ROYAL ACADEMY OF ENGINEERING

@RAEngGlobal
#SDGs

Problem Based Learning: Teaching engineers to tackle the SDGs

Dr PAULA ANDREA ZAPATA
Assistant Professor, Universidad Pontificia Bolivariana

Novel approaches to tackle the SDGs in the countries of blue economy

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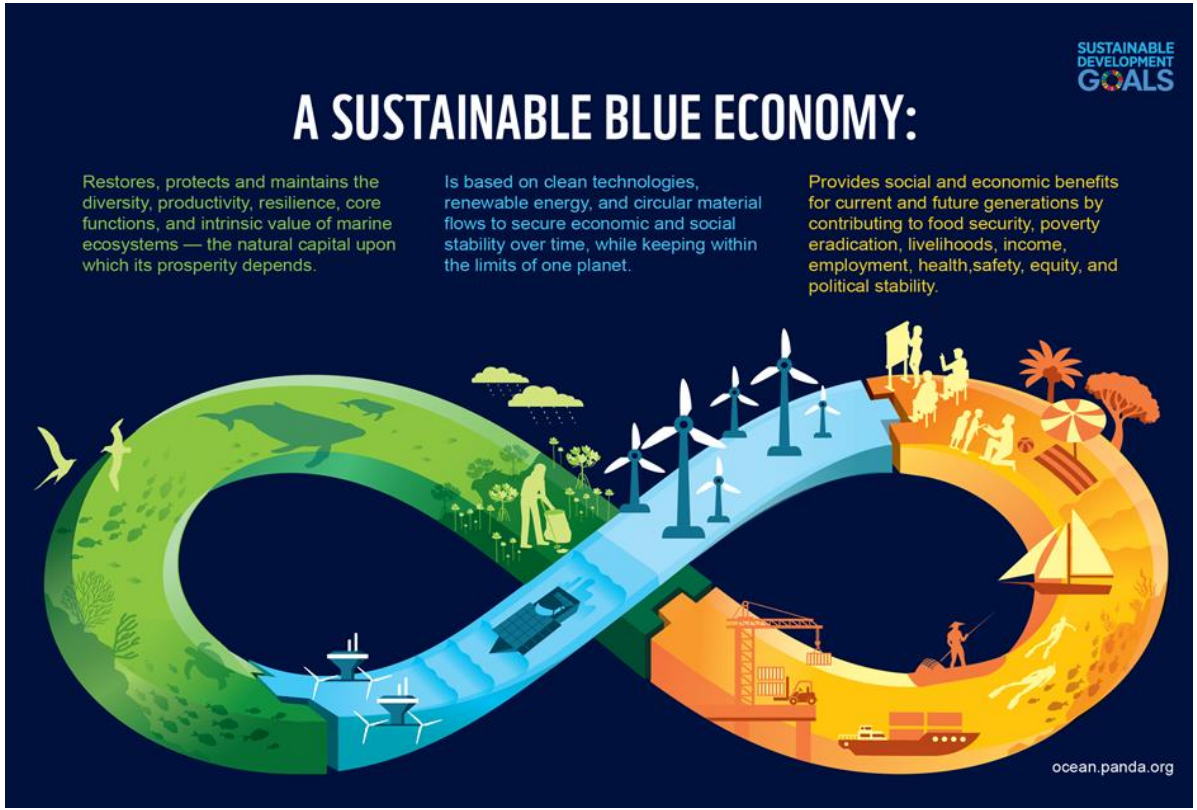

https://www.euractiv.com/section/circular-economy/opinion/the-sustainable-blue-economy-eus-actions-must-match-its-words/

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SUSTAINABLE DEVELOPMENT GOALS

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Aim is to *conserve and sustainably use the oceans, seas and marine resources for sustainable development*

TARGET 14.A

INCREASE SCIENTIFIC KNOWLEDGE, RESEARCH AND TECHNOLOGY FOR OCEAN HEALTH

- Develop research capacity
- Transfer marine technology
- Enhance the contribution of marine biodiversity
- Empower communities through knowledge, education and communication
- Strategies to fully develop the potential of the blue economy

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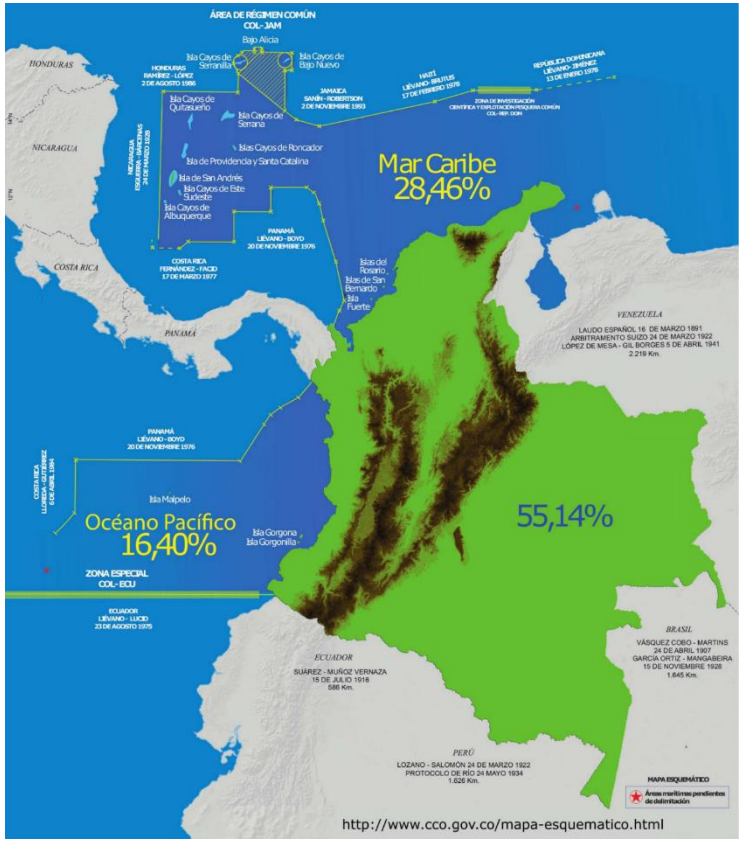
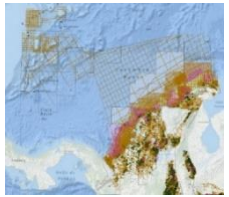
COLOMBIA

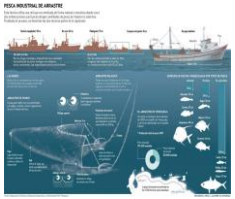


Transportation

Oil & Gas industry

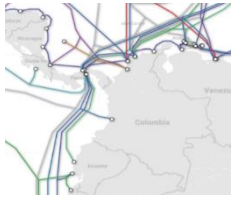


Industrial fisheries



Artisanal

Cable routes



Offshore energy

Deep-sea mining ??

