



# Balancing Climate, Renewable Energy Transmission and Conservation of Marine Ecosystems

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**International Union for the Conservation of Nature (IUCN)**

Regional Office for Mesoamerica & the Caribbean Initiative



IUCN\_Caribbean



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## About IUCN... [www.iucn.org](http://www.iucn.org)

### Globally:

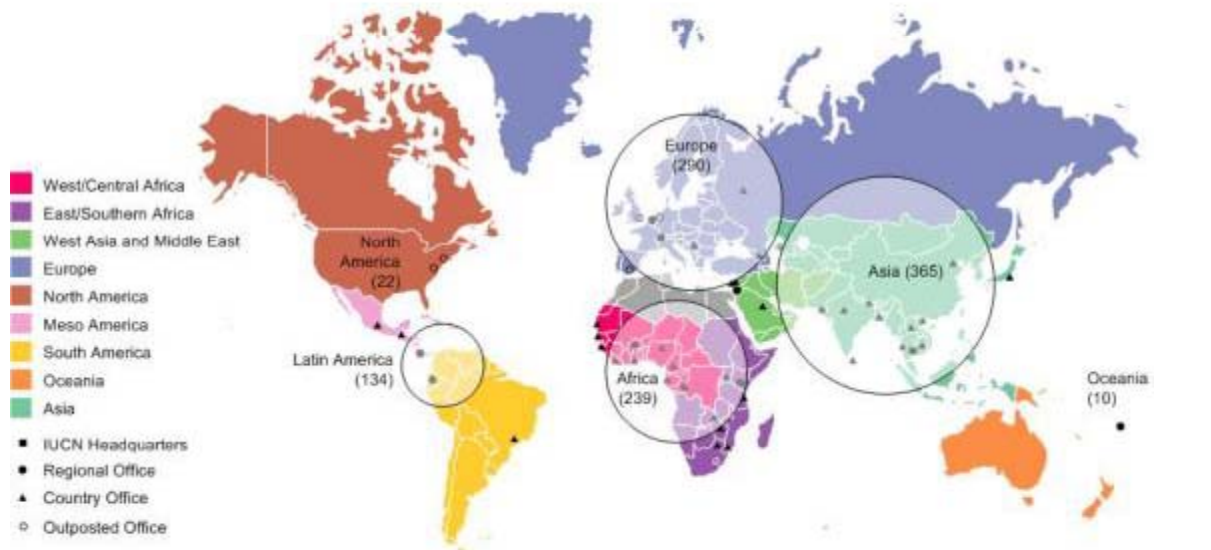
- The world's oldest and largest global environmental network - founded in 1948
- A democratic membership union with more than 1,000 government and NGO member organizations
- 11,000 volunteer scientists in more than 160 countries
- Distributed secretariat in 8 regional offices, 6 commissions (peer membership)

### Regionally:

- Regional Office for Mesoamerica & the Caribbean Initiative
- Membership: 80 in Mesoamerica; 22 in the Caribbean



