Monitoring and Assessment in Caribbean SIDS…Approaches, Challenges and Opportunities

Workshop on the World Ocean Assessment for the Wider Caribbean

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World Ocean Assessment

CEHI

CARICOM

Outline

- About CEHI
- Context – monitoring and assessment
- Case example - Regional effort at WQ assessment
- Case example – national effort; planning approach for monitoring and assessment of LBS pollution
- Challenges
- Capacity building contributions
- Way forward

About the Caribbean Environmental Health Institute

- Inter-Governmental technical institution of the Caribbean Community (CARICOM)
- Established 1989 to provide technical advisory services to Member States in all areas of environmental management
- 16 Member States
- Areas of work
  - water supply, water resources management,
  - liquid waste management,
  - solid waste management,
  - coastal zone management including beach pollution,
  - air pollution, occupational health,
  - natural resources conservation,
  - disaster prevention and preparedness,
  - environmental institution development and
  - the socio-economic aspects of environmental management

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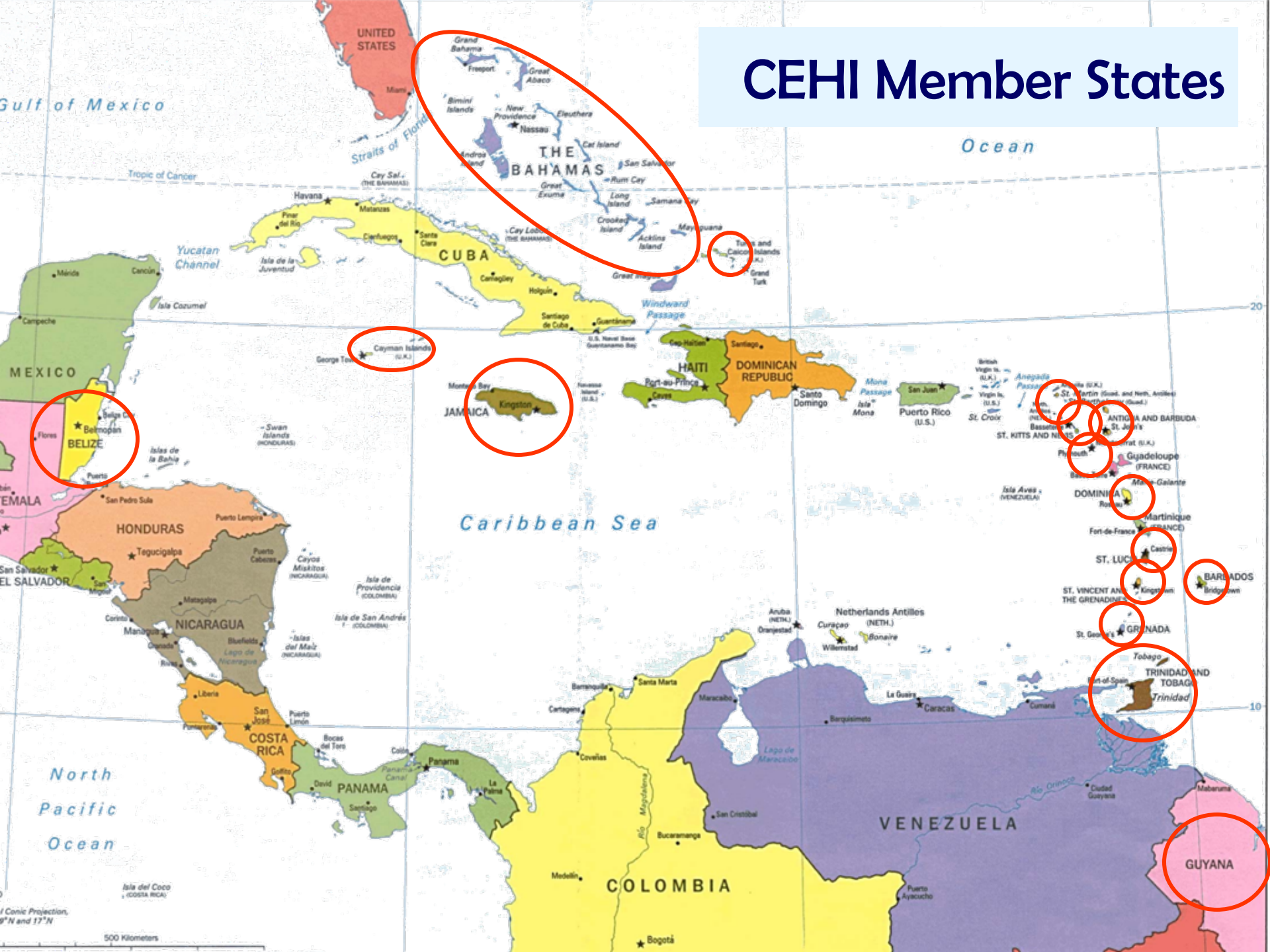
CEHI Member States



