A GUIDE TO SUSTAINABLE DEVELOPMENT

Friends of the Environment has adopted the Bruntland Commission’s definition of sustainable development: development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

The concept supports strong economic and social development, in particular for people with a low standard of living. At the same time it underlines the importance of protecting the natural resource base and the environment. Economic and social well-being cannot be improved with measures that destroy the environment. Intergenerational solidarity is also crucial: all development has to take into account its impact on the opportunities for future generations.
Table of Contents

1. Site

2. Energy Conservation

3. Water Conservation

4. Resource Efficiency

5. Sustainable Construction Methods

6. Permitting Process
   a. Excavation & Landfill Operations
   b. Quarrying and Mining Operations
   c. Protected Trees
   d. Docks and Dredging

Appendix
   a. Contact Information
   b. Helpful Links
   c. The Conservation and protection of Physical Landscape of The Bahamas Act, 1997
   d. The National Invasive Species Strategy for The Bahamas - Voluntary Code of Conduct for Landscape Architects
   e. Guiding principles
1. Site

Prepare a site analysis to understand unique site features to preserve, such as mature trees and sensitive habitats. Work with local plant ecologists to understand landscape habitats of the site to restore or preserve as well as invasive vegetation which should be managed or removed.

- Don’t clear the entire lot – it’s expensive and destructive; only clear for house footprint
- Minimize disturbance by using future driveway areas for construction activities
- Save native vegetation
- Remove invasive vegetation carefully and establish new native plantings
- Understand wind and weather so that they influence the development of the site and building.

A Simple Site Analysis for a House Lot at North End of Elbow Cay

This site included 3 groves of buttonwood only 4 feet from the house. The house was sited to preserve these groves, during and after construction, as well as take advantage of summer breezes, while providing some protection from the winter blows. Construction staging areas were sited on top of the future driveway area, in order to minimize site disturbance to preserve the buttonwoods.
The site along the beach was infested with Hawaiian sea grape, which had smothered all the native vegetation, leaving a shallow-rooted coastal edge that could significantly erode during storms.

In front of the house along the beach, a new dune was established once the Hawaiian sea grape was removed, with small plugs of sea oats (Uniola paniculata). Sea oat roots, once established, can grow up to 25 feet underground, providing a more stable beachfront during storms.

This is what the dune looked like three years after planting.

Three years later, after the removal of Hawaiian sea grape, a diverse coastal edge of sea lavender, native sea grape, bay cedar, and dune grasses became established by itself.
2. Energy Conservation

• Use nature to protect buildings from heat gain
Preserve plantings around the building particularly on the east and west facades. On the south façade create shading devices such as vegetated trellises or over-hangs.

• Insulate the exterior from heat build up
Use reflective roofing material such as light metal or white roofs. Insulate walls and ceilings. Use good windows with high performance glass such as low E.

• Plan for cross and stack ventilation throughout
Place windows that open high and low and across from one another. Use ceiling fans throughout (solar fans are quite effective and easy to install).

• Use energy efficient appliances and lighting
Select energy star appliances. Change all lamping to fluorescent bulbs. Install solar hot water and solar panels if possible.

*The Bahamas Government has reduced and even waived the duty on most energy saving products. If the efficiency rating on a product is greater than 15, the duty is reduced.

Examples:
Low flush toilets 15% compared to 35%
Washer & Dryers 15% compared to 45%
Refrigerators 15% compared to 35%
Shower Heads 15% compared to 45%

Solar panel for heating 80 gallon hot water tank.