Tourism

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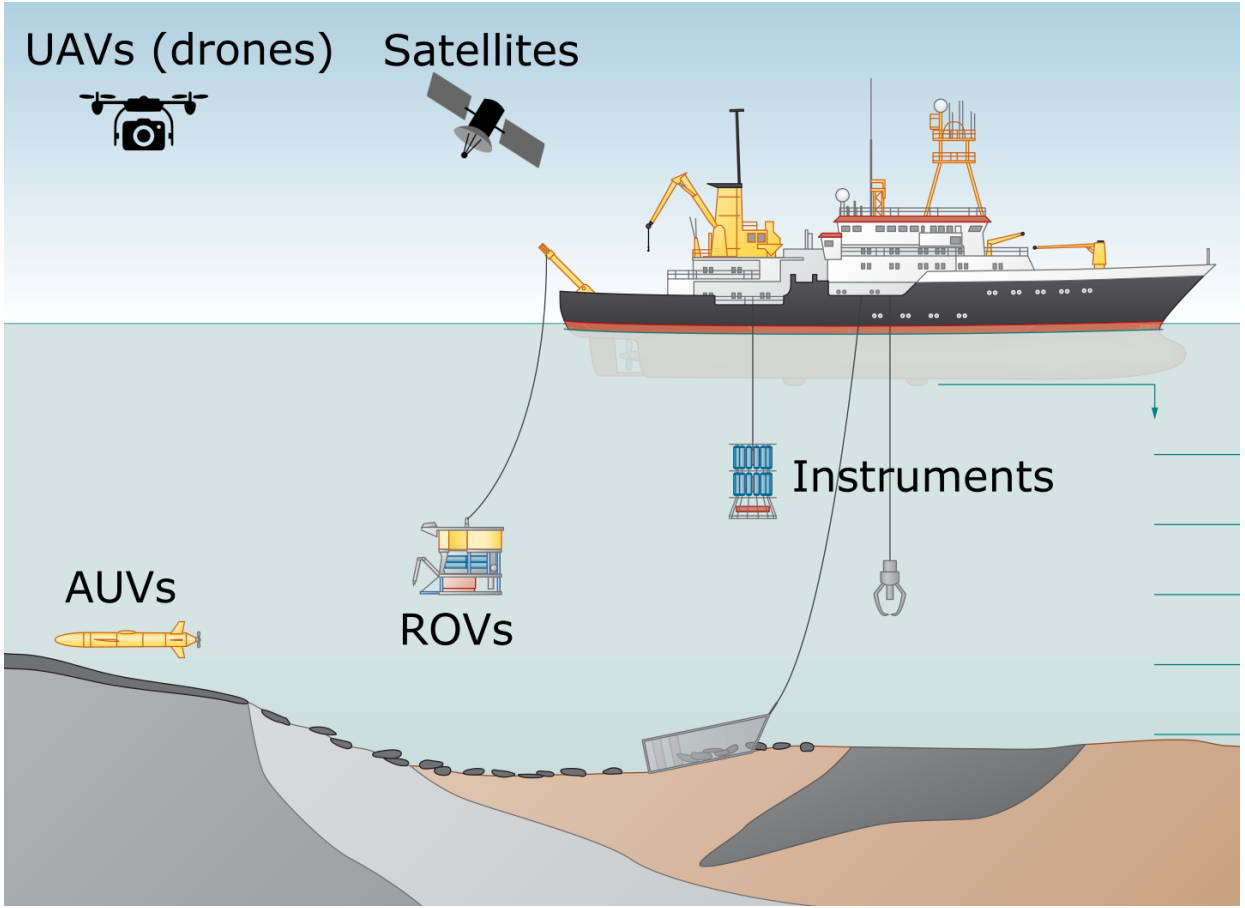

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Modern technologies for ocean exploration

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Project: IAPP1617\69 (2017-2019)

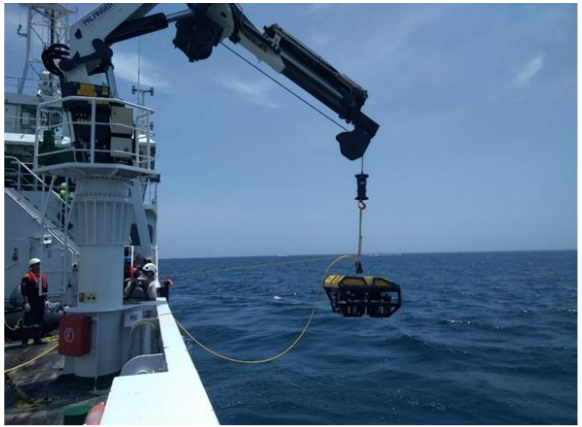
"Development of a technology-based methodology for the characterization of underwater ecosystems as tool towards marine spatial planning decisions of marine areas in the Colombian seas"

IAPP Industry Academia Partnership Program

Stakeholders

Develop research capacity

Foto: Santiago Estrada



Parque Nacional Natural Corales del Rosario y Parque Nacional Corales de Profunidad, 2018

R/V ARC Roncador

Falcon (Saab Seaeye)

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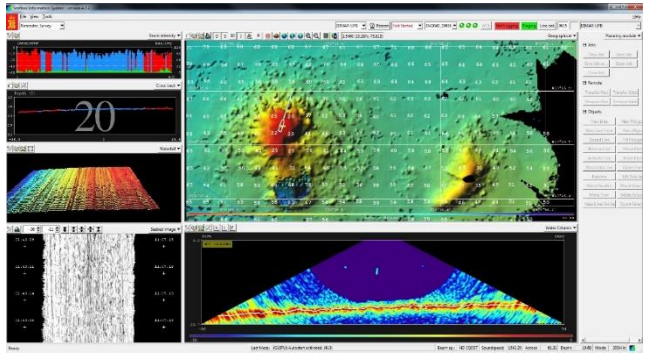
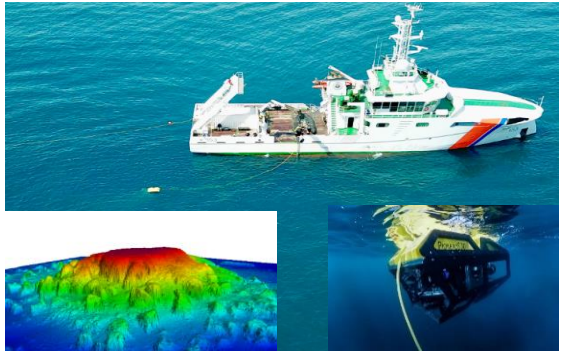
Transfer marine technology

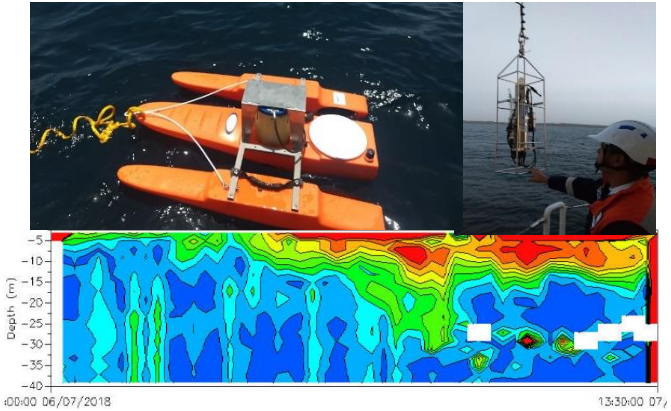
Multibeam bathymetry



Modern tools and remote sensing



Oceanography



Visual information - ground truthing

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Generation of thematic geomorphological cartography from multibeam bathymetry