Context

- The watersheds and coastal areas of the Caribbean are among world's most diverse and productive habitats; encompass extensive areas of complex and unique eco-systems
- Many species endemic to the Caribbean region
  - Some 30% considered to be either destroyed, or at extreme risk from anthropogenic threats.
  - Another 20% or more expected to be lost over the next 10-30 years if significant action is not taken to manage and protect them over and beyond existing activities.
- Water and coastal area resources and ecosystems in the Caribbean, are exposed to various stresses:
  - Aquifer degradation, reduction in surface water quality and availability
  - Loss of watershed and coastal biodiversity
  - Land degradation and coastal erosion
- Climate change will accelerate degradation
- COMPROMISING LONG-TERM ECONOMIC SECURITY!!!
  - Tourism investment
  - Agriculture and fisheries

Coastal Water Quality Issues in Caribbean SIDS

- Principal Sources of Contamination
  - Industrial (oil and gas, agro/beverage, mining, power generation)
  - Commercial (various, construction)
  - Agricultural (point and non-point)
  - Household / domestic waste water including sewage discharges from suck wells/soak-aways near to the coast
  - Storm water
  - Tourism (hotels with poorly functioning WW treatment plants)
- Types of contamination based on sources of contamination
  - Inorganics – sodium and calcium hypochlorites
  - Organics – hydrocarbons
  - Nutrients – nitrates
  - Bacteriological – faecal coliform
  - Sediments

Monitoring and assessment

- Monitoring and assessment of the state of fresh and coastal waters
  - Of increasing importance
- Raw water sources – potable supply
- Ambient fresh and coastal waters
  - Recreational water use
    - Vital importance to hospitality industry
  - Ecosystem services
    - Not well understood

Case Example - Regional Approach

Assessment of coastal water quality across Caribbean Sea

Coastal WQ study of Caribbean SIDS - "Know-Why Network"

- CEHI collaboration with the Centro De Ingeniería Y Manejo Ambiental De Bahías Y Costas (CIMAB), Cuba - 2009
- Assessment of the quality of coastal wasters in the English-speaking countries including independent states and dependent overseas territories.
- Entailed:
  - administration of a survey instrument to capture and characterise land based sources of coastal water pollution
  - areas that are most impacted by pollutant discharge
  - pollution indicators and available data on the severity of pollution
- 15 countries and dependent territories targeted
  - responses to the survey was relativity poor.

Know-Why Network study

- Only basic information obtained - largely confined to:
  - identification of the main sources of pollution in a rather general context
  - types of pollution and the general locations from which pollutants were being generated
  - coastal areas that were being impacted
- Conclusion
  - Low willingness on the part of the counties to volunteer water quality data.
  - Limited success outside formal project mechanisms

Challenges

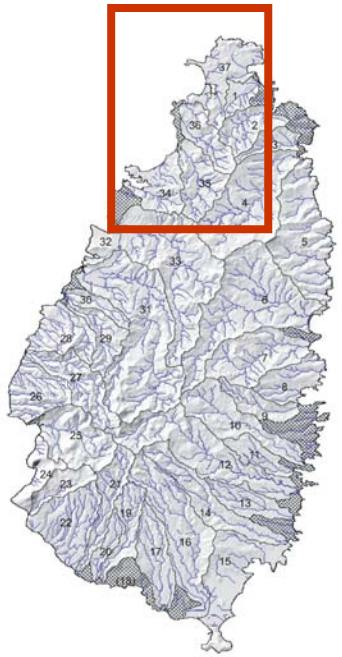
- Countries unwilling to release data
  - Possible ‘bad’ publicity – concerns for tourism
- Lack of national centralized, systematic data collection and archival systems
  - Difficulty to access historic data; multiple agencies involved in data collection
  - Decision-making fragmented
- Resource constraints
  - Human resources
  - Financial resources; related to data collection and processing; procurement of reagents and supplies