## Secretariat locations worldwide



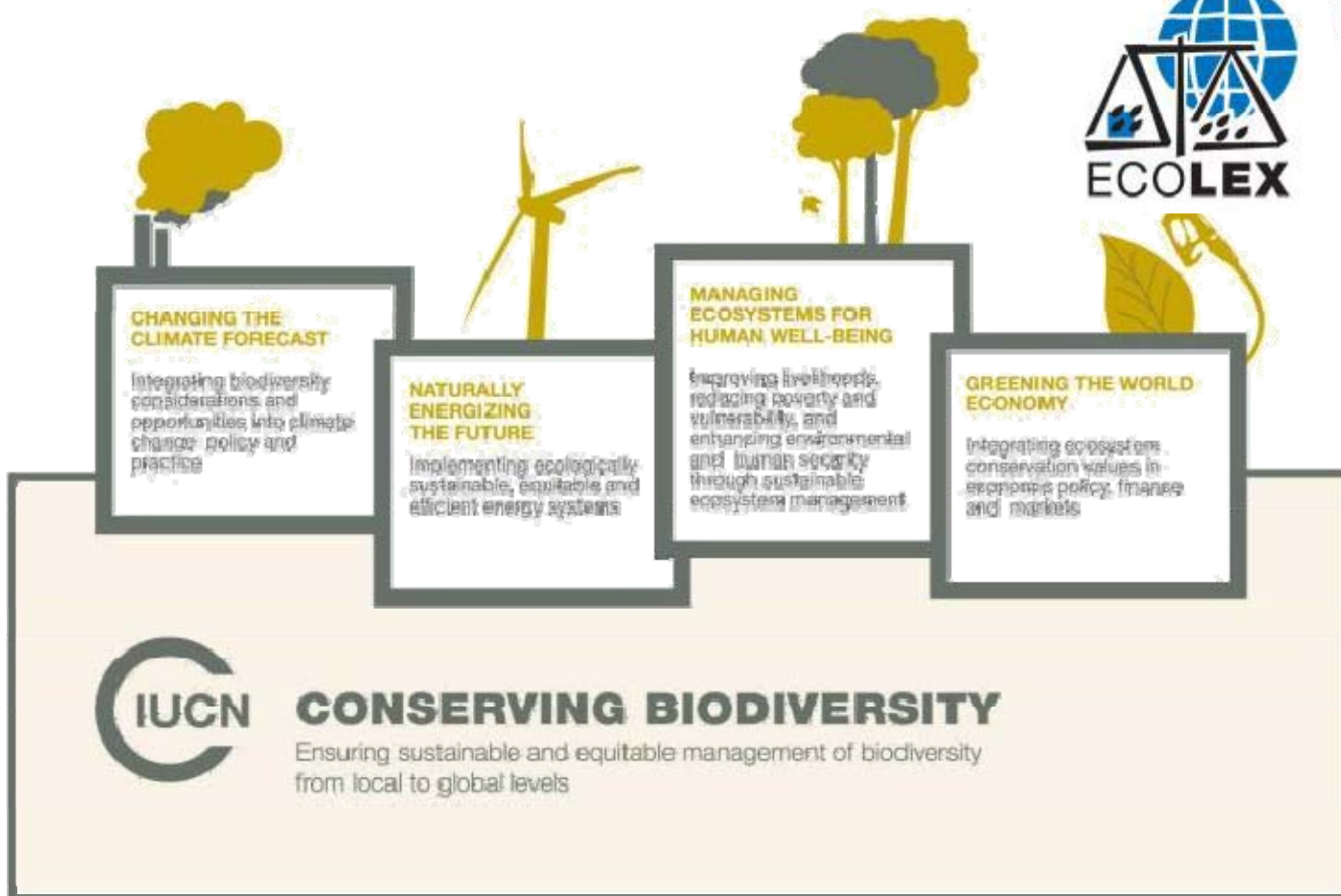
IV INTERNATIONAL CONFERENCE  
**CIEMADes**  
May 5-7, 2011  
Universidad del Turabo-Gurabo, Puerto Rico





# Shaping a sustainable future

IUCN One Programme 2009-2012



**IUCN Mission:**  
 “To influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable”



## Background to IUCN work on **ENERGY**



- ALL energy options have some **impact** on ecosystems and livelihoods



- Need **knowledge** and **tools** to have **informed** discussions on **trade-offs** to ensure rapid transition to truly sustainable energy future



# Greening Blue Energy: Identifying and managing the biodiversity risks and opportunities of offshore renewable energy

Edited by Dan Wilhelmsson *et al.*



Table 3: Key environmental issues of offshore wind energy

Wilhelmsson (2010)

Key environmental issues Relates to cabling impacts Source: Wilhelmsson (2010)		Level of certainty for predictions/ estimates (1 low to 5 high)	Estimated scale of impact n.a. = Not assessed			Discussed in section in Annex 1
			Spatial	Temporal	Estimated degree of severity (-) or benefit (+) of impacts for species assemblages within the wind farm area	
<b>FISH</b>	Injuries from sound pulses (construction)	3	Local	n.a.	Small (-)	7.1
	Displacement/habitat loss (construction)	3	Very broad	Short term	(-) see 4.2.2	7.3
	Sediment dispersion (construction)	4	Broad	Short term	Small (-)	4
	Disturbance from operational noise	4	Very local	Long term	Small (-)	7.6
	Trawling exclusion	5	Broad	Long term	Large (+) see 4.2.3	3.3
	Artificial reef effects	3	Local	Long term	Moderate (+) see 4.2.3	3.3
	Electromagnetic fields	2	Local (but see migrating fish)	Long term	Small (-) (but note level of certainty and see migrating fish)	8.1
	Collisions with turbines	2	n.a.	n.a.	Small (-)	3.4
	Noise masking bioacoustics	2	Local	Long term	Small (-) (but note level of certainty)	7.9
<b>MARINE MAMMALS</b>	Injuries from sound pulses (construction)	3	Local	n.a.	Small (-) but see 4.2.2	7.1
	Displacement/habitat loss (construction)	3	Very broad	Short term	(-) see 4.2.2	7.2
	Displacement, disturbance (operation)	3	Very local	Long term	Small (-)	7.7
	Habitat enhancement	1	Broad	Long term	Small (+) (but note level of certainty)	3.3
	Migration barriers	2	n.a.	Long term	Small (-) (but note level of certainty and extra caution for whales), and see 4.2.3	7.9
	Collisions with turbines	2	n.a.	n.a.	Small (-)	3.4
	Noise masking bioacoustics	2	Local	Long term	Small (-) (but note level of certainty)	7.9

