

## Chapter 13

### 13.0 Alternatives to Development

#### 13.1 Principles Underpinning Alternatives to Development

The general principle involved in identifying option(s) to the proposed development is to ensure that the option chosen, which indeed may be the ‘non development’ option, would result in optimal returns in social and environmental capital. In other words the option chosen should bode well not only for the developer, but also for the environment and stakeholders in the area and by extension the nation. The various options are detailed in Table 13.1 below.

**Table 13.1: Options for Development**

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<b>Development Concept</b>			
<ul style="list-style-type: none"> <li>• Development concept</li> </ul>	<p>Resort &amp; Residential Development: <i>Provide clientele with full and complimentary experiences of site at competitive rates relative to other locations in Belize, as well as destinations in Cancun, Mexico; Ocho Rios, Jamaica, and Providenciales, Turks and Caicos Island.</i></p>	<p>Resort: <i>Focuses on recreational aspect only of site to exclusion of time-share residential component – Decreases returns and commercial attractiveness of project.</i></p>	<p>Non-Development Option: <i>Leaves caye in native state with no earning power that would exclude full-time jobs for 35 employees, and loss of investment of US\$125 MILLION.</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non-Development)
<b>Location or Placement</b>			
<ul style="list-style-type: none"> <li>Location or placement of overall development on Caye</li> </ul>	<p>False Caye: <i>Offshore insular location provides ambience that would make project much more attractive than if it was located on mainland Belize.</i></p>	<p>Un-Named mainland location: <i>No know location on mainland Belize available to project proponent to execute project – Technically no mainland location exists with coral reef in nearshore waters to sea-based recreational experiences such as snorkeling and scuba diving.</i></p>	<p>Non-Development Option: <i>Leaves caye in native state with no earning power that would exclude full-time jobs for 35 employees, and loss of investment of US\$125 MILLION.</i></p>
<ul style="list-style-type: none"> <li>Location or placement of Recreational Beach on south-east coast of island</li> </ul>	<p>Current Siting of Beach: <i>Beach located along prevailing wind that is consistent with on-shore recreational activities such as lounging in sun, access to nearshore seas, volley ball, biking and power walking.</i></p>	<p>Siting of Beach along south-west Cove of Caye: <i>Being located away from prevailing wind markedly decreases quality of outdoor recreational experiences, also exposes clientele to mosquitoes, sand flies and other biting insects.</i></p>	<p>Non-Development Option: <i>Absence of beach markedly erodes quality of shore-based recreational experience and makes project much less attractive and viable.</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<ul style="list-style-type: none"> <li>Location or placement of Main Pier and Service Dock</li> </ul>	<p>Currently Proposed Site on Mid-Western reaches of Island: <i>Location chosen on basis of Access to Deep Water and Shelter from heavy seastates decreases length of pier, and poses less navigational risk.</i></p>	<p>Location on Eastern or Northern Shores of Caye: <i>Exposure to heavy seastates exposes infrastructure and berthed vessels to battering effects of sea, and consequent damage and depreciation in value – These locations are also in shallow seas that would entail longer piers with negative implications for human health and safety, as well as financial costs and environmental consequences given that these areas are coral reef environments..</i></p>	<p>Non-development Option: <i>Project not implementable without piers since this would be only practical access to site.</i></p>
<ul style="list-style-type: none"> <li>Location or placement of Over-water Cabanas</li> </ul>	<p>Siting Over-water Cabanas in North-eastern Cove of Island: <i>Location is in shallow seas on side of island with prevailing wind – This provides requisite vista and ambience, especially with respect to biting insects and other nuisance pests.</i></p>	<p>Siting on Western side of Caye: <i>This would avoid ambience of fresh Caribbean breeze and vista of open seas and neighbouring cayes – preponderance of biting insects and other pests would be a major demerit of site.</i></p>	<p>Non-development option: <i>Would significantly erode saleability of project with consequent loss of jobs and earning power without any good environmental, social or economic justification..</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<ul style="list-style-type: none"> <li>Location or placement of Internal Lagoons and Water ways</li> </ul>	<p>Current Siting along Mid-Longitudinal axis of Caye: <i>Lagoons and waterways to be located in pre-existing inundated areas that are to be excavated to a depth of 5 ft. to facilitate greater flushing and improvement in aesthetic assets – Also major improvements in decreasing eliminating area as breeding ground for mosquitoes and other nuisance insects.