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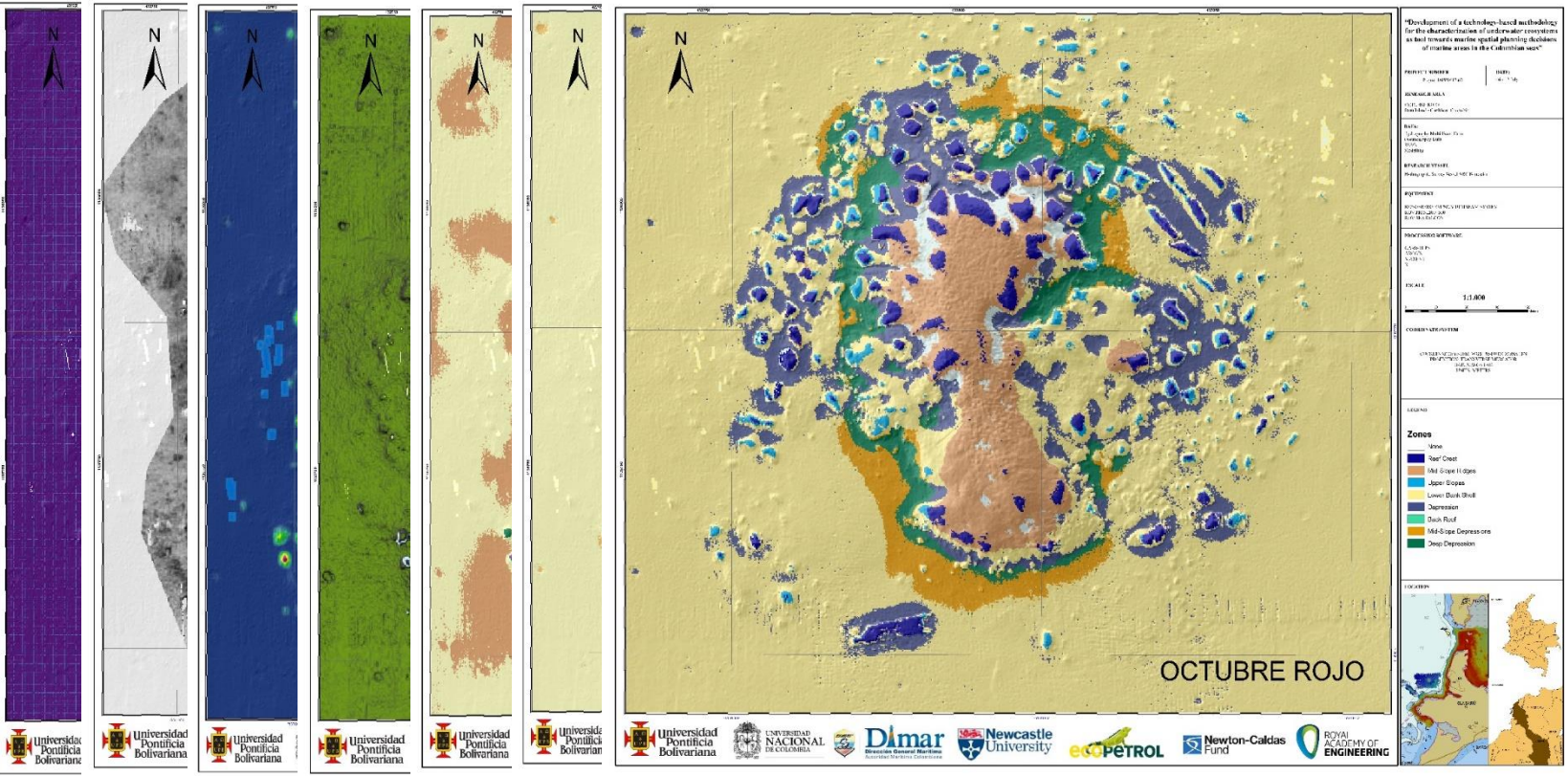

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Compile data Ground truthing – Visual Information (ROV´s)
Biodiversity data / morpho-sedimentary information

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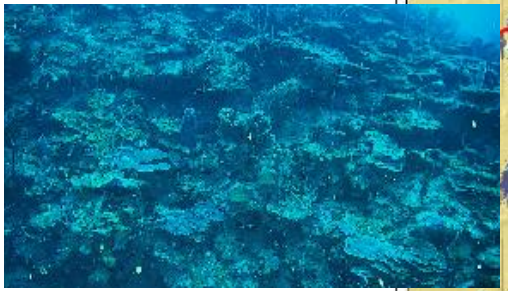