Key environmental issues  Relates to cabling impacts  Source: Wilhelmsson (2010)		Level of certainty for predictions/ estimates (1 low to 5 high)	Estimated scale of impact n.a. = Not assessed			Discussed in section in Annexe 1
			Spatial	Temporal	Estimated degree of severity (-) or benefit (+) of impacts for species assemblages within the wind farm area	
<b>BIRDS</b>	Displacement/habitat loss (construction)	5	Very broad	Short term	(-) see 4.2.2	9.3
	Displacement/habitat loss for seabirds (i.e. sea ducks and divers) (operation)	4	Very broad	Long term	(-) see 4.2.3	9.3
	Migration barriers (operation) 1. long distance migrators 2. daily commuters	3	n.a.	Long term	1. Small (-) 2. Moderate (-) see 4.2.3	9.2
	Collisions with turbines	3	n.a.	Long term	Small (-) but see 4.2.3	9.1
<b>BENTHOS</b>	Sediment dispersion (construction)	3	Broad	Short term	Small (-)	4
	Acoustic disturbance (construction)	2	Local	Short term	Small (-) (but note level of certainty)	7.4
	Changes in community structure directly due to turbines	4	Local	Long term	Small to Moderate (-) see 4.2.3	3.1 & 5
	Electromagnetic fields	2	Very local	Long term	Small (-) (but note level of certainty)	8.2
	Anoxia created	4	Very local	Long term	Small (-)	5
	Habitat enhancement (not considering trawling exclusion)	4	Very local	Long term	n.a.	3.1
	Entry point for invasive species	2	Very broad	Long term	n.a.	3.2
	Effects of trawling exclusion	5	Broad	Long term	Large (+) see 4.2.3	3.1
<b>HYDROLOGY</b>	Depletion of phytoplankton	4	Local	Long term	Small (-)	5
	Upwelling or downwelling at the perimeter of wind farm	1	Local	Long term	Small (+/-) (but note level of certainty)	5
	Toxic substances	4	Local	n.a.	Small (-)	6
	Oil spills (e.g. ship accidents)	-	n.a.	n.a.	(-) see 4.2.3	
<b>SEA TURTLES</b>	Displacement/habitat loss (construction)	2	Very broad	Short term	(-) see 4.2.2	7.1 & 7.8
	Displacement/habitat loss (operation)	2	Very local	Long term	Small (-) (but note level of certainty) see 4.2.3	7.8



# Green Energy Report Findings (main impacts):

Wilhelmsson (2010)

- **Risks**

- Piling noise (dependent on foundation type and soils)
- Electromagnetic disturbance
- Potential collisions with wind turbines \*
- Deviation of the migratory routes of birds and whales \*
- Navigational hazards for ships \*

**\*\*\* Strategic planning can help to avoid sensitive sites**

- **Opportunities**

- Artificial hard bottom habitats created
- Fish Aggregation Devices created
- Limitations of fishing in the wind farms
- Development of “marine protected areas”



# Green Energy Report Recommendations

To reduce impacts on marine biodiversity and promote opportunities:

## **Governments**

- Integrate the development of wind farms in marine area management decisions
  - Use strategic environment assessments
- Collate and share information on impacts

## **Economic operators**

- Avoid sensitive sites
- Use clever designs
- Incorporate other uses where feasible
- Offset residual impacts





## Featuring IUCN Oceania Office: Energy, Ecosystems and Sustainable Livelihoods Initiative

- Energy program supporting national policy directives
- Regional, national scales

**Goal:** The overall goal is reducing the impacts of climate change through sustainable energy initiatives in Pacific Small Islands Developing States (SIDS).

**Outcome:** The expected outcome is the implementation of projects that demonstrate sustainable energy technologies, and management mechanisms for those technologies.