Case Example – National Approach

Monitoring and assessment framework towards National Programme of Action

Water Quality assessment - Saint Lucia Northwest Coastal Corridor

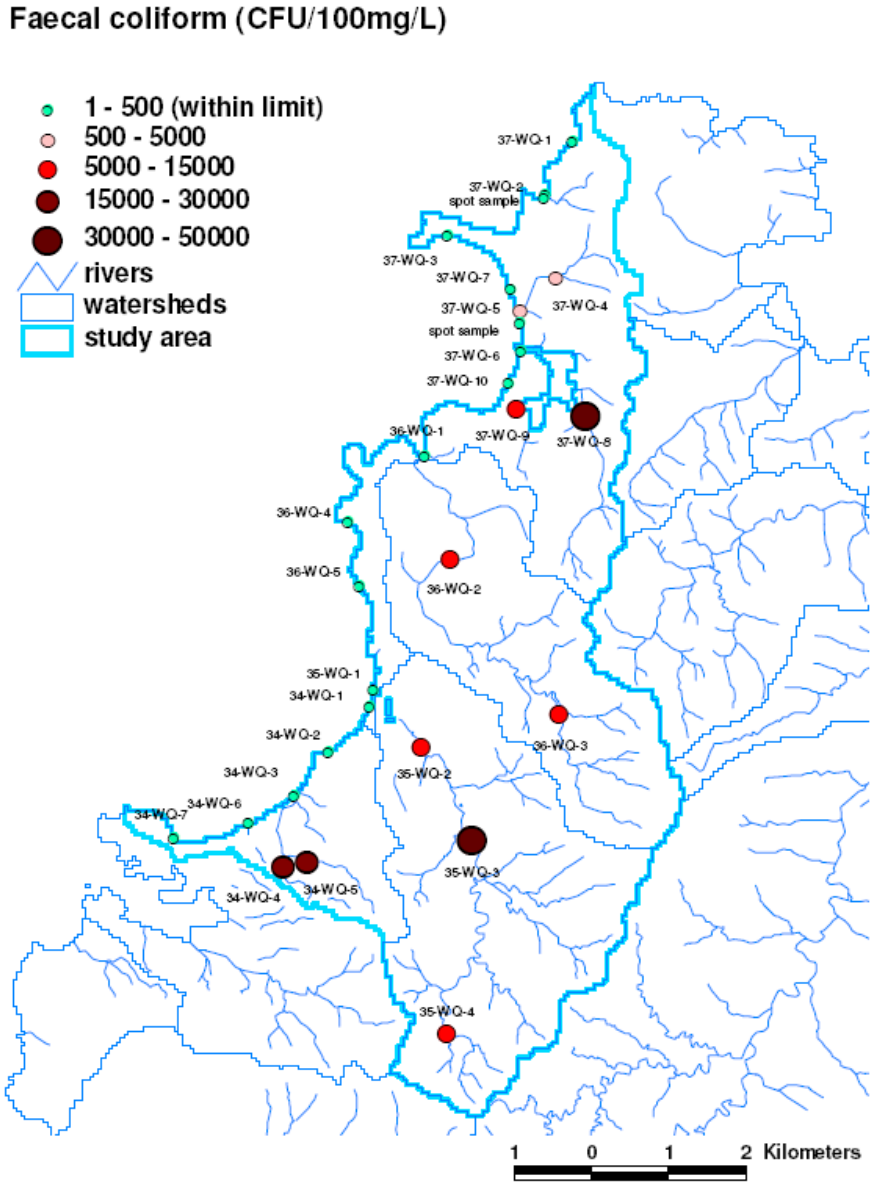
- An approach to rationalize and prioritize monitoring efforts for LBS pollution and targeting interventions within NPA framework
  - Watershed as spatial management unit
- Main elements:
  - Characterization of pollution “hot spots” that can have impacts on the coastal environment. Assessment of pollutant loading in the receiving environment.
  - Promote public awareness and sensitization
  - Establish priority pollution control strategies and interventions
- Replication across country, countries in the region

