

**Challenges to Effective Water Resources Management in Barbados**

Alex S. Ifill  
Water Quality Technologist  
BWA

**World Water Scarcity**

- Only 0.007% of the world's freshwater resources is available for human use.
- Globally freshwater is a scarce commodity.
- UN's World Water Development Report (WWDR) concludes; "This crisis is one of water governance, essentially caused by the ways in which we mismanage water,"

**WATER AND THE WORLD**

"Water supplies are falling while the demand is dramatically growing at an unsustainable rate. **Over the next 20 years, the average supply of water world-wide per person is expected to drop by a third.**" Director-General Koichiro Matsuura UNESCO

"The remaining two-thirds is likely to be heavily impacted by hundreds of chemical pollutants" Alex

**WORLD BANK**

- **Water resources management examines the opportunities and challenges associated with the use and management of water resources in the context of economic, social and environmental constraints of a nation or region...address the challenges of sustainable development.**

**Global Water Partnership**

- "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

**Local Mandate**

**The Barbados Water Authority Act (Cap. 389) Section 5 (b):**  
**The BWA must "manage, allocate and monitor the water resources of Barbados with a view to ensuring their best development, utilization, conservation and protection in the public interest".**

## Perceptions of Importance of Water

Use	Environmentalist	Agriculturalist	Water Utility	Public	Rating
Environment	1	3	3	3	3
Agriculture	3	2	2	2	2
Human Use	2	1	1	1	1

## Major Management Challenges

- Fair and equitable distribution of water resources to all stake holders:
  - The Public
  - Agriculture
  - Recreation/Golf development
  - The Ecosystem
- Keeping Public Water Supplies safe
- Augmenting the Present Supply

## Barbados in the World

Country	UN Rank	Available Water (m <sup>3</sup> /per capita year)	Ranking
Antigua	157	800	1
St. Kitts-Nevis	160	621	2
Tunisia	162	482	3
Algeria	163	478	4
Djibouti	164	475	5
Oman	165	388	6
<b>Barbados</b>	<b>166</b>	<b>307</b>	<b>7</b>
Israel	167	276	8
Bahamas	177	66	9

Water resources: FAO: AQUASTAT 2002; land and population:

## The Barbadian Scenario

- Available Water Resources 306 m<sup>3</sup>
- 15th Most Water -scarce nation
- Population Density = 616 per Km<sup>2</sup>
- 16th most densely populated nation
- Increasing Urbanisation
- 98% of renewable freshwater resources used
- Increasing per capita water demand 1.5%/Yr

## 3 SOURCES OF WATER

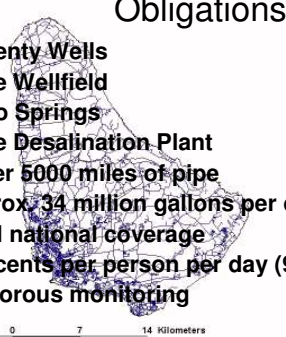
- Groundwater: 21 Wells
- Springs : 2 Springs
- Surface Water: None
- **Desalination : 1**

## Solving the Conflict

- Participation on the EIA evaluation committee
- Interaction with both public and private stakeholders
- Public Education and information distribution

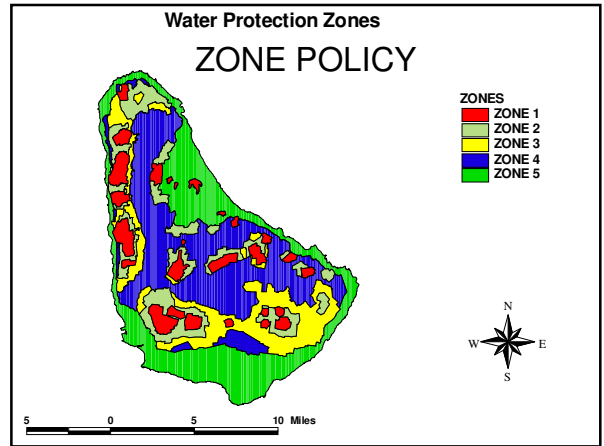
## How Does BWA meet the Obligations

- **Twenty Wells**
- **One Wellfield**
- **Two Springs**
- **One Desalination Plant**
- **Over 5000 miles of pipe**
- **Aprox. 34 million gallons per day**
- **Full national coverage**
- **28 cents per person per day (90,000 services)**
- **Rigorous monitoring**



