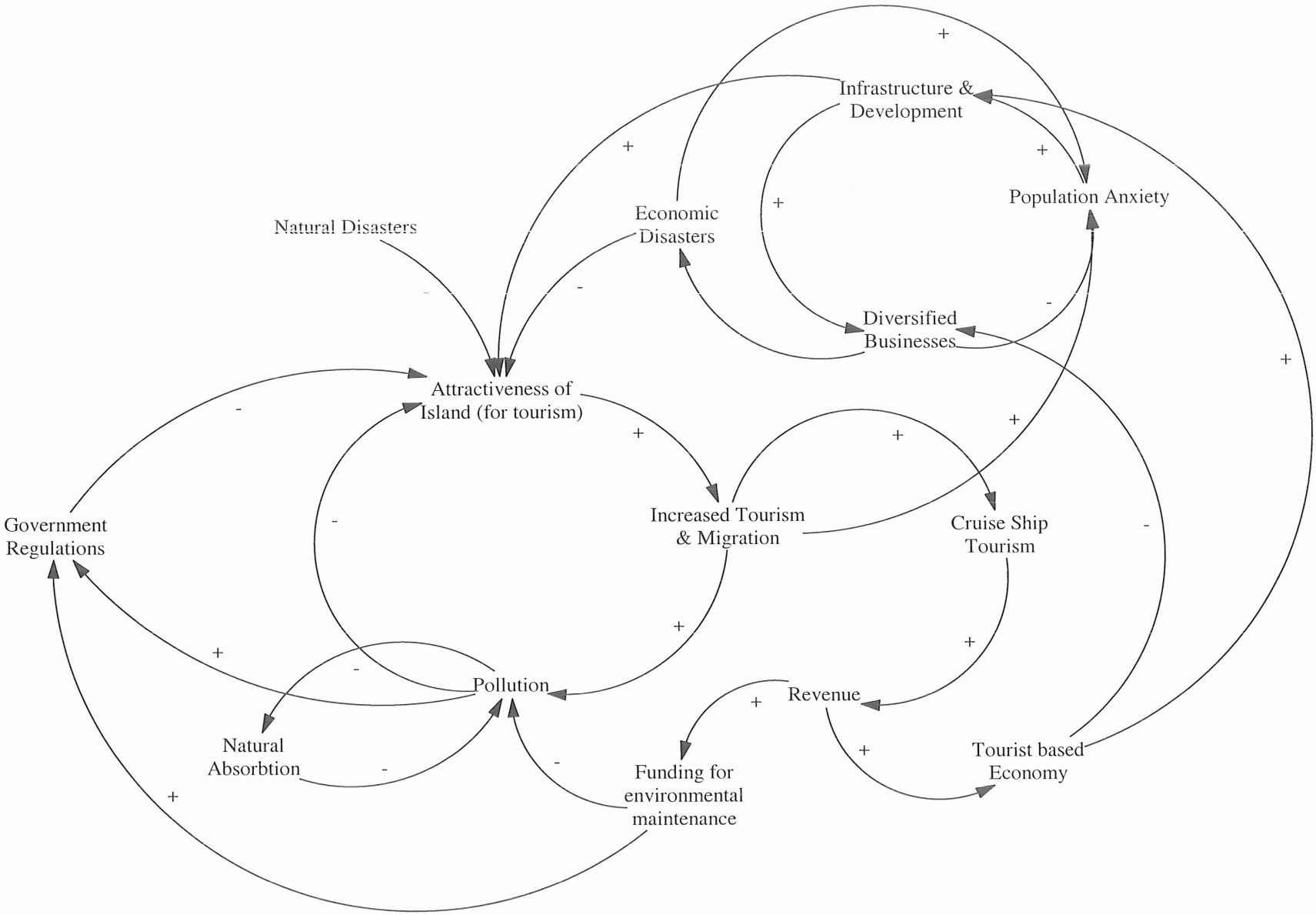


Figure 4.1: Paradoxes of Attraction

Appendix 5.1:

What is The Montserrat Volcano Observatory?