PACIFIC ISLAND STATE	PROJECT FOCUS	TOTAL \$\$
PALAU	Home loan energy efficiency	\$500,000
MARSHALL ISLANDS	Retrofitting of street lighting, solar street lighting	\$1.09M
SAMOA	Greenhouse gas abatement in the transport sector through energy efficiency	\$1.3M
TONGA	Solar lighting rehabilitation	\$206,000
TUVALU	PV Hybrid System and solar street lights	\$800,000
VANUATU	Solar lighting systems, Wind Resource Assessment, Community based hydro power	\$800,000

**EXPECTED BENEFITS:** Energy efficiency and lower electricity costs, less dependence on fossil fuels, reliable power supply for small communities, income generating activities, building capacity for RE technologies, CO<sub>2</sub> emissions savings, markets for EE products

**FUNDING SUPPORT:** €1.8M from Governments of Italy and Austria to 2013



# Overview of the Caribbean region's key ecosystems and biodiversity resources



**Views of the Caribbean:  
Crowded regional space  
Exclusive Economic Zones and countries that have ratified the SPAW Protocol**

Source: UNEP Caribbean Environment Programme



# Views of the Caribbean

(150 years of storm records)

Increased weather-related threats to island ecosystems as a result of climate changes





## Views of the Caribbean:

**Caribbean Hotspot: Key Biodiversity sites of importance - Greater Antilles** (Source: Critical Ecosystem Partnership Fund, 2010)





**RAMSAR Caribbean Sites:**  
Wetlands of International  
Importance  
Source: ramsar.org



# Green Sea Turtle Nesting Habitat in the Wider Caribbean Region



## Green Nesting Habitat

- X Crawls per year
- <25 Crawls per year
- 25-100 Crawls per year
- 100-500 Crawls per year
- 500-1000 Crawls per year
- >1000 Crawls per year