</i></p>	<p>No Internal Lagoon or Waterway: <i>Entails reclamation of entire Caye including existing lagoons and channels or creeks –Would require substantially more landfill and consequently more dredging activity with attendant ecological and financial costs... Would also detract from attractive landscaping of rolling greenery punctuated by placid lakes and flowing streams.</i></p>	<p>Status Quo or Non-development Option: <i>Current shallow lagoons and mudflats with limited flushing is unattractive swamp with attendant insect pests, which would pose significantly problems in terms of comfort and human health, as well as real estate value of lots.</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<ul style="list-style-type: none"> <li>Location or placement of Utility Zone</li> </ul>	<p>Planned Siting Mid-Western Quadrant of Caye: <i>Siting away from prime recreational location on eastern or windward portion of caye.</i></p>	<p>Eastern or Windward Side of Caye: <i>Site is prime recreational location which would detract from optimizing potential use of caye.</i></p>	<p>Non-development Option: <i>Could entail either no service infrastructure or the decentralized location of such – No service infrastructure makes the project immediately untenable... The decentralized location of the energy support, sewage and potable water infrastructure makes for the non-optimal use of space where land space is a priority, also this would lead to competing use conflicts</i></p>
<ul style="list-style-type: none"> <li>Dredging &amp; Reclamation</li> </ul>	<p>Dredging and Reclamation Operation: <i>Primary needs for dredging is to source landfill material to reclaim cayses – without reclamation caye remains largely inundated and in large part at or below sea level.</i></p>	<p>Importation of Landfill Material: <i>Trucking Landfill material from Inland Destinations: Prohibitive financial costs and logistically complex and macroscopic in scope.</i></p>	<p>The Non Development Option: <i>Project not technically or economically viable without reclamation</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<ul style="list-style-type: none"> <li>Reclamation method</li> </ul>	<p>Retaining Rip-Rap Wall within Circumnavigating Zone of Fringing Mangroves: <i>Retaining wall provides physical support to prevent spoils from flushing back out to sea and creating unsustainable ecological damage... Geotextile liner allows retention of fine sediment and in effect eliminates or greatly curtails turbidity plume flushing back to sea: Use of geotextile also makes retention of fringing mangrove zone a viable proposition since the sedimentation would normally 'blanket' and suffocate the root systems leading to the demise of trees and overall mangrove stand.</i></p>	<p>Reclamation of Caye without Engineering Containment Structures: <i>Other methods of containment of fill material available – Use of solid seawall type structures such as that made of concrete not porous and would result in extended period of time for dewatering of dredged spoils... Such a wall would also be unaffordably expensive.</i></p>	<p>Non-Development Option: <i>Flushing or return of significant sediment plume to sea resulting in demise of fringing mangroves, and decimation of attached invertebrates and coral formations.</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<ul style="list-style-type: none"> <li>Water Supply</li> </ul>	<p>Freshwater Lens or Aquifer to be tapped by Drilling Well – Could be same source as Placencia Municipal Supplies: <i>Entails no-extraction and little or no environmental cost, save for possible groundwater depletion and saline intrusion into sub-surface.</i></p>	<p>Piping water from Placencia Municipal Source via Zebos Resort Line: <i>Issue of competition and possible exhaustion of source – Laying of main pipes across seabed technically challenging and financially expensive.</i></p>	<p>Non-development Option: <i>No source of freshwater exists on caye, thus non-development option would make the project inviable.</i></p>
<p><b>Liquid Waste</b></p>	<p>Installation of BESST Treatment Technology: <i>This entails ‘secondary’ level treatment of sewage and the recycling of effluents to flush toilets and irrigate lawns and hedge rows - Option is least deleterious on the environment, not only in terms of direct ecological impact, but also because it significantly reduces water demand, which is a scarce commodity on the cayes in general.</i></p>	<p>Septic Tank System: <i>Lack of freshwater resources and presence of saline influences greatly constrains functionality of ‘soak away’ reduction of nutrients and pathogens – also possibility of leaching of effluents into sea which is a threat to both human health from pathogenic viruses and bacteria, as well as the environment from eutrophic or nutrient enrichment influences.</i></p>	<p>Non-Development Option: <i>This is redundant given the fact that such a development cannot proceed without effective waste water treatment.</i></p>