Bahama shutters, deep porches, and attic window vents make this Man-O-War house very comfortable.
## Savings achieved through Simple Home Energy Conservation Practices
(using cost of electricity as $0.29/kWh)

<table>
<thead>
<tr>
<th>Category</th>
<th>Current Average Consumption</th>
<th>Annual Savings</th>
<th>Conservation Practice to achieve Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of total kWh</td>
<td>kWh/yr</td>
<td>Annual Cost</td>
</tr>
<tr>
<td>Central AC</td>
<td>22%</td>
<td>2,546</td>
<td>$  738</td>
</tr>
<tr>
<td>Water heaters</td>
<td>25%</td>
<td>3,000</td>
<td>$  870</td>
</tr>
<tr>
<td>Refrigerators</td>
<td>14%</td>
<td>1,462</td>
<td>$  424</td>
</tr>
<tr>
<td>Freezers</td>
<td>10%</td>
<td>1,150</td>
<td>$  334</td>
</tr>
<tr>
<td>Lighting</td>
<td>9%</td>
<td>940</td>
<td>$  273</td>
</tr>
<tr>
<td>Water pump</td>
<td>3%</td>
<td>400</td>
<td>$  116</td>
</tr>
<tr>
<td>Clothes Washers</td>
<td>1%</td>
<td>120</td>
<td>$   35</td>
</tr>
<tr>
<td>Clothes dryers</td>
<td>6%</td>
<td>1,079</td>
<td>$  313</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>4%</td>
<td>512</td>
<td>$  148</td>
</tr>
<tr>
<td>Color TV</td>
<td>1%</td>
<td>176</td>
<td>$   51</td>
</tr>
<tr>
<td>PC &amp; printer</td>
<td>3%</td>
<td>384</td>
<td>$  111</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td>11,769</td>
<td>$3,413</td>
</tr>
</tbody>
</table>
Energy Conservation: Free and Low Cost Recommendations

Unplug Electronics
- Unplug electronics, battery chargers and other equipment when not in use. Taken together, these small items can use as much power as your refrigerator.

Save Water
- Installing faucet aerators and low-flow shower heads will cut water heating costs by 50% and save up to $300 per year. It will also cut water use by up to 50%. As much as 19% of California electricity is used to pump, transport and treat water.

Adjust Your Thermostat
- Setting your air conditioner 5° higher will save up to 20% on cooling costs.

Buy Energy Efficient Appliances
- Always buy ENERGY STAR qualified appliances and equipment - they're up to 40% more efficient. Find rebates and incentives in your area using our rebate finder.

Adjust Your Water Heater
- Turn your water heater down to 120° or the "Normal" setting when home, and to the lowest setting when away. Water heating accounts for about 13% of home energy costs. For super savings, turn your water heater off when everyone is at work.

Keep Cool with Ceiling Fans
- Reduce air conditioning costs by using fans, keeping windows and doors shut and closing shades during the day. Most ceiling fans use less energy than a light bulb. Turn fans off when not in the room.

Be Smart About Lighting
- Turn off unnecessary lighting and use task or desktop lamps with CFLs instead of overhead lights.

Power Down Your Computer
- Enable "power management" on all computers and make sure to turn them off when not in use. A laptop computer uses up to 90% less energy than bigger desktop models.

Load Up Your Dishwasher
- Run your dishwasher and clothes washer only when fully loaded. Fewer loads reduce energy and water use.

Maintain Your Clothes Dryer
- Make sure your dryer's outside vent is clear and clean the lint filter after every load. When shopping for a new dryer look for one with a moisture sensor that automatically shuts off when clothes are dry.

Find and Seal Leaks
- Sealing cracks, gaps, leaks and adding insulation can save up to 20% on home heating and cooling costs.
- Test for air leaks by holding a lit incense stick next to windows, doors, electrical boxes, plumbing fixtures, electrical outlets, ceiling fixtures, attic hatches and other locations where there is a possible air path to the outside. If the smoke stream travels horizontally, you have located an air leak that may need caulking, sealing or weather stripping.

You can save $25 to $35 a year in energy costs by replacing a 10-year-old dishwasher with an ENERGY STAR qualified model, and save more than 1,000 gallons of water. Because the average dishwasher is designed to last up to 12 years, savings from a new energy-efficient dishwasher can add up when multiplied over the life of the machine.
3. Water Conservation

- **Use only low flow fixtures and water conserving appliances**
  Use low flow toilets and shower heads. Use water efficient dishwashers and front loading washing machines.

- **Recycle grey water**
  Recycle grey water from sinks and showers to use for irrigation.