(http://www.geo.mtu.edu/volcanoes/west.indies/soufriere/govt/)

The Montserrat Volcano Observatory was established shortly after the first phreatic eruption of the Soufriere Hills Volcano on July 18th 1995. The Observatory is staffed by scientists from a variety of organisations working with local personnel. The scientific teams come mainly from the Seismic Research Unit (SRU) of the University of the West Indies in Trinidad and the British Geological Survey (BGS).

The role of the MVO is to advise the civilian authorities on the volcanic activity and its associated hazards. Funding of the Observatory comes from the U.K. Overseas Development Administration and the Government of Montserrat.

SRU has responsibility for volcanic and earthquake monitoring in the English-speaking Eastern Caribbean countries. In Montserrat, they have been assisted by the British Geological Survey, the United States Geological Survey, the University of Puerto Rico and several individual researchers from universities in the U.S. and the U.K.

The Observatory is based in temporary accommodation in Olde Towne, northwest of the volcano. This is in the safe zone, so that continuous monitoring can occur even during an evacuation. A permanent observatory is planned.

There are a number of strands in the research carried out by MVO, to try to monitor all aspects of the volcanic activity.

Earthquake Monitoring

Two seismic networks are in operation at the moment. The short-period network has been in place since July 1995, and includes stations that were operated by SRU before the crisis started. The signals from 8 short-period stations are transmitted to the Observatory by radio links and phone lines. The stations are located around the volcano and detect the ground movements caused by local earthquakes and dome collapses. Occasionally, large earthquakes outside Montserrat are also recorded. The seismic signals are monitored 24 hours a day at the Observatory. Four of the stations are written on paper drum recorders to give a real-time view of the seismic activity. All the signals are digitised and processed on a computer system, which enables the scientists to calculate the location of local earthquakes.

A new seismic network was installed in October 1996. This consists of five broadband, three-component sensors and three short-period, one-component sensors. The broadband sensors are

capable of recording the seismic vibrations in much greater detail than the existing network, and will eventually enable a better understanding of volcanic processes. The two seismic networks will operate in parallel for at least a few months.

Deformation Monitoring

Measurements between fixed points on the flanks of the volcano are made daily using a "Total Station", which measures distances using an Electronic Distance Meter (EDM). This technique uses an infra-red laser beam to make very accurate measurements between two points. Two reflectors are positioned high on the flanks of the volcano and reflect the infra-red beam back to the instrument which is installed at a fixed point lower down. Daily changes to these measurements are caused by deformation of the volcano, and may indicate the movement of magma.

The Global Positioning System (GPS) is also used to detect deformation. GPS receivers record signals from orbiting satellites and these signals are processed to calculate the average distance between the receivers, with an accuracy of less than 1 cm. Repeated measurements between the same sites can show if deformation is occurring.

There are two different GPS programs in operation. Temporary GPS sites are occupied every week on sites around the island. There are several different networks, around the volcano and one that includes points in the north of Montserrat. There are also two permanent sites, where receivers record GPS signals for 20 hours each day. These are operated by the University of Puerto Rico.

The GPS stations are located further from the volcano than the EDM points, and thus can detect deformation over a wider area; such deformation may be due to a deeper source.

Other observations

The scientific team makes visual observations from the ground and from helicopter flights over the volcano. Flights to view the crater area are made whenever visibility is good. Occasional trips are made on foot to Chances Peak, on the west side of the crater rim, when it is safe enough to do so.

Measurements of the topography of the growing dome and the pyroclastic flow deposits are made regularly. Several different techniques are used, including surveys with laser range-finding binoculars from the ground and the helicopter, and measurements from photographs taken at fixed points. The aim of these studies is to quantify the dome volume and rate of growth.