Development Issue	Option #1 & Justifications (Chosen Option)	Option #2 & Justifications	Option #3 & Justifications (Non- Development)
<ul style="list-style-type: none"> <li>• <b>Solid Waste</b></li> </ul>	<p>Chosen Option Shuttling Inorganic Waste to Placencia Municipal Dump Site and Composting Organic Waste: <i>Most environmentally sound option given reduction of organic waste to form that does not attract feral animal or household rodents and pests – Carting inorganic waste away eliminates habitat for breeding of insect pests and interaction of plastics with sea turtles and other marine animals.</i></p>	<p>Burning and Burial of Wastes on the Caye: <i>Burning and burial of wastes would result in significant aerial, aesthetic and ecological impacts.</i></p>	<p>Non-Development Option: <i>This is untenable given the amount of trash that would accumulate over time and the fact that a development of this magnitude would not be able to sustain over time without an effective solid waste management regime.</i></p>
<ul style="list-style-type: none"> <li>• <b>Energy Production</b></li> </ul>	<p>Chosen Option is to Source Energy from the BEL Grid: <i>To be accomplished through the running of underwater cables from the Peninsula to the Caye – Most significant impact would be human health and safety related.</i></p>	<p>Alternate Option is Deployment of Diesel Generators On-Site: <i>Issue of Petroleum Pollution and Noise from internal combustion process.</i></p>	<p>Non-Development Option: <i>This is untenable since energy usage and energy generation is fundamental to the development.</i></p>

## References

- Auil, N.E. (1998). Belize Manatee Recovery Plan, Coastal Zone Management Project. (GEF UNDP)
- Bak, R.P.M. and Meesters, E.H. 1998. Coral population structure: the hidden information of colony size-frequency distributions. *Marine Ecology Progress Series* **162**: 301-306.
- Blackstone Corporation. 1998. Tourism Strategy for Belize. Ministry of Tourism and Environment, & IADB.
- BTB. 2003. Belize Cruise Ship Policy. Belize Tourism Board.
- BTB. 2004. Tourism & Travel Statistics. Belize Tourism Board
- BTB, 2007. BTB Annual Statistics for 2006
- Budd, A.F, Stemann, T.A and Johnson, K.G. 1994. Stratigraphic distributions of genera and species of Neogene to Recent Caribbean reef corals. *Journal of Paleontology* **68**: 951-977.
- CSO. 2004. Environmental Statistics for Belize. Central Statistical Office, Ministry of National Development, Belize.
- CSO, 2006. Labour Force Survey.
- CZMAI. 1996. Belize City Cayes Development Guidelines.
- CZMAI. The National Integrated Coastal Zone Management Strategy for Belize.
- Development Solutions. 2004. Belize City Cayes Region Development Guidelines Volume 5.
- Edwards, Ernest P. 1998. The Birds of Mexico and Adjacent areas.
- Graham, Elizabeth and David M. Pendergast. 1987. Excavations at the Marco Gonzalez Site, Ambergris Caye, Belize. *Journal of Field Archaeology* **16**: 1 – 16
- Gischler E. and A.J. Lomando. 1999. Recent sedimentary facies of isolated carbonate platforms, Belize-Yucatan System, Central America. *Jour. Sedimentary Res.*, Vol. 69, No. 3.
- Ginsberg, R. and Kramer, P. 1999. Atlantic and Gulf Rapid Reef Assessment (AGRRA) Regional Update 1999. *Reef Encounter, Newsletter of the International Society for Reef Studies*, **26 (Dec)**: 41-43.

Ginsburg, R.N., Steneck, R., Lang, J. and Kramer, P. 1998. Atlantic-Gulf Reef Assessment, an international collaboration. International Society for Reef Studies European Meeting – Perpignan: 80 (Abstract).

Gobin, Judith. 2001. Coastal Infrastructure Design, Construction and Maintenance A Course in Coastal Zone/Island Systems Management. Organized by Department of Civil Engineering, The University of the West Indies, in conjunction with Old Dominion University, Norfolk, VA, USA and Coastal Engineering Research Centre, US Army, Corps of Engineers, Vicksburg, MS, USA.

Goldsmith F.B. 1991. Monitoring for Conservation and Ecology, Chapman and Hall.

Guderjan, Thomas H. 1988. Maya Maritime Trade at San Juan, Ambergris Caye Belize: PhD diss., Department of Anthropology, *Southern Methodist University, Dallas*.