- **Collect maximum amount of rain water from roof**
  Design roof to maximize water collection.

- **Plant only native and drought tolerant plantings**
  Visit FRIENDS’ website for a guide to native and invasive plants of Abaco.
  (http://www.friendsoftheenvironment.org/Invasive_Species_Education.html)

---

A typical solar hot water system for a three-bedroom two-bath house would consist of a 4 x 8 collector and an 80 gallon tank. The pump is powered by a small solar electric panel that attaches to the collector. This system would cost approximately $2,100. With duty (10%) and freight and installed around $3,600 to $4,000. Pay back around 3 1/2 to 4 years. Install prices can vary a lot depending on your configuration. Prices listed are estimates, as the system needs to be sized for each application. See www.advancedsolarsolutions.net

---

Above left: two 10,000 gallon fiberglass cisterns for rainwater storage. Above right: 2,500 gallon grey water cistern collects sinks, showers, washers, except the kitchen sink (which can make the water very smelly). Grey water can be used for irrigation of plants and garden.

Above, far left: A mature Gum Elemi tree (Bursera simaruba) in a Parrot Cay garden

Left, bottom: The Whiteland Coppice along a private driveway on Elbow Cay supports a diversity of native plants.
4. Resource Efficiency and Sustainable Construction Methods

- **Build only the minimal amount of space required**
  Well designed space can produce very efficient rooms with the least amount of square footage.

- **Reuse existing structures when feasible**
  Recycle existing buildings and or materials, when possible.

- **Use materials with recycled content**

- **Select only materials from renewable resources**

- **Protect all existing vegetation on site**

- **Recycle all construction waste when possible**

- **Layout material to minimize waste**

A small kitchen in a small cottage on Parrot Cay

A small cottage on Man O War using recycled materials

A grove of buttonwood trees preserved during construction of house

Soak pit for house sanitary waste is located beneath driveway area to minimize landscape disturbance

Driveway with soak pit beneath after additional planting
6. Permitting Process – Note that this is meant to be a guide to some of the permits required for development in The Bahamas. It is by no means complete.

Permitting

a. Excavation and Landfill Operations

The Conservation and protection of Physical Landscape of The Bahamas Act, 1997
Part III

A permit is required for excavation and landfill operations.

Excavation: revealing or extraction, by digging systematically into the ground, of physical natural resources (such as soil, rock, quarry, fill, or sand)

Also includes:

1. removal of a hill or any portion of a hill
2. creation of a pit by lowering the natural ground level
3. the extraction of natural resources for the purpose of
   a. Creating a lake, a watershed or an area of the type commonly referred to as a drainage basin.
   b. Any work connected with a canal, bulkhead or pier
   c. protecting land against, encroachment by, or recovering land from, fresh or saltwater
   d. Any work which would affect any part of the coast line of the Bahamas
   e. The removal of sand from any beach or sand dune

It is illegal to do any of the following without obtaining the appropriate permit:

1. Commence any excavation or landfill operation
2. For commercial or other purposes- remove any part of any beach or seashore (sand, earth, stones)

Penalties may be as harsh as a $10,000 fine along with a fine in the amount 5 times the open market value of the material to which the offense relates and up to six months imprisonment.
An application for the grant of a permit related to any excavation or landfill operation must be made to the Director of Physical Planning. Permits may be subject to specific conditions.

Permitting

b. Quarrying and Mining Operations
   The Conservation and protection of Physical Landscape of The Bahamas Act, 1997
   Part III

Zoning - The minister has the authority to prescribe areas permitting and forbidding quarrying or mining.

The Minister may by Order prescribe:
1. Areas (being unoccupied Crown Land or other public land) within which quarrying and mining may be permitted after the operative date;
2. Areas (being any land other than unoccupied Crown Land or other public land) within which quarrying may be permitted after the operative date.
3. Areas within which no quarrying or mining shall be permitted after the operative date.

A LICENCE IS REQUIRED FOR QUARRYING AND MINING

No person shall commence or carry on or cause or procure to be commenced or carried on any quarrying or mining in any area prescribed pursuant to 1 and 2, except under and in accordance with the conditions of a license and in accordance with the provisions of this Act and the regulations.