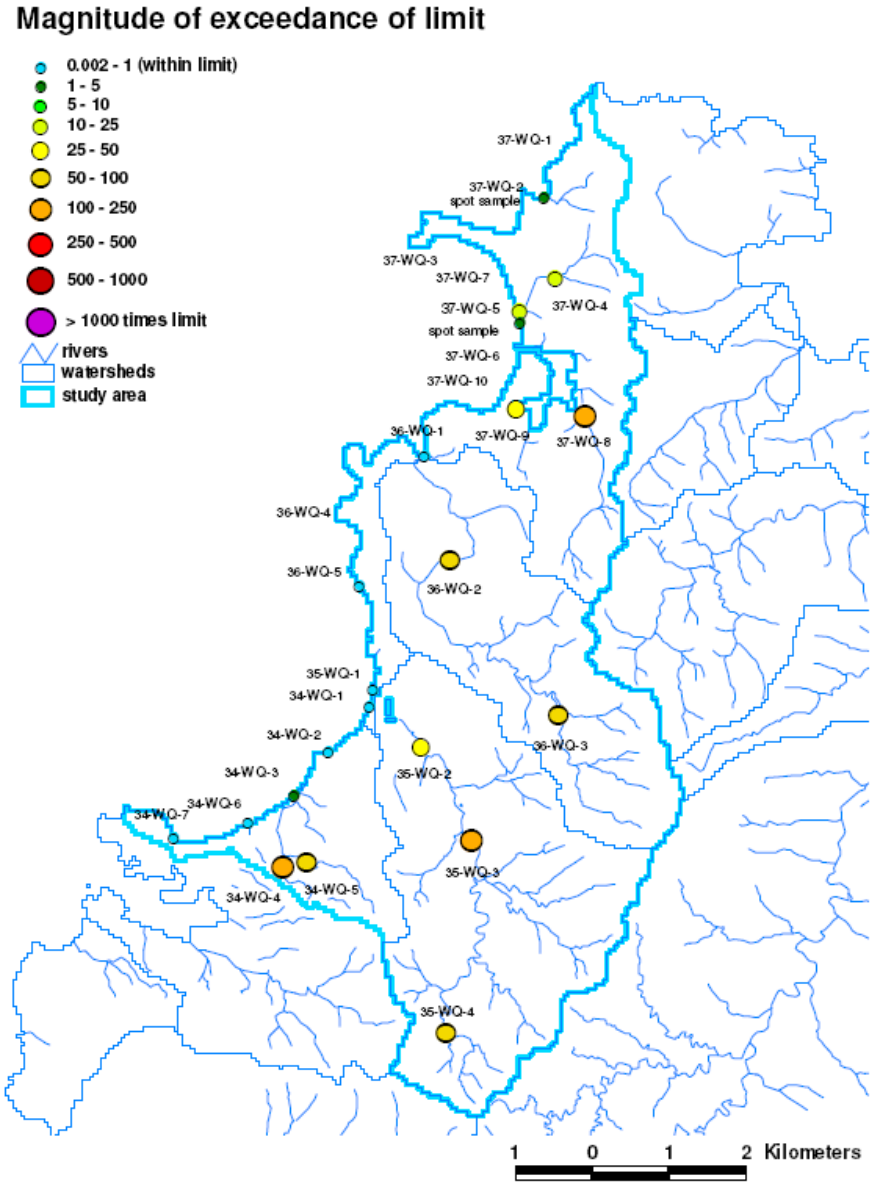


A. Water Quality Sampling

- Water sample collection within target watersheds - conducted on 5 separate occasions (within a five week period) so as to derive mean values
- 28 water quality points analyzed
  - 18 coastal;10 river sample points.
- Use of existing coastal sampling points
  - Points monitored by Fisheries Department and Ministry of Health
  - New sampling points included
- Rainfall data from three stations in target area
  - Used for interpretation of pollutant concentrations at the sampling locations