Gas samples are collected from the hot springs (soufrieres) and these are analyzed for the content of various gases. SO2 production from the volcano is monitored using a Correlation Spectrometer (COSPEC), which is driven along the coast road round the south of the island, beneath the gas plume. These measurements enable an estimate of the SO2 flux to be estimated in tonnes per day. SO2 monitors have also been placed at various locations around Plymouth to

measure the amount of gas that is drifting from the crater area. Rainwater and ash samples are taken regularly.

Hazard analysis

The aim of all these studies is to develop an understanding of the eruption to enable timely warnings of hazardous activity to be communicated to the local authorities. The Governor and local government officials are briefed several times a week about the level of activity, and reports for the local radio station and media are prepared daily.

Chapter Six

Can Tourism Really be Sustainable?

Environmental considerations are only part of the picture of vulnerability for tourism-dependent economies. Tourist flows are also disrupted by any level of instability within or external to host countries. For example, flows to Jamaica almost halted during the political violence of the 1970s when Michael Manley's socialist government was in power and clashed with the conservative opposition. Tourist flows around the world have similarly been affected in recent times by the Asian financial crisis of the late 1990s and the impact of 9/11 and its aftermath. When there are so many ups and downs to the tourist trade, it is hard to convince governments to eschew short-term gains (from full exploitation) for longer-term gains from proper environmental management.

In this IQP, I have also left out other issues involved in the tourism debate such as the problem of the inflow of people out of agriculture into tourism, and the need to control the influx of foreign foods and customs. Instead, since my aim was to see how technology can (and does) help in fostering sustainable tourism development, I focused on only a few pertinent issues. I divided tourism into eco-tourism and beach tourism and discussed some of the environmental problems found in each area. Scientific research and technology is important in assessing tourism's impact and potential impact on the already degraded wetlands and flora and fauna of the Caribbean. Scientific approaches are needed also to ensure that the drive to develop forest resources for commercial uses (particularly pharmaceuticals) is properly managed. In the case of traditional tourism, the damage to coastal areas has to be contained through an integrated approach to these shared-use areas. Cruise tourism is especially destructive and measures need to be taken

to ensure that the industry abides by environmental rules. Legislation regarding dumping has to be implemented and enforced and policies such as restricting the number of ships in port are necessary. Economic revenue arguments are another matter not directly related to the environment.

This IQP focused first on the general concept of sustainable development (essentially economic improvement without endangering resource supplies for future generations), paying attention to the concerns of some analysts that technological advances cannot prevent such depletion in the long run, aggravates the ecological effects, and in many cases has unforeseen social and cultural effects. The inescapable conclusion was that we should indeed (of course) adopt technology to help achieve economic goals but we should be cautious in adopting these technologies and also put in place measures that would assure intergenerational equity. In the case of tourism, sustainability is ideally promoted before tourism development takes place but, as France and Wheeller point out, not all Caribbean countries have experienced tourism development on "virgin" land. "Once natural environments have been modified, tourism development can be sustainable for generations, as the experience of many successful resorts demonstrates. The critical factor in this respect is the ability to continue to satisfy the demands of tourists without changing the character or scale of the resort, or the destination created" (1995: 63). This is difficult to do, however. Among other things, the community has to be involved and consulted to ensure restrictive and beneficial use.

The small states of the Caribbean as well as the mainland 'circum-Caribbean' states are all dependent on tourism to some degree for revenue to sustain their development. With economies that are otherwise dependent on single agricultural

products or minerals, tourism is very important as a revenue-producer in these countries. This means that they need to balance the pros of tourism (money) with the cons (human assaults on habitats, reefs and on biodiversity, excessive hotel development, cultural exploitation, high import bills as products are imported to suit tourist tastes and the resulting degradation of indigenous products, population drifts out of agriculture into tourist enclaves, exploitation of hotel industry workers, and corruption - especially in casino cultures - and prostitution and other criminal effects, and so on.