Violation of Laws

First Conviction for the offense: A fine of $10,000 and, in addition, an amount equal to five times the open market value of the quarried or mined material to which the offence relates or imprisonment for a term of 3 months or to both such a fine and imprisonment.

Second or subsequent conviction for the offense: A fine of $20,000 and, in addition, an amount equal to ten times the open market value of the quarried or mined material to which the offense relates or to imprisonment for a term of six months, or to both such a fine and imprisonment.

Application for grant of license to quarry or mine

An application for the grant of a license to quarry or mine shall be made to the Director in writing.
Permitting

Protected Trees
The Conservation and protection of Physical Landscape of
The Bahamas Act, 1997
Part VI

21. (1) No person shall harvest or cause or procure to be harvested any protected tree except under
and in accordance with the conditions of a permit and in accordance with the provisions of this Act and
the regulations.
(2) Any person who acts in contravention of subsection (1) is guilty of an offence and liable on
summary conviction to a fine of ten thousand dollars or to imprisonment for a term of three months or
to both such fine and imprisonment.

22. An application for the grant of a permit to harvest a protected tree shall be made to the Director in
writing and the provisions of section 7(1) and (2) shall mutatis mutandis apply to any such application
as those provisions apply to an application for the grant of a permit in relation to an excavation or
landfill operation and the said provisions shall have effect as if references in those provisions to any
excavation or landfill operation were references to the harvesting of protected trees.

23. (1) Subject to the payment of the prescribed fee, the Director of Physical Planning, acting on the
advice of the Director of Agriculture, may grant or refuse a permit to harvest a protected tree.
(2) The provisions of sections 9, 10, 11 and 13 shall mutatis mutandis apply to any permit to
harvest trees as those provisions apply to a permit in relation to any excavation or landfill operation,
and the said provisions shall have effect as if references in those provisions to any excavation or
landfill operation were references to harvesting of protected trees.

The following trees are on the protected tree list of The Bahamas:

1. Beefwood (Guapira discolor)
2. Black Ebony/ Bullwood (Pera bumeliifolia)
3. Brasiletto (Caesalpinia vesicaria)
4. Candlewood (Gochnatia ilicifolia)
5. Caribbean Pine (pinus caribaea var bahamensis)
6. Horsefelsh (Lysiloma sabicu)
7. Lignum vitae (Guaiacum sanctum)
8. Mahogany/ Madiera (Swietenia mahagoni)
9. Rauwolfia (Rauvolfia nitida)
10. Red cedar (Juniperus bermudiana)
11. Silk cotton (Ceiba pentandra)
Permitting

d.

Docks and Dredging

*Courtesy: Capt. Cyril Roker*

1. The Port Authorities Act, chapter 269, section 41 (a) (b) is the Statute Law that governs all marine related construction.

2. The Act states that:

3. There shall be charged, levied, collected and paid, in respect of the financial year commencing on the 1st day of July, and in respect of every succeeding financial year upon any private pier, wharf or abutment situated on a Family Island (other than the port area) the following fee-

   i. Private $1.94 per linear foot
   ii. Commercial $6.13 per linear foot
   iii. Industrial $4.00 per linear foot

Upon any of the following groins, moorings, causeway, pipeline

<table>
<thead>
<tr>
<th></th>
<th>Groins</th>
<th>Moorings</th>
<th>Causeway</th>
<th>Pipeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>$90.00</td>
<td>$30.00</td>
<td>$50.00</td>
<td>$3.00/ft</td>
</tr>
<tr>
<td>Comm.</td>
<td>$120.00</td>
<td>$150.00</td>
<td>$100.00</td>
<td>$3.00/ft</td>
</tr>
</tbody>
</table>

4. Section 41; subsection 3 of the Port Authorities Act states the tax payable under subsection (1) shall be paid into the Consolidated Fund and on neglect of payment of same, may be sued for and recovered by the Port Controller or any Deputy duly appointed by him.