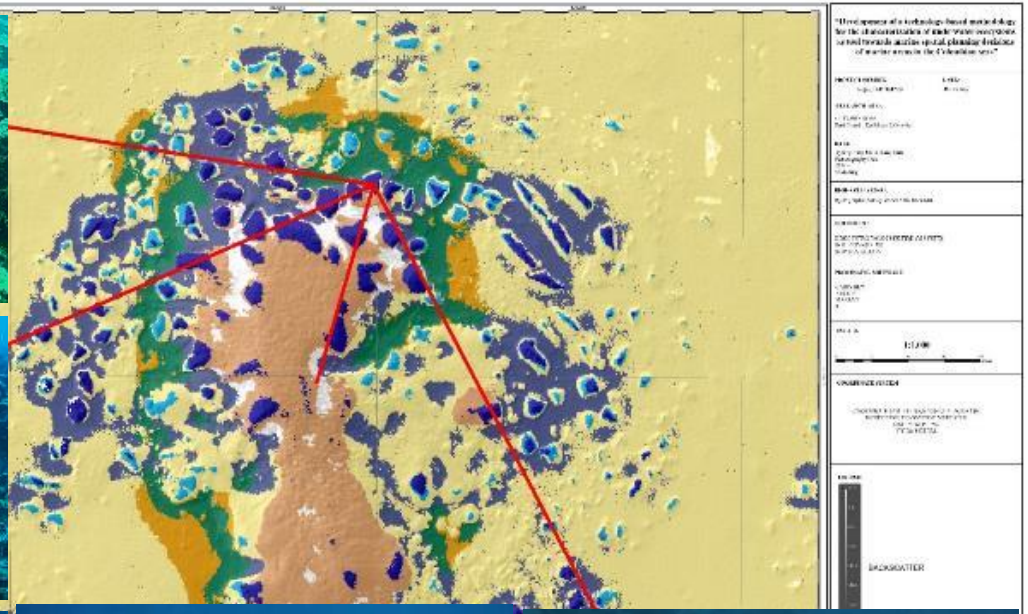

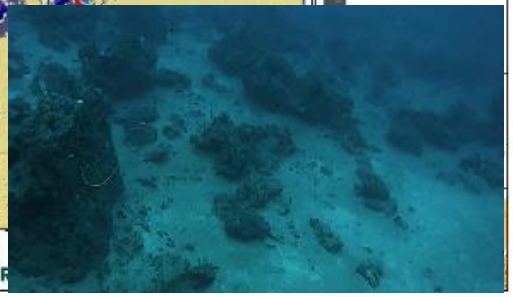

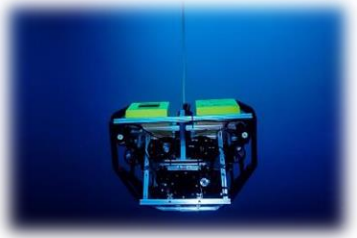

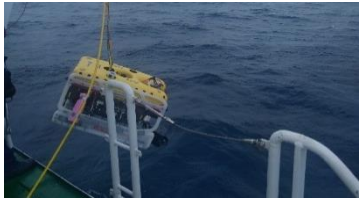

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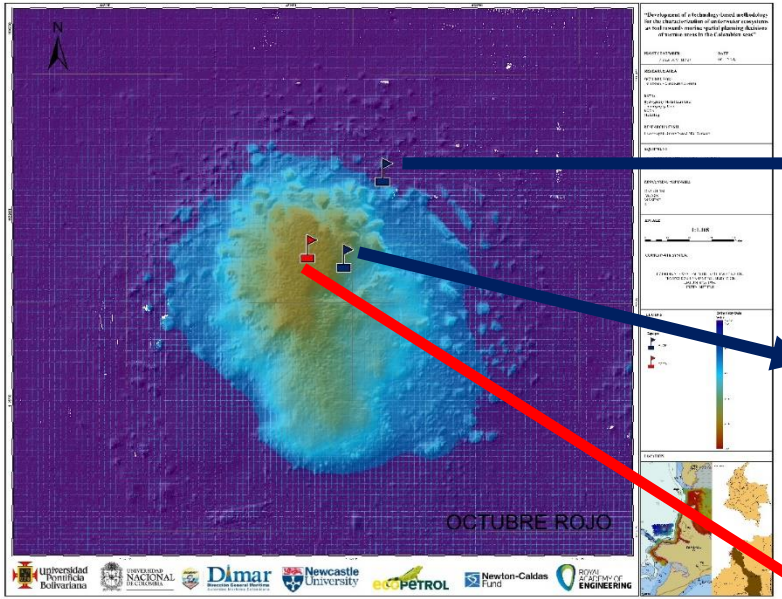
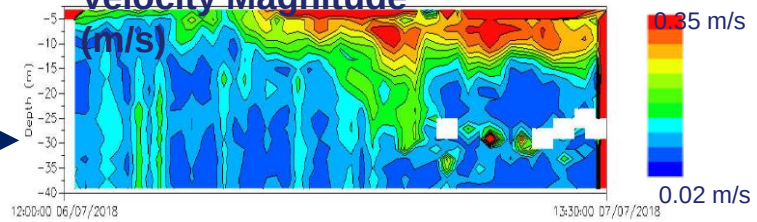
Collection of oceanographic data

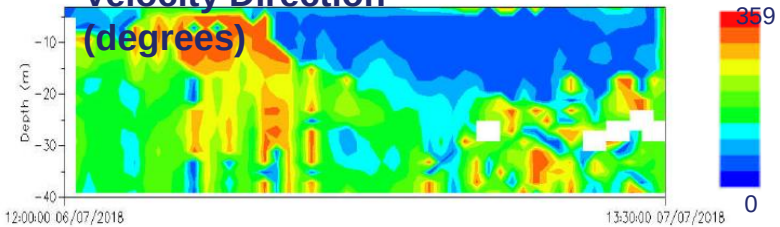


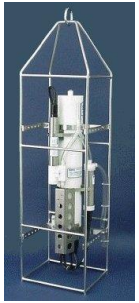
ADCP

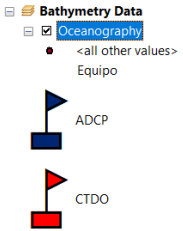
Velocity Magnitude (m/s)



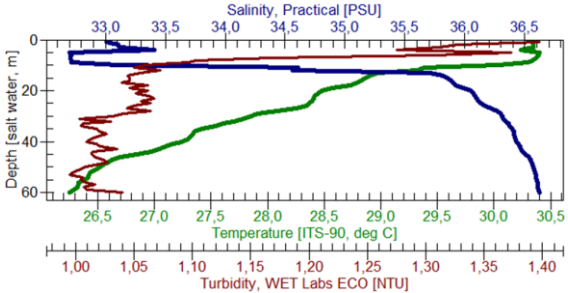
Velocity Direction (degrees)







Mediciones CTD– 60m
(entre Bajo Paula – Octubre Rojo)



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Defining habitat areas extension and integrating the information with diverse uses and impacts