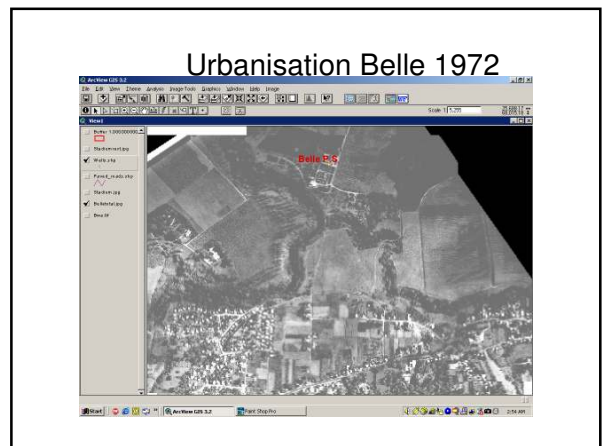
Distribution Network  
Thearea

7 0 7 14 Kilometers



## Zoning Explained

Zone	Nominal Time of Travel	Rationale
1	300	> Survival time of enteric bacteria
2	600	Hard to degrade organics
3	5 - 6 years	extremely hard to degrade organics
4	> 5 - 6 years	Protection of Recharge Area
5	N/A	Non-recharge Zone



- ## Challenges to the Zoning Policy
- 300 days far exceeds the survival survival time of enteric organism
  - Since calculation in 1963 average abstraction rates have increase by 35%
  - Recent preliminary work suggest that in the largest aquifer conduit flow is much more significant that previously thought.
  - Increase pumping and dominance of conduit flow mean larger boundaries
  - Larger boundaries are not practical
  - The present system does what it was designed to do

## Pesticide Use

Keeping the Water Safe

- **Worldwide** = 2.3 million tonnes/yr
- **Barbados data**
  - 2004 = 415 Registered Pesticides
  - 1999 and 2003 = 8,157,714 kg imported
  - 2001 Peak = 2,069,068 kg imported
- **Average Application Rates**
  - National Rate = 38 kg/Hectare/yr
  - Arable Land = 159 kg/Hectare/yr

## Illegal Dumping



## Climate Change

Future Challenge ?

- Changing Rainfall Patterns
- Increasing length of Dry Seasons
- Increase in Storm intensity and Frequency
- Rising Sea levels

## WATER AUGMENTATION

- Desalination – 1 plant in operation
- Reduced Water Use: Program started
- Wastewater reuse
- Demand management
- Economic incentives and Disincentive

## Climate Change

Future Challenge ?



## CLIMATE CHANGE SCENARIOS

EPOC	1890 - 1990	1990 - 2050	1990 - 2100
SEA LEVEL RISE	15 CM	30 CM	48 CM
CPACC SCENARIOS	20 CM SLR1	50 CM SLR2	90 CM SLR3
TEMP. CHANGE	> 5	2.5 BEST GUEST	4.5 BEST GUEST
RAINFALL	=+ - 10%	=+ - 10%	=+ - 10%

## Synergetic Effect

- Increased Temperature = More Evapo-transpiration
- Reduced Rainfall/Increase run-off = less recharge
- SLR = Elevated Salt Water Interface

• 1 + 1 + 1 ≈ 5

## Climate Change

- Changing Rainfall Patterns
- Increasing length of Dry Seasons
- Increase in Storm intensity and Frequency
- Rising Sea levels