5. ALL matters pertaining to Docks, Bulkheads, Break-waters, Boat-Lifts, Moorings, Groins or any Marine related Construction can ONLY be approved by the Minister responsible for the Port Department, who currently is the Minister of the Environment. This is done through the Docks Committee in Nassau.

6. This Committee comprises members from the Ministry of Works; the Department of Lands and Surveys; The Department of Environmental Health Services; The Department of Physical Planning; Department of Public Works; the Office of the Prime Minister; and the Port Department (the Port Controller is the Chairman of this Committee).

7. The criterion for applying for any of the above are as follows:
   i. An Application with proposed pans is made to the Local Council responsible for the District of the proposed project.
   ii. The application is then considered by the Local Council, which may include a Site visit.
   iii. Their comments are noted on the proposed plans.
   iv. The plan(s) are then forwarded to the Docks Committee in Nassau for their consideration before forwarding on to the Minister for a decision.
Note; Applications are to include the following:
   a. Drawing of the proposed docks
   b. Site location plans
   c. Proof of ownership of the land where dock is to be built.
   d. If dredging is involved, an EIA and EMP are required. In addition where will the spoils be deposited.
   e. If the application is a marina, proposals for a pump out station must be included.

8. Only Wooden docks up to 120 feet can be approved by the Local Council Members. This does not include dredging or the removal of mangroves.

9. The Approval of dredging can be approved by the Minister responsible for Lands and Surveys Department.

FRIENDS Note: Ask your contractor to use a turbidity screen when dredging or excavating. The screen will help prevent silt from spreading throughout the marine environment.
The National Invasive Species Strategy for The Bahamas

Voluntary Code of conduct for Landscape Architects

Work with local plant ecologists, horticulturists, nurseries, botanic gardens, conservation organizations and others to determine what species in your region are currently highly invasive or show aggressive potential.

Increase interaction with other professionals and non-professionals to identify alternative plant material and other solutions to problems caused by harmful invasive plants.

Take advantage of continuing education opportunities to learn more about invasive species issue.

Identify and specify non-invasive species that are aesthetically and horticulturally suitable alternatives to invasive species in your region.

Be aware of potential environmental impacts beyond the designed and managed area of the landscape plan (for example, plants may spread to adjacent natural areas or cropland)

Encourage nurseries and other suppliers to provide landscape contractors and the public with non-invasive plants

Collaborate with other local experts and agencies in the development and revision of local landscape ordinances. Promote inclusion of invasive species in these ordinances.
Helpful Links

Bahamas Environment Science and Technology Commission (BEST). [www.best.bs](http://www.best.bs)
BEST is responsible for reviewing environmental impact assessments (EIA's) and for making recommendations to the government in regards to environmental concerns. The site has downloadable versions of Bahamian policies and environmental documents.

The Bahamas Government. [www.bahamas.gov.bs](http://www.bahamas.gov.bs)
This site has information about government ministries and departments, as well as contact information for government officials.

Bahamian Laws Online. [www.laws.bahamas.gov.bs](http://www.laws.bahamas.gov.bs)
Most Bahamian laws can be accessed through this site. If you can't find something directly, try doing a specific search through Google.

Friends of the Environment. [www.friendsoftheenvironment.org](http://www.friendsoftheenvironment.org)
Includes a history of conservation in Abaco, as well as detailed information about FRIENDS' programs.

Bahamas National Trust. [www.bnt.bs](http://www.bnt.bs)
By an Act of law, the Bahamas National Trust was designated the governing body of all National Parks in The Bahamas. The site includes information about Bahamian parks and committees of the BNT.

Planning Abaco, Andrew's University. [www.planningabaco.com](http://www.planningabaco.com)
Visit this site to download a copy of the Planning Abaco document.

Smart Growth Online. [www.smartgrowth.org](http://www.smartgrowth.org)

The U.S. Green Building Council. [www.usgbc.org](http://www.usgbc.org)
Access to information about LEED certification, rating systems etc.
Contacts:

Advanced Solar Solutions
Andrew Curry
Andrew@advancedsolarsolutions.net
PH: 561-743-3090
CELL: 561-632-2655