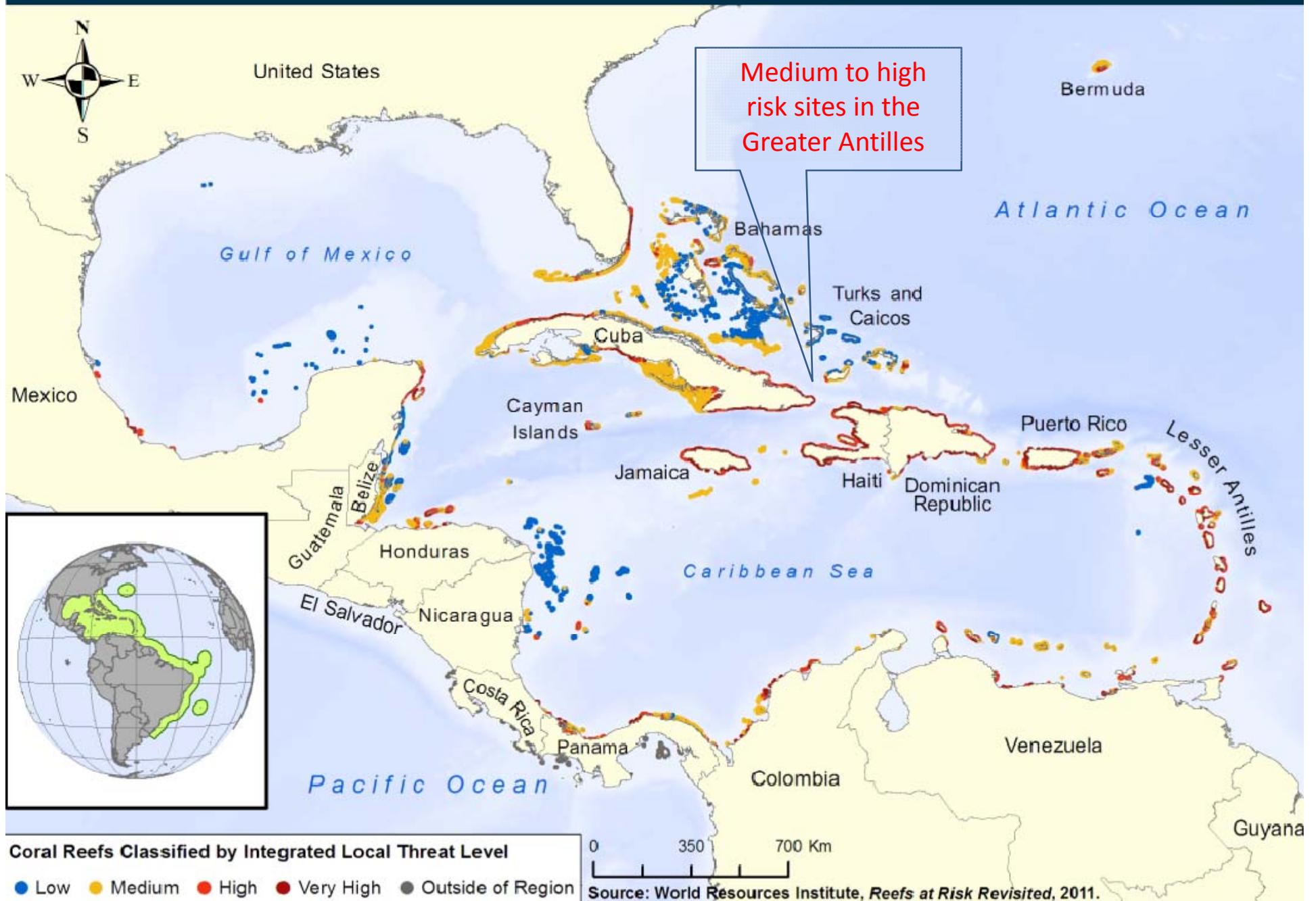
— GSHHS Caribbean Shoreline

0 375 750 1,500 2,250 3,000 Km

Dow et al. (2007) Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region



# REEFS AT RISK IN THE ATLANTIC/CARIBBEAN

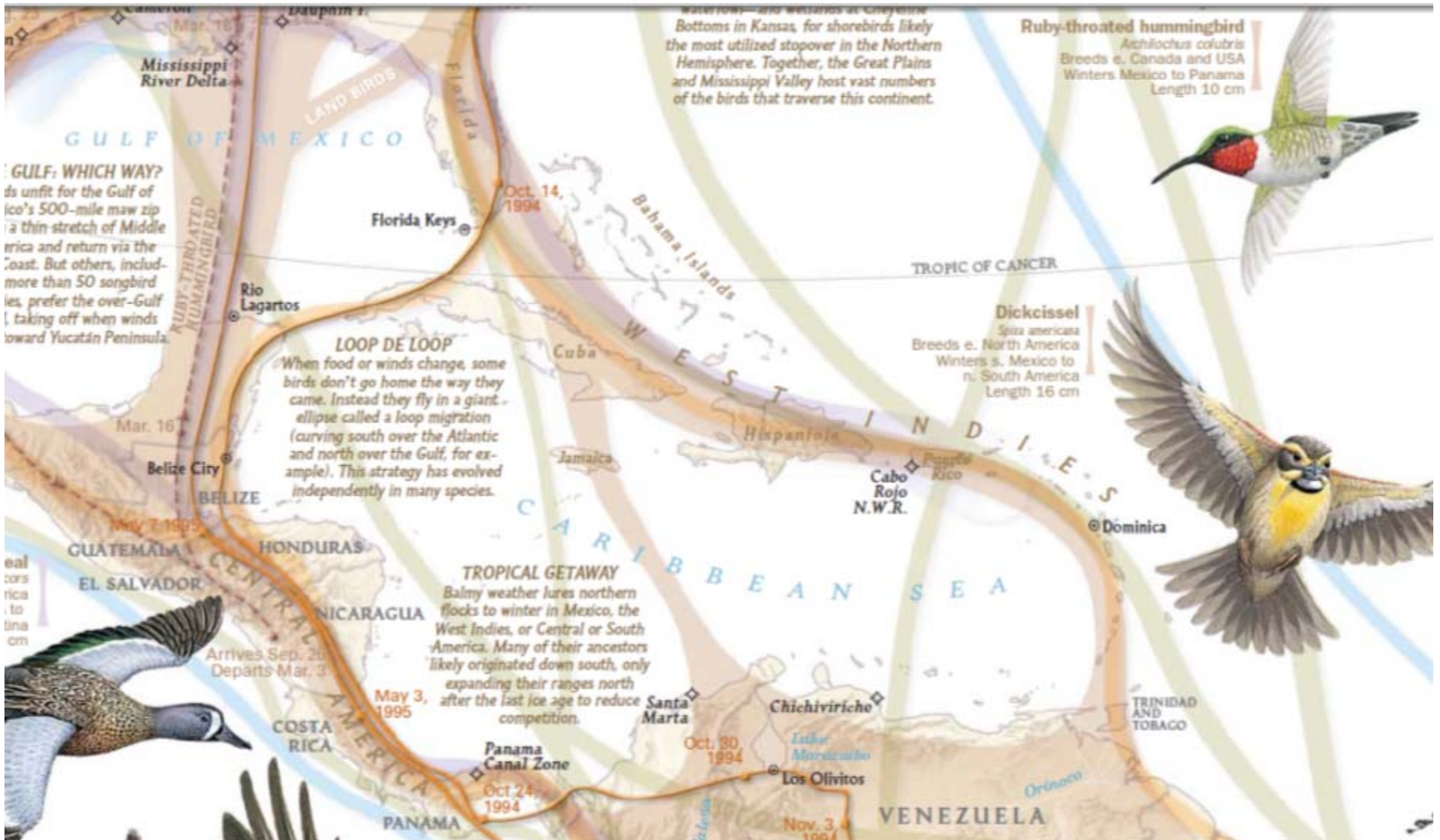




# Bird Migration Routes well established in the Greater Antilles

Source: Bird Life International & National Geographic

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## Major oil and gas shipping routes in the Caribbean and previous oil spills