Pollution profile by WQ parameter (example)





WQ findings synthesis

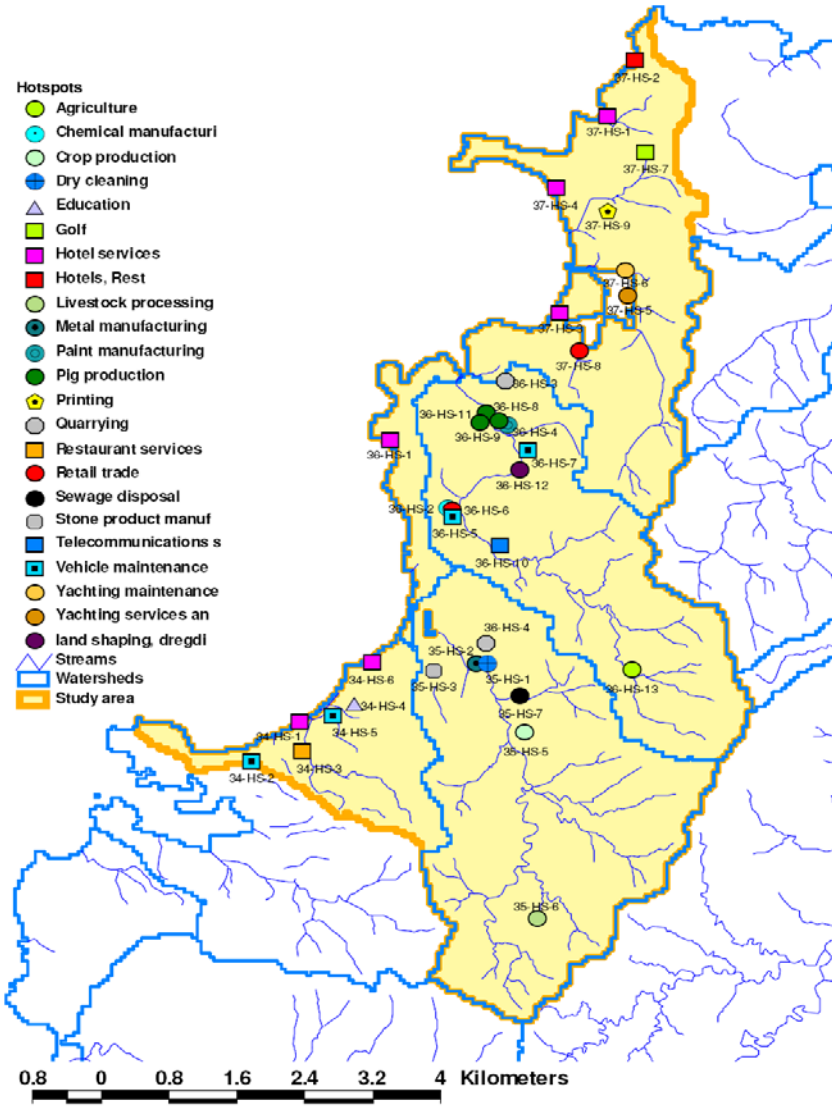
Magnitude of exceedence of the recommended limit for pollution parameters in accordance with the Saint Lucia Recreational Water Quality Standard (SLBS, 2010) **CAP ESTATE WATERSHED**

Sample point ID	Location	pH	TSS	Turbidity	Nitrates	Phosphates	Oils and grease	Faecal coliform	Enterococci*
		6.5-8.5 units	5 mg/L	50 NTU	0.0098 mg/L	0.00248 mg/L	15 mg/L	200 CFU/100 ml	35 CFU/ 100 ml
37-WQ-1	Coast		5.1	0.0	1.0	56.5	0.3	0.0	0.2
37-WQ-2	Coast		4.7	0.1	1.0	16.1	15.2	0.0	0.5
37-WQ-3	Coast		5.3	0.1	1.0	28.2	10.9	0.0	0.1
37-WQ-4	River Lower watershed	1.0	39.0	0.9	5.1	149.2	14.8	11.1	81.5
37-WQ-7	Coast		5.7	0.2	1.0	8.1	0.7	0.0	0.4
37-WQ-5	Watercourse Lower watershed	1.1	9.2	0.7	18.4	185.5	9.2	10.2	47.5
37-WQ-6	Coast		6.0	0.1	1.0	88.7	1.3	0.0	0.3
37-WQ-8	Coast	1.1	52.6	0.4	6.1	169.4	19.3	151.2	208.4
37-WQ-9	Coast	1.2	6.6	0.4	2.0	48.4	7.9	29.6	4.7
37-WQ-10	Coast Cap		6.4	0.2	1.0	12.1	12.8	0.0	0.3