At the strictly technical level, advances in technology and related public policy programs can mitigate some of the uncertainties of tourist-based development – we can't prevent hurricanes, earthquakes and volcanic eruptions but we can minimize their disastrous effects by early warning systems and public policy precautions such as modernized building codes and early evacuations; we can certainly prevent further destruction of reefs and erosion of beaches through coastal management; we can preserve biodiversity by continuing scientific research and proper policing; we can prevent pollution (including by cruise ships) by the same methods and punishments. The cultural and social ills are harder to deal with: governments are always balancing the economic need for bringing in tourists against the social and cultural problems some bring (for example, drugs).

Some problems are not as foreseeable: a case in point is the fact that according to the Caribbean Epidemiological Unit, in Tobago many HIV/AIDS cases can be traced to a single infected and careless tourist (or depending on sources, one 'reckless' tourist). Others can be prevented somewhat: drug abuse by tourists, for example, or casinos being used for money laundering. The most difficult thing for governments, however, is to put

measures in places, short of just creating isolated tourist enclaves, to ensure that tourism works hand in hand with other economic sectors so that benefits are spread through the economy. Socially and culturally the challenge is to ensure beneficial interaction between guests and hosts overall – bluntly, to ensure that tourists not engage in crime or become crime victims, that locals not be looked down on and patronized by tourists, that tourists be given opportunities to understand and appreciate the local culture in an atmosphere of mutual respect.

The final question is really difficult to answer: how sustainable can tourism development ever be? Focusing on sustainability leaves out (deliberately) the broader question of how can these countries manage *without* large-scale growth in tourism. For the GDP of a country to depend so much on one fairly volatile product is hardly a positive thing: unpredictable natural disasters, global terrorism, global market slowdowns, sudden diseases such as SARS, all make this sector of the economy volatile, even if the most perfect local environment is sustained.

But on the issue of environmental sustainability per se, there is definitely a tension between tourism development and sustainability and who knows if this can ever be resolved? For those who think that eco-tourism is the answer, I am inclined to agree with the following:

> Perhaps, the only satisfactory approach is to agree on priorities but realistically, can this be achieved? For example, is the main aim to satisfy the needs of the tourists – in which case, are the needs of others regarded as unimportant? Alternatively, is it a question of the conservation of the physical environment being of paramount concern – with the needs of people considered to be of lesser importance? Or is the principal focus the improvement of the situation for the disadvantaged and powerless who are likely to lose through the action of the market? At different stages, particular countries or areas may theoretically vary their priorities. …
>
> Ideally, sustainable ecotourism should provide satisfying jobs and

> carefully planned economic growth. Decisions should be made locally *and* democratically; benefits should be diffused through the community; traditional values should be maintained and the natural environment should not be abused. The "traveler" is preferred to the tourist; the independent specialist operators are more acceptable than large firms; indigenous village accommodation is preferred to multinational hotel chains. All these features basically involve small versus mass. Unfortunately, the chasm between what (perhaps) the perfect situation should be and what the situation actually is, or is likely to be, remains vast. The ideals of sustainable ecotourism remain essentially just that: utopian myths divorced from the harsh constraints of reality. True, there are many examples of small-scale alternative successes but these should not be cited (deliberately or inadvertently), as evidence that tourism as a whole can in a physical sense be controlled… [The control of numbers of tourists] cannot be successful at the macro-level where, on the one hand, the problem is that the massive global growth in the numbers of tourists is out of control and is increasing at an accelerating rate. Yet, on the other hand, the suggested solutions of slow, small-scale steady development demand much greater control. [and this is difficult] (France and Wheeller 1995: 61-62.

In sum, Caribbean countries have a difficult road ahead, even as they compete with one another for a limited tourist market. Few have had the success of Barbados but the Barbadian example has come at the price of excessive catering to tourists that some others are not willing to pay. Jamaica has also been successful but only by isolating tourists in enclaves. The way ahead, apart form the imperative of continuing to attract tourists, particularly in a globalized world where people can travel easily to any other region, remains economically and environmentally unclear.

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