(Source: UNEP/CEP)



No.	Year	Source and spill zone	Millions of litres (type of oil)
1	1971	Sain Augusta, St. Croix, U.S. Virgin Islands	13 (crude)
2	1973	Zoe Colocotronis, Cabo Rojo, Puerto Rico	5 (crude)
3	1975	Garbis, Florida Keys, United States	24-25 (crude)
4	1976	Ruptures pipeline in Corpus Christi, Puerto Rico	1 (crude)
5	1977	Unidentified ship, Guanilla Bay, Puerto Rico	2 (crude)
6	1978	Howard Star, Tampa, Florida, United States	15-20% crude, 80% bunker
7	1979	Burhah Agate, Texas United States	5-41
8	1979	Atlantic Empress, off the coast of Trinidad and Tobago	158
9	1979-1980	Itox I, marine platform explosion, Campeche Mexico	528-1626 (crude)
10	1984	Alvenus, Louisiana, United States	25
11	1985	Ranger, marine platform explosion, Texas United States	24-52
12	1986	Las Minas Refinery, Panama	8 (crude)
13	1991	Vista Bella Barge, of Saint Kitts and Nevis	2(bunker C)
14	1994	Berman, San Juan, Puerto Rico	375 (gasoil No. 6)
15	1997	Nisos Armorgos, tanker, Gulf of Venezuela	3.2



## Hispañiola: Protected Areas (Google Satellite Map) – scalable maps

Source: ProtectedPlanet.net



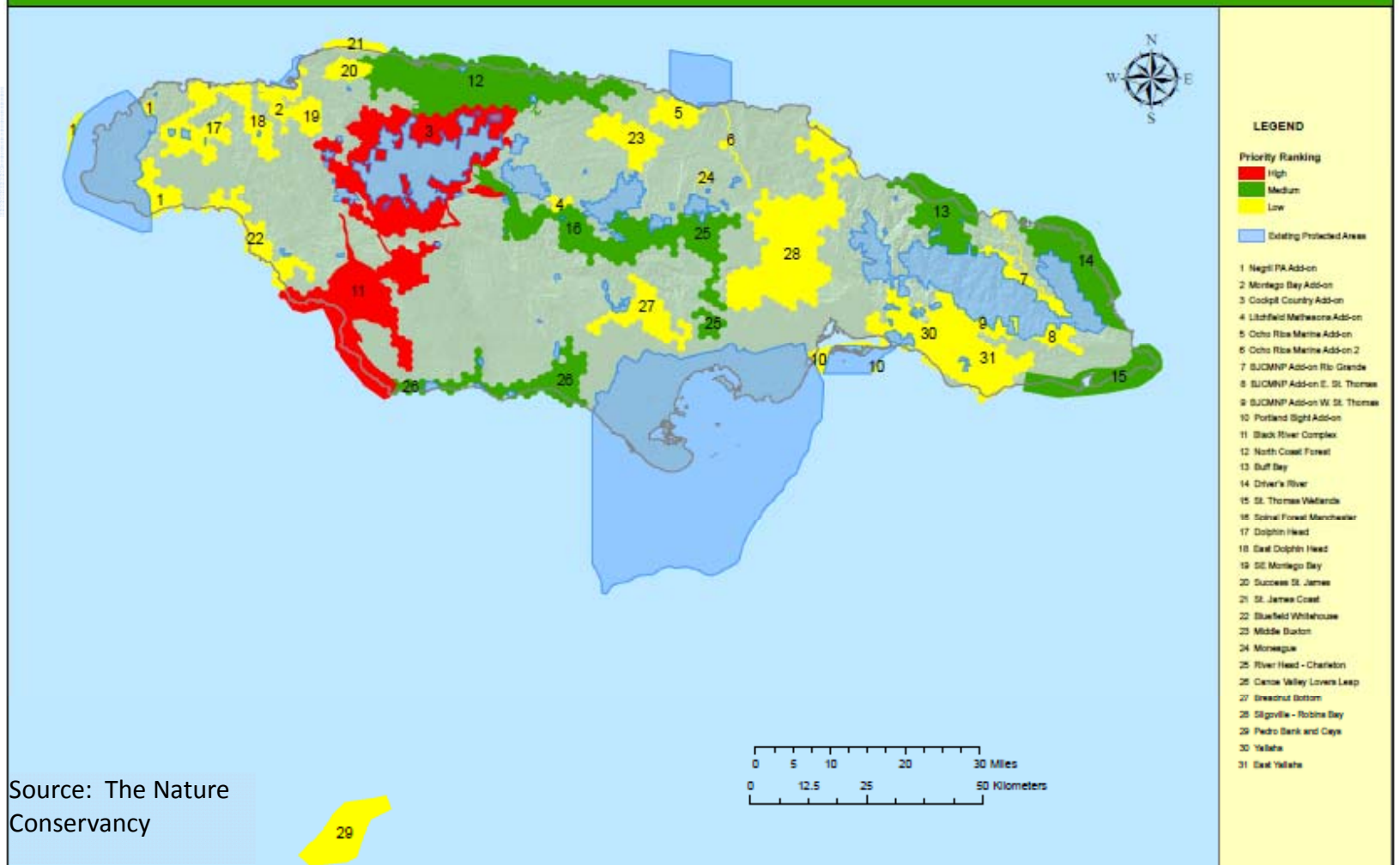
Available data:  
Case of Cuba,  
Hispañiola