Guderjan, Thomas H. 1994. Maya Settlement and Trade on Ambergris Caye, *Belize. Ancient Mesoamerica* 6 (2): 147 – 160

Guderjan, Thomas H., James Garber, Herman A. Smith 1989. Maritime Trade on Ambergris Caye, Belize. In *Coastal Maya Trade*, ed. Heather Mckillop and Paul F Healy Occasional Papers in Anthropology 8. 123 – 33. Peterborough, Ontario, : Trent University, Department of Anthropology

Guderjan, Thomas H., and James F. Garber, eds. 1995. *Maya Maritime Trade, Settlement and Population on Ambergris Caye, Belize*. Culver City, California. Labyrinths Press

Halcrow Group. 2000. The Coastal Zone Management Strategy for Belize. Draft. CZMA & I, Belize.

Hartshorn, G., Nicolait, J., et al. 1984. Belize Country Environmental Profile. A field study. United States Agency for International Development

High, L.R. 1969. Geomorphology and Sedimentology of Holocene Coastal Deposits. Taken from PhD thesis, Rice Univ.

Hoese, H. D., and R. H. Moore. 1977. Fishes of the Gulf of Mexico, Texas, Louisiana, and Adjacent Waters. Texas A&M University Press.

Humann, P. 1992. Reef Creature Identification. Florida, Caribbean, Bahamas. New World Publications.

Humann, P. 1994. Reef Fish Identification. Florida, Caribbean, Bahamas. New World Publications.

James, N.P. and R.N. Ginsburg. 1979. The seaward margin of the Belize barrier reef and atoll reefs. Int. Ass. of Sedimentologists, Special Publication; No. 3.

- Jolly, K. and E. McRae. 1998. The Environment of Belize: our life support system, Cubola Productions.
- Jones H. L. & A.C. Vallely. 2000. Annotated Checklist of the Birds of Belize. Lynx Edition.
- Jones H. L. 2003. Birds of Belize. University of Texas Press, Austin.
- King, R.B., I.C. Baille, P.G. Bissett, R.J. Grimble, M.S. Johnson and G.L. Silva, 1989. Land resource assessment of the Stann Creek District. Land Resource Development Centre.
- Launchpad Consulting. 2005. Belize Tourism Policy 2005. Belize Tourism Board.
- Littler, D.S., M.M. Littler and B.L. Brooks. 1995. Marine Algae and Seagrasses from the Tobacco Range Fracture Zone, Belize, C.A. Atoll Research Bulletin, Nos. 426-431.
- MacKinnon, J. Jeff, 1988. Coastal Maya Trade Routes in Southern Belize. *In Coastal Maya Trade*, Ed. Heather McKillop and Paul F. Healy, 111 -122. Occasional Papers in Anthropology 8. Peterborough Ontario: Department of Anthropology, Trent University
- McCalla. W. 1995. Guide for Developers. Ministry of Tourism and the Environment.
- McField, M.D., Wells, S.M and Gibson, J.P. (eds). 1996. State of the Coastal Zone Report. Belize, 1995. Coastal Zone Management Programme and Government of Belize.
- McGee, M. Understanding and interpreting water quality. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.
- McGlade, J. 1995. SIMCOAST. Interdisciplinary scientific methodologies for the sustainable use and management of coastal resource systems. Contributed paper at ASEAN-EU workshop, 13-15<sup>th</sup> September 1995, Penang, Malaysia.
- McKillop, Heather. 1987. "Wild Cane Caye: An Insular Classic Period to Post-Classic Period Maya Trading Station." PhD diss., Department of Micro Film, Ann Arbor
- McKillop, Heather. 1994. Traders of Maya Coast. Five Field Seasons in the Swamps of Southern Belize. *Mexicon* 16: 115 – 119
- McKillop, Heather. 1996. Ancient Maya Trading Posts and the Integration of Long-Distance and Regional Economics: Wild Cane Caye in South – *Central Belize. Ancient Mesoamerica* 7: 49 - 62
- McKillop, Heather. 2002. Salt, White Gold of Ancient Maya. University Press of Florida, Gainesville

McKillop Heather, Aline Magnoni, Rachel Watson, Sharon Ascher, Terrance Winemiller and Bryan Tucker, 2004. The Coral Foundation of Coastal Maya Architecture. In Archaeological Investigation in Eastern Maya Lowlands: Papers of the 2003 Belize Archaeology Symposium ed., Jaime Awe John Morris and Sherilyn Jones. Vol. 1 2004

McKinnon, J. Jeff, and Susan M. Kepecs. *Antiquity* 54:522-233

Miller W. B., & C. M. Miller. 1994. National Protected Areas Systems Plan For Belize, Full Report Vol. 3, Zoological Report.