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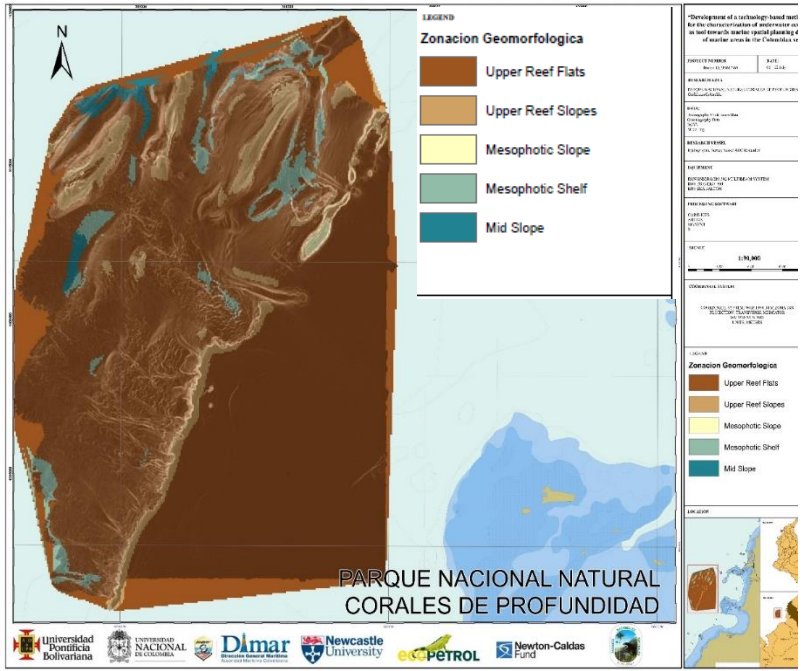
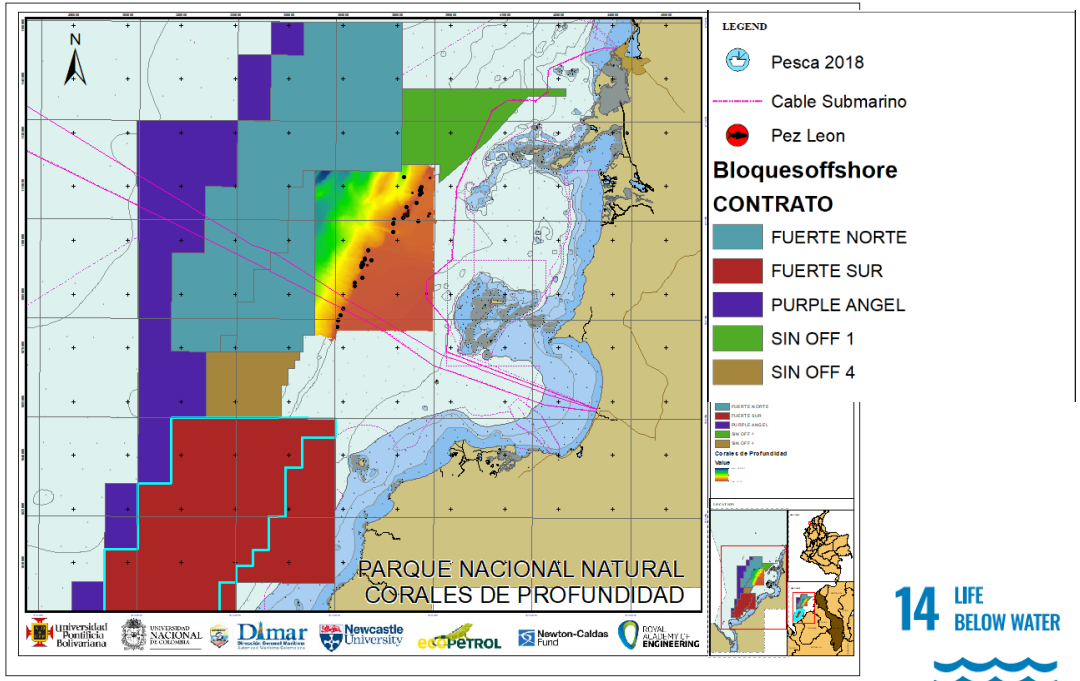
Corales de Profundidad National Park





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Stakeholders engagement activities and capacity building

Enhance the contribution of marine biodiversity

- Oil and gas companies
- Submarine cables
- Fisheries authorities (AUNAP)
- Tourism representants
- Environmental License Agency (ANLA)
- Ministry of Environment and Sustainable Development
- Ministry of Transport
- National Administrative Department of Statistics (DANE)

Satellite image processing applied to coastal zones and Insular areas management

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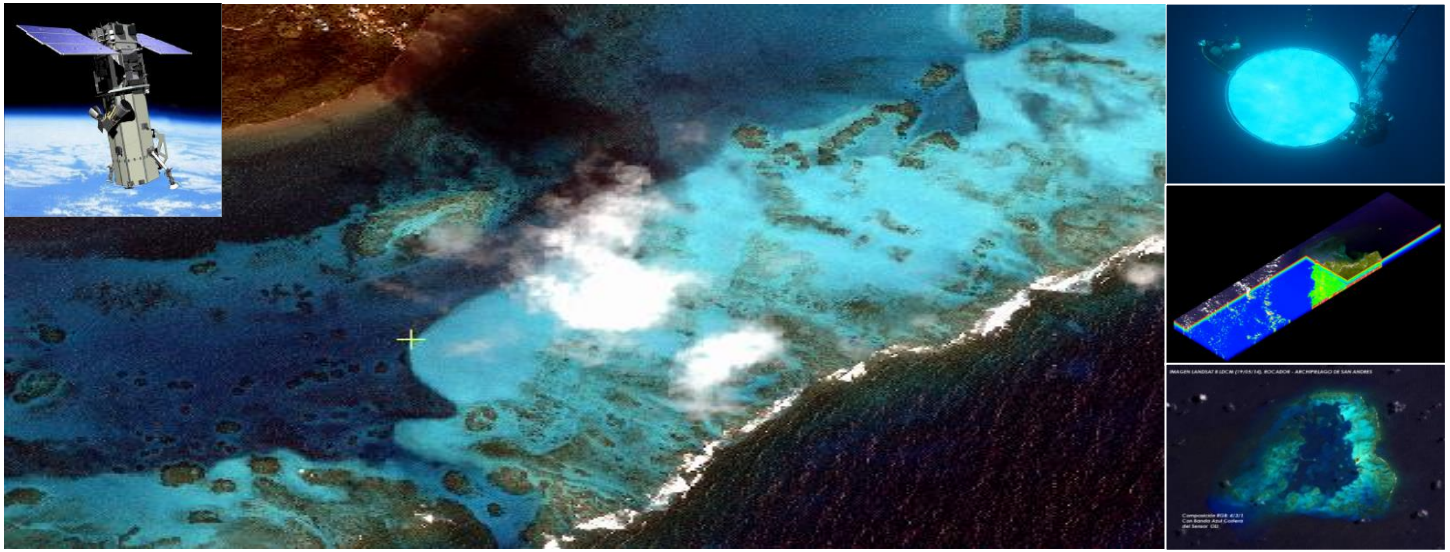
Seaflower Biosphere Reserve



Stakeholders

Universidad Pontificia Bolivariana

IGAC
INSTITUTO GEOGRÁFICO AGUSTÍN CODAZZI

Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

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Testing field measurements to analyse satellite images

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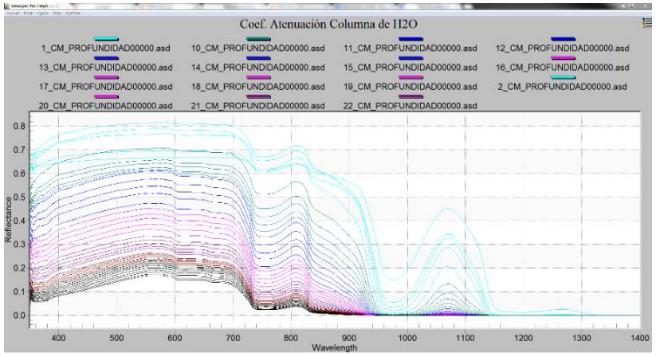
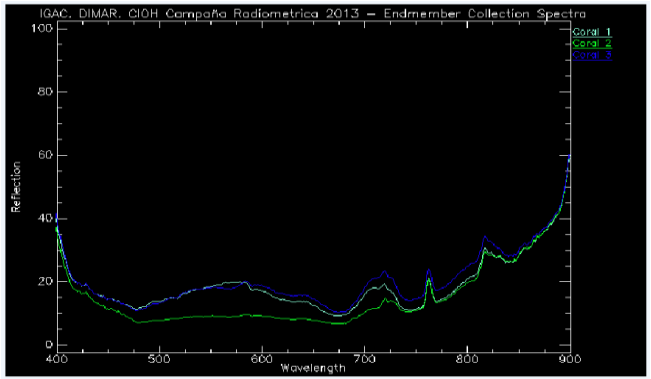
Attenuation coefficient (k) in the water column