### Jamaica National Ecological Gap Assessment

Proposed National Protected Areas Portfolio - Priority Ranking : Biodiversity

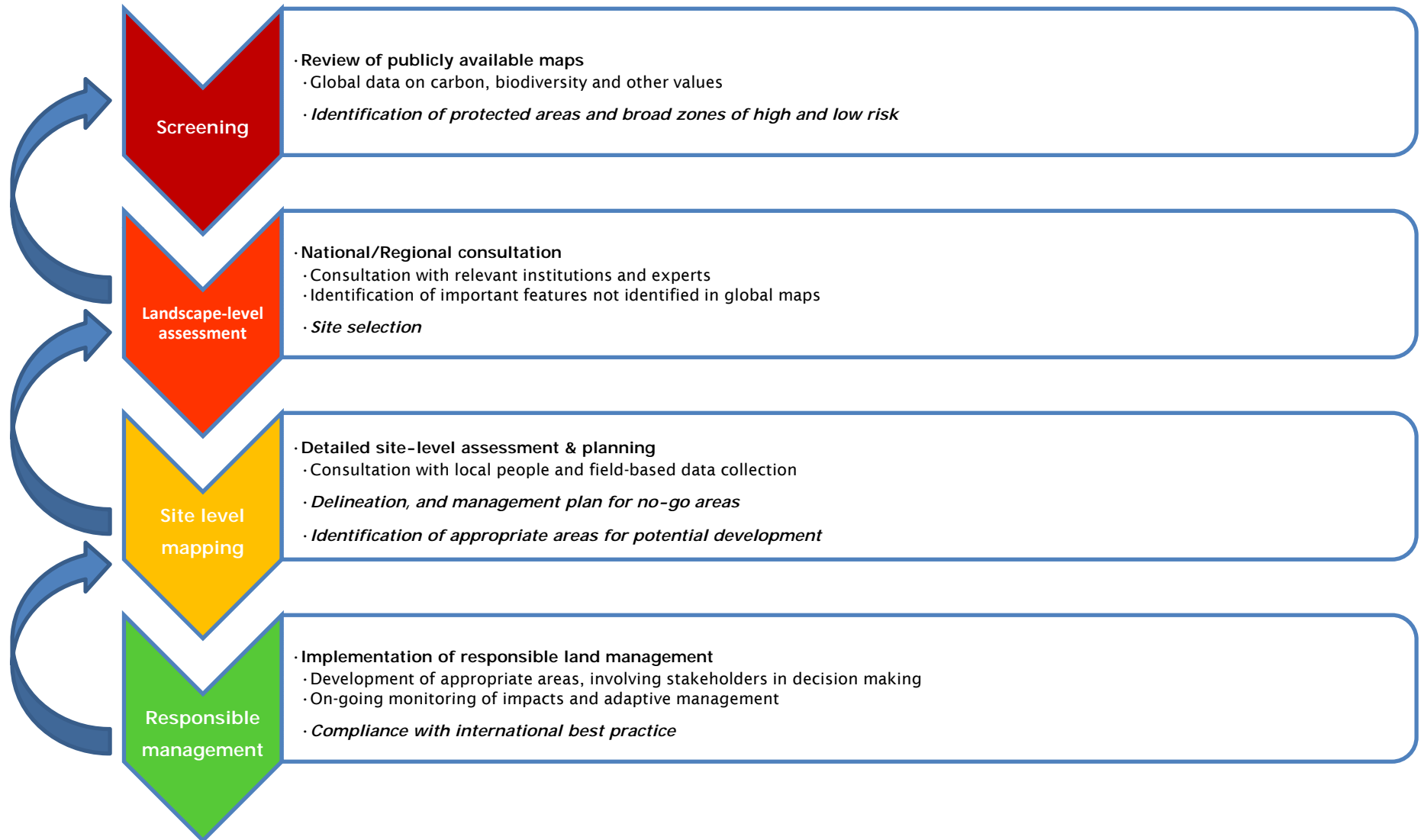
Available data:  
 Case of Jamaica



Source: The Nature Conservancy



# IUCN Recommendations: Apply learning – planning and decision-making

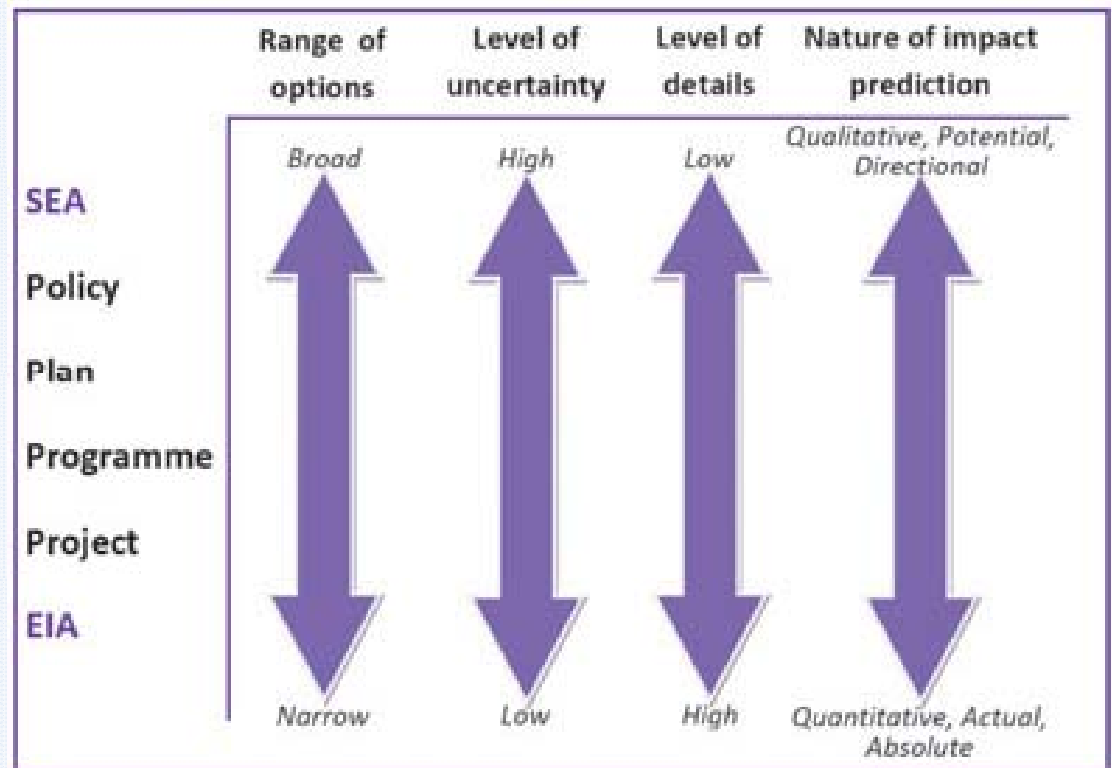




## IUCN Recommendations:

1. Consider strategic environmental assessments (SEAs) for regional scale view of possible impacts and conflicts
2. Site specific environmental impact assessments (EIAs)
3. Project life cycle phases:
  - Design
  - Construction
  - Operation
  - Decommissioning

Source: Wilhelmsson et al., 2010





Countries with 'discretionary' EIA requirements	Countries with a legislated EIA process	Organizations that require EIAs or SIAs
Bahamas (BEST)	Jamaica	Organization of Eastern Caribbean States (OECS) Secretariat
Barbados (T&CPO)	Trinidad & Tobago	Caribbean Development Bank
St. Kitts & Nevis (PPU)	Guyana	Inter-American Development Bank
St. Vincent & the Grenadines	Dominican Republic	World Bank
Dominica	Cuba	
St. Lucia	Puerto Rico	



## IUCN Recommendations:

4. Involve regional organizations
5. Involve local organizations: private, public, community, NGOs
6. Identify and quantify impacts: scale, short vs. long term, degree of severity/seriousness
7. Identify mitigation options: design, construction and operation
8. Monitoring & evaluation  continuous improvement
9. Promote energy efficiency:
  - Supply side: generators, IPPs etc.
  - Demand side: sectors (e.g. tourism, manufacturing); communities, households
10. Cross-cutting issues:
  - Policy environment, awareness & education, gender etc.



## Contact us:

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