Colour key – magnitude of exceedenec of limit:	Within limit	1-5 times	5-10 times	10-25 times	25-50 times	50-100 times	100-250 times	250-500 times	500-1000 times	>1000 times

B. Hotspot assessment

- Approach for assessment of hazard/risk at site
  - chemical, physical and microbial
- Developed based on existing approaches for stream bank, riparian and watershed assessments, occupational health and safety assessments, environmental assessments
- Development was an iterative process
  - Field testing



Hotspot assessment tool

(excerpt)

SECTION 1: GENERAL DESCRIPTION

1.1 WATERSHED NAME

1.2 MAIN DISCHARGE POINTS

#	(a) LOCATIONAL (GPS) COORDINATES: EASTINGS	(a) LOCATIONAL (GPS) COORDINATES: NORTHINGS	(b) DESCRIPTION (provide for each discharge outfall)
1			
2			
3			
4			

1.3 PHOTO ID (Camera-Pic #s)

#	PHOTO #	DESCRIPTION
1		
2		
3		

1.4 SITE IDENTIFYING CHARACTERISTICS (e.g. address, major landmarks, light pole number)

1.5 MAJOR LAND USE/LAND COVER (Adapted from Cooper 1996)

☐ Residential ☐ Industrial ☐ Commercial

☐ Agricultural ☐ Natural vegetation (e.g. forest, savannah) ☐ Vacant lot/abandoned area/open space

1.6 TOPOGRAPHY WEIGHT FACTOR 6

☐ Gradient flat to gentle sloping (0-10 degrees) RANK 2

☐ Gradient gentle to moderate sloping (10-20 degrees) RANK 5

☐ Gradient moderate to steeply sloping (20+ degrees) RANK 8

1.7 PROXIMITY TO WATERCOURSES WEIGHT FACTOR 10

☐ Manmade drain or stream (<3m in width) on property or within 10m of property boundary RANK 5

☐ Channelized water course, river or dry riverbed (>3m in width) on property or within 10m of property boundary RANK 8

☐ Property on coastline, on beach or within 10m of coastline or beach RANK 8

☐ Multiple water courses/coastline within 10 of the property boundary RANK 15

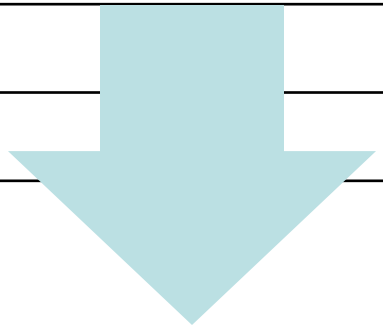
Hotspot ranking and scoring

Excerpt from database – in MS Excel

2.3a Chemical Storage/ Production	RANK	WEIGHTING	RISK SCORE	2.3b Special storage arrangements	RANK	WEIGHTING	RISK SCORE	2.4 Chemical Contamination Risk	RANK	WEIGHTING	RISK SCORE
GAS - Compressed gas cylinders/	2	7	14	Y - Yes	2	5	10	Y - Yes	9	9	81
PAI - Paints & Pigments	5	7	35	P - Partial	5	5	25	N - No	2	9	18
PLA - Plastics	3	7	21	N - No	8	5	40	NA - not assessed			
AGR - Agricultural chemicals	4	7	28	NA - not assessed							
INK - Inks	2	7	14								
SOA - Soaps / detergent	6	7	42								
GLU - Glues	3	7	21								
PYR - Pyrotechnic products and ex	2	7	14								
ACD - Acids	6	7	42								
SOL - Solvents	6	7	42								
PET - Petroche-mical products	8	7	56								
OTH - Other	5	7	35								