Radiometric data collection in the water column for the Depth of Penetration Improving (DOP) areas



Wavelength spectral analysis



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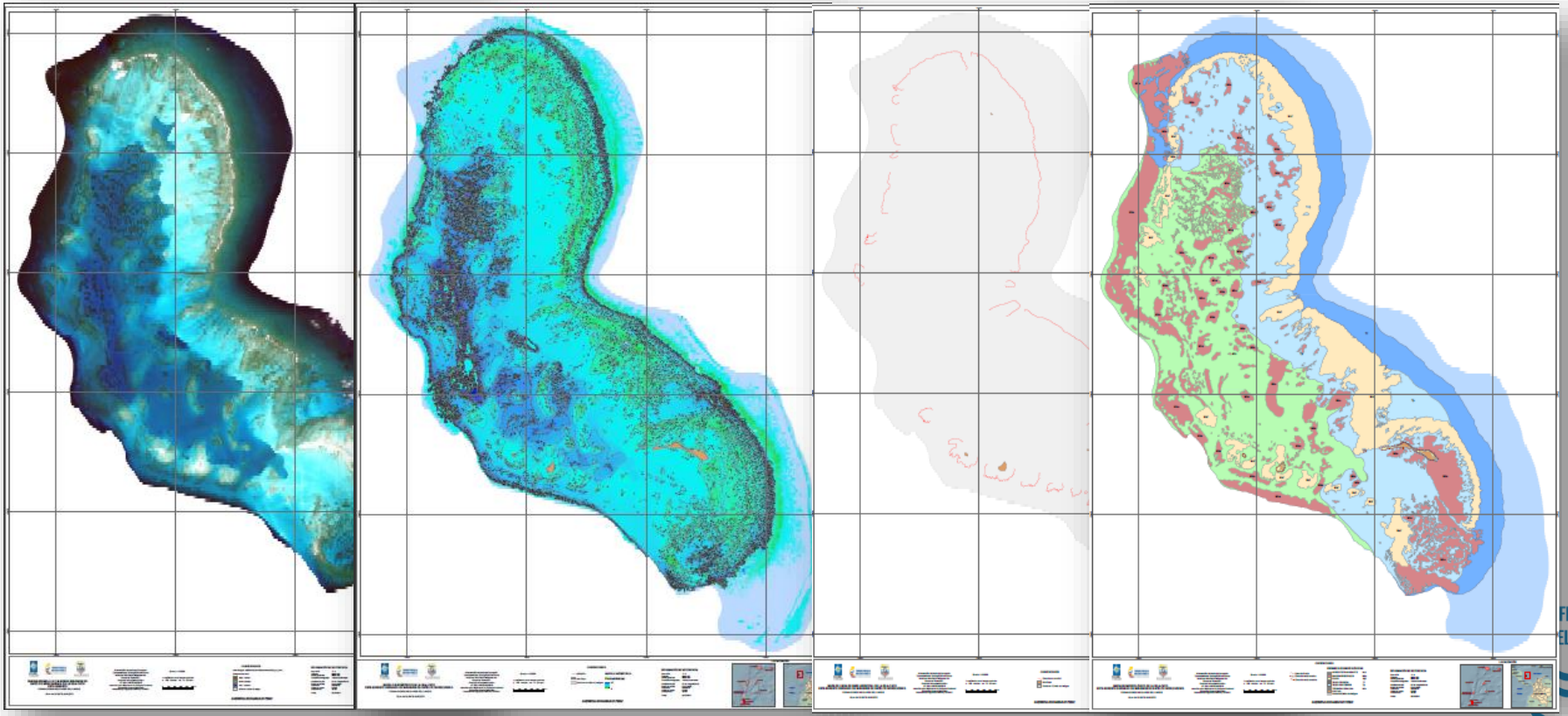
Generation of thematic geomorphological cartography from satellite images (world view 3)



Project: IAPP18-19\210 (2019-2021)

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Using remotely piloted aircraft systems as tools for coral reef monitoring, management, and stakeholders engagement

Stakeholders

Universidad Pontificia Bolivariana

Newcastle University

PARQUES NACIONALES NATURALES DE COLOMBIA

Dimar Dirección General Marítima Autoridad Marítima Colombiana

GEOMARES

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Engineering UK

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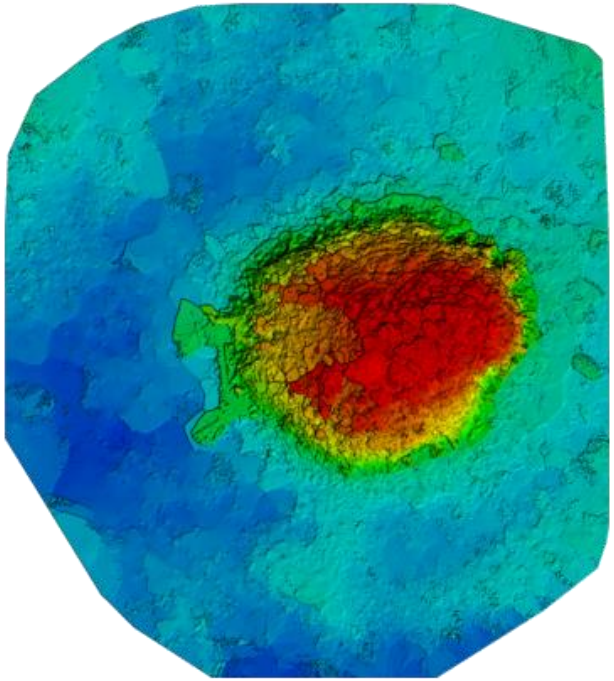
Bathymetric and Digital Elevation Model (DEM), generated from drone images