Miller, B.W., and Carolyn M. Miller, 2000. Birds of Belize: a check list. Belize Audubon Society: Belize, Central America. 2<sup>nd</sup> revised edition.

Mumby, P.J., A.R.Harborne and P.S.Raines. 1998. Classification scheme for marine habitats of Belize. Unpublished report for the UNDP/GEF Belize Coastal Zone Management Project.

Mumby, P.J. and Harborne, A.R. 1999. Development of a systematic classification scheme of marine habitats to facilitate regional management and mapping of Caribbean coral reefs. *Biological Conservation* 8: 155-163.

Nicolait, R. 1984. Belize Country Environmental Profile, A Filed Study.

Odum, E., C.C. McIvor and T.J. Smith. 1982. The Ecology of the Mangroves of South Florida: A Community Profile. Dept. Env. Sc., Univ. Virginia, Charlottesville, Virginia.

PAHO. 2002. Health Systems and Services Profile. Organization and Management of Health Systems and Services Division of Health Systems and Services Development.

Perkins, J.S. 1983. The Belize Barrier Reef Ecosystem: an assessment of its resources, conservation status and management. New York Zoological Soc. Report pp. 189.

Purdy, E.G. 1974. Karst-determined facies patterns in British Honduras: Holocene carbonate sedimentation model. Am. Ass. Petrol. Geol. Bull. 58: pp. 825-855.

Purdy, E.G. and E. Gischler. 2003. The Belize margin revisited: Holocene marine facies. *Int J Earth Sci. (Geol Rundsch)* 92: 532-551.

Raines, P.S., McCorry, D., Mumby, P.J. and Ridley, J.M. 1993. Coral Cay Conservation – survey techniques and their application in Belize. *Proceedings of the 7<sup>th</sup> International Coral Reef Symposium* 1: 122-126.

Rauscher, F. and J.M. Wilensky. 1996. Cruising Guide to Belize and Mexico's Caribbean Coast, including Guatemala's Rio Dulce, 2<sup>nd</sup> Ed.

- Sale, P.F. 1997. Visual census of fishes: How well do we see what is there? *Proceedings of 8<sup>th</sup> International Coral Reef Symposium* **2**: 1435-1440.
- Sale, P.F. and Douglas, W.A. 1981. Precision and accuracy of visual census technique for fish assemblages on coral patch reefs. *Environmental Biology of Fishes* **6**: 333-339.
- Sedberry, G.R. and Carter, J. 1993. The fish community of a shallow tropical lagoon in Belize, Central America. *Estuaries* **16(2)**: 198-215.
- State of the Coast Report of Belize, 1999. Coastal Zone Management Authority and Institute.
- Stoddart, D.R. 1974. Post-hurricane changes on the British Honduras reefs: resurvey of 1972. Proc. 2<sup>nd</sup> Int. Coral Reef Symp. Pp. 473-483.
- Stoddart, D.R., F.R. Fosberg and D.L. Spellman. 1982. Cays of the Belize Reef and Lagoon. Atoll Res. Bull. 256: pp. 1-76.
- Sullivan, K.M., G.A. Delgado, G.A. Meester, and W.K. Miller. 1994. Rapid Ecological Assessment Methods for Tropical Estuarine Ecosystems: Port Honduras, Belize. The Nature Conservancy, Florida and Caribbean Conservation Science Center, University of Miami.
- Thurman, H.V. 1988. Introductory Oceanography, Fifth Ed. Published by Merrill Publishing Company.
- Tunich Nah Consultants. 2002. Castaways Reef Resort Environmental Impact Assessment on Calabash Caye.
- Tunich Nah Consultants & Eng. Ltd. 2001. Environmental Impact Assessment Spanish Bay Resort to be Established on Spanish Lookout Caye South-East of Belize City.
- Wantland. K.D. 1967. Recent Benthic Foraminifera of the British Honduras Shelf. Ph.D. thesis, Rice Univ., Houston, Texas. pp. 299.
- Watson, R.A., Carlos, G.M. and Samoilys, M.A. 1995. Bias introduced by the non-random movement of fish in visual transect surveys. *Ecological Modelling* **77**: 205-214.