Rank (1 to 10): high values - the higher the pollution risk
Weighting (1 to 10): high values – greater relative importance of factor
Risk score: multiplicative result of Rank and Weighting

Organization	Final Score	Risk
Piggery Bois D'Orange	854	Very High
Livestock processing – Choc	809	
Waste Treatment Facility- Choc	742	High
Piggery- Bois D'Orange	704	
Quarry Bois D'Oraange	639	
Concrete and Aggregates	636	
Industry- Bois d' Orange	624	
Hotel- Castries	592	Moderate to High
Hotel – Bois D'Orange	557	
School- Castries	546	
Garage- Bois D'Orange	542	
Retail-Bois d'Orange	540	



remaining ranked entities

Score risk categories

- < 250 minimal risk
- 250 - 500 low risk
- 500 - 750 moderate risk
- 750 - 1000 high risk
- > 1000 very high risk

Outputs

- Pollution profile of watershed and coastal areas – derived from the WQ data
  - Determine changes in pollution loads across the watershed
- Understanding of the influence of dilution effects due to rainfall/increased discharge
- Identification of water course reaches, coastal zone segments of greatest concern based on WQ data and hotspot assessment
- Preliminary identification of the hotspots that are likely to contribute to greatest pollution loading

Hotspot assessment - considerations

- As a first cut – hotspot is a reflection of the pollution "risk" based on the number and types of on-site activities, site physical characteristics, including how well the site is managed for the reduction of environmental impacts.
  - Lay basis for further work and more detailed investigations
- Limitations
  - High score biased towards sites with higher number of activities
    - a site with both agricultural and manufacturing activities may have a higher risk than a site with only agricultural activities, simply because there are more potential threats

Next stages

- Lead to adoption of permanent sample points
- "2nd phase" type actions - Focus on pollution mitigation strategies:
  - Dialogue with the operators of entities that were evaluated to pose greatest risk to the environment.
  - Investment in wastewater/pollution management facilities/protocols, riparian buffers
- Policy maker sensitization
  - foster Government commitment to address water quality issues
- Private sector, civil society sensitization
  - Broad-based buy-in

Building Capacity

- CEHI's contributions towards improved monitoring and assessment
- Way forward

Under GEF-IWCAM

- GEF-IWCAM Project supported laboratory strengthening
  - 13 participating countries
  - Select environmental/water quality labs
- Select areas - training
  - Quality Assurance / Quality Control
  - Practical Water Quality Monitoring (PAHO & IWCAM)
    - Microbiological
    - physico-chemical analyses
  - Membrane filtration techniques
  - Environmentally Sound Management of Laboratory Waste
- Equipment procurement

GEF-IWCAM contributions

- Capacity built in countries to perform the following:
  - Microbiological analyses
    - Total coliform count
    - Faecal coliform count
    - Pseudomonas aeruginosa
    - Enterococci count
    - E. Coli count
    - Heterotrophic plate count
  - Chemical Analyses:
    - Total Suspended Solids
    - Total Dissolved Solids
    - Dissolved Oxygen
    - BOD
    - pH

CEHI support

- Metals analyses
- Pesticide analyses:
  - Organochlorine pesticides
  - Organophosphorous pesticides
- Low level nutrient analysis
  - Nitrates, phosphates in sea water

Way forward – sustainability at national level

- Strengthen inter-agency cooperation in monitoring
  - Establish MOUs, data sharing protocols
- Engage non-traditional stakeholders
  - Private sector, Schools, community groups
- Establish ‘simple’ reporting framework
  - Agree on information sharing protocols to support decision-making
    - LBS Protocol core parameters

Way forward – sustainability at regional level

- Strengthen national inputs to State of Cartagena Convention Area Reports
  - Notably LBS Protocol reporting templates
- Formalize/harmonize data collection agreements amongst regional partners
  - CEP (UNEP CAR/RCU) Secretariat as hub
- Advocate for improved information exchange
  - Support regional policy making
  - Agree on protocols for information sharing

Questions?

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