Crab Cay, Providencia: 559 images, 30000 m²

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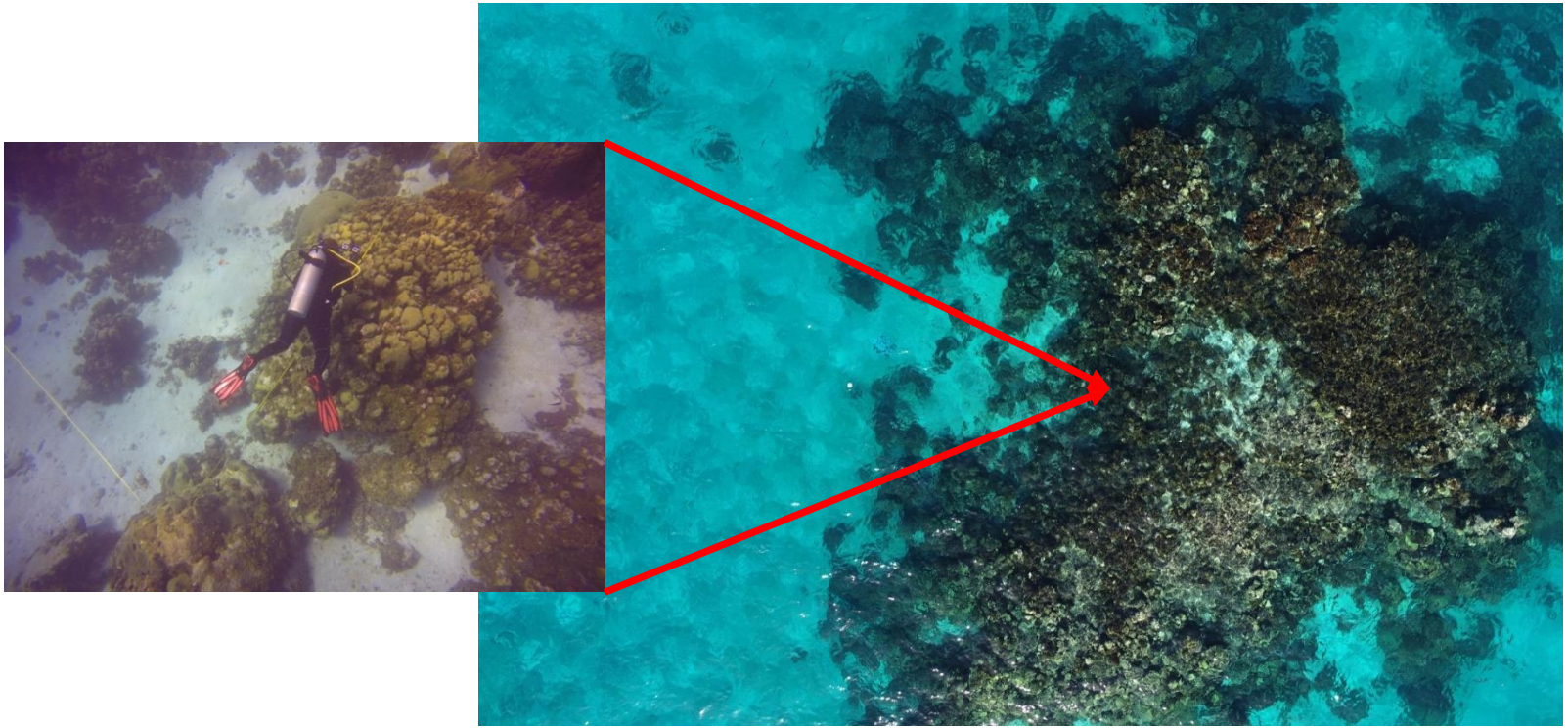
Drone flights mosaic and ground truthing: geo-referenced diving



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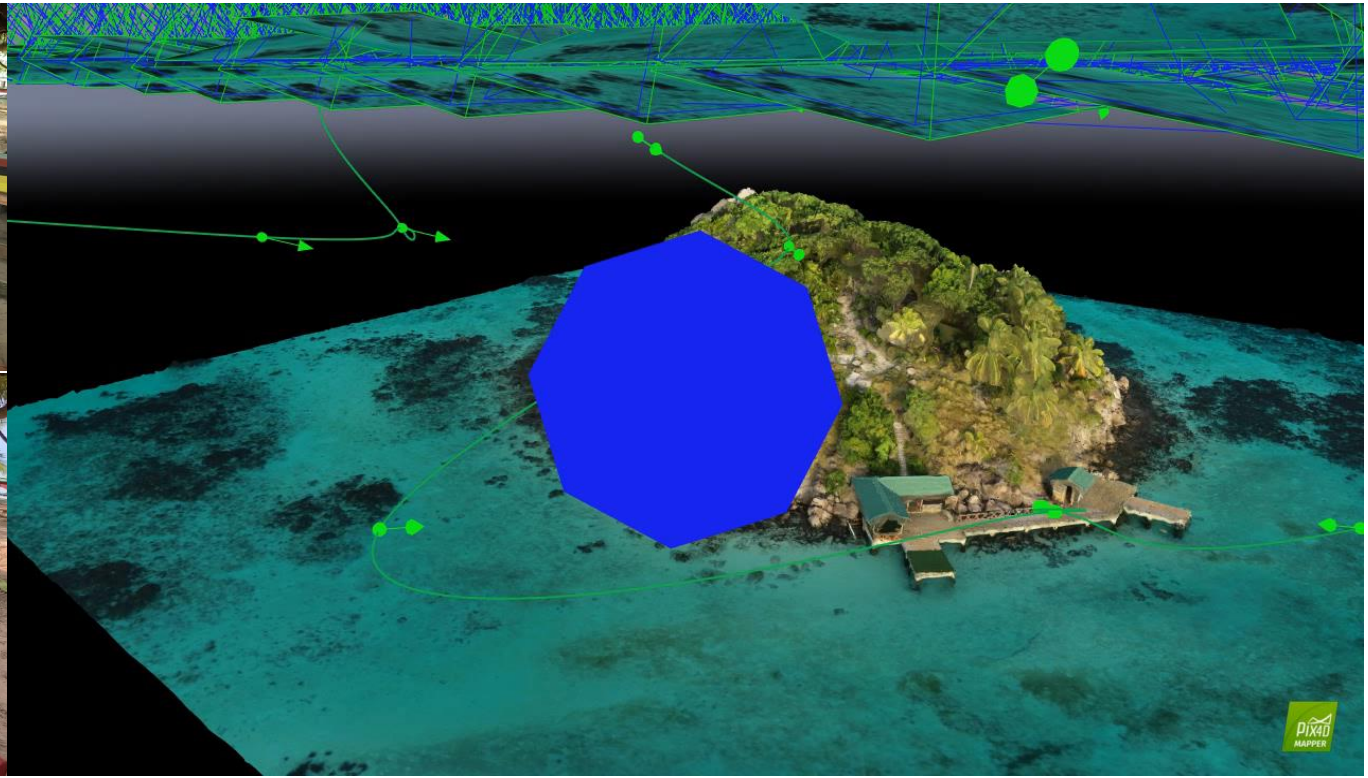
Empower communities through knowledge, education and communication



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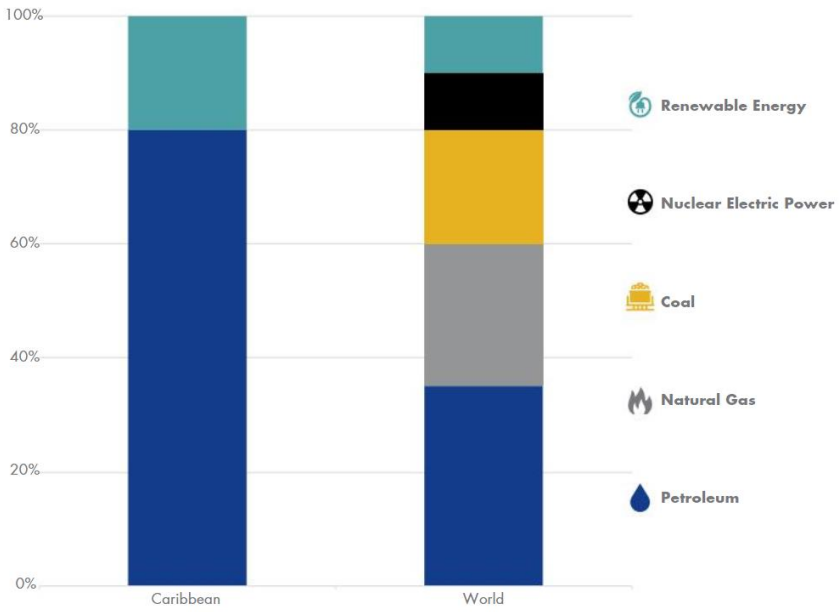
Outputs	Outcomes	Impacts
Data integration and simultaneous pressure analysis in order to avoid conflicts in the usage of resources	These methods evaluate several pressures exerted on the systems. Additionally, they assess the risk and the compensations within the management options, and verify if the decisions are working	Resources stability promotes employment and economic growth
Using the same indicators to measure ecosystem progress and to assess SDG.		Marine resource management and conservation planning based on EBM
Flexibility, since they can be used for the evaluation of different management processes		Stakeholder engagement, outreach activities and awareness
		Starting point for more directed, tailored investment and new capacity development strategies.

Strategies to fully develop the potential of the blue economy



Note: (1) Excludes T&T and Haiti; (2) Renewable energy includes hydro power, geothermal, solar/PV, wind, and biomass; (3) For the Caribbean, renewables include hydropower and biomass | Source: EIA; IDB; and IMF staff calculations (2016)

https://issuu.com/caribank/docs/financing_the_blue_economy-_a_carib

"Blue Growth is still in its early stages. Our responsibility today is to make sure that maritime economic development leads to a sustainable and competitive blue economy"

WWF, 2019

Blue Renewable Energies in Colombia

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Development in Colombia under the projects:

- **Identification of Knowledge Gaps in the Academia and Capacity Building for Aquatic Renewable Energy in Colombia**
- **Enhancing Aquatic Renewable Energy (ARE): Technology design and adaptation programme for Colombia**

SMART HYDRO POWER

EMEC ORKNEY

mates

Stakeholders

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ruta n MEDELLÍN CENTRO DE INNOVACIÓN Y NEGOCIOS

Universidad Cooperativa de Colombia

HERIOT WATT UNIVERSITY

aquatera environmental services and products

Newton Fund

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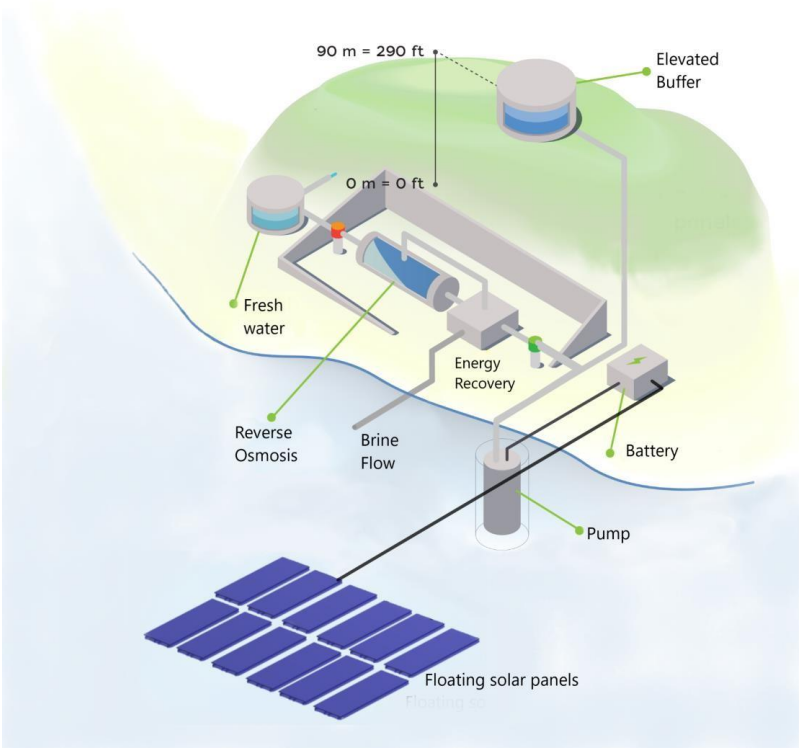
COTECMAR

SWEET- Sustainable Water by floating solar Energy powered Efficient reverse osmosis Treatment



Project aims

Design a large-scale desalination plant powered by marine solar energy

Development of commercial cases for attract investors

Collaboration with government institutions and local partners

Adoption of Deep Ocean Water Technologies and their Contribution to Sustainable Development in the Caribbean

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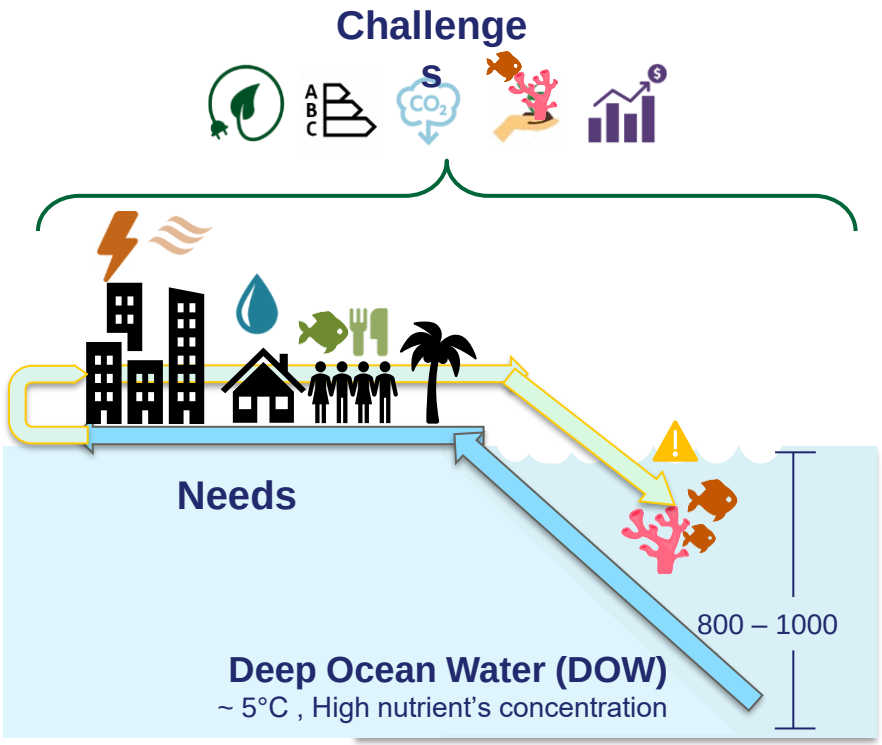

Most studies alternatives

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- Electricity (using also warm superficial water)
- Freshwater.
- Cold water for air conditioning.
- Greenhouses conditioning.
- Mariculture.
- Cosmetics.

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Final remarks

https://issuu.com/caribbank/docs/financing_the_blue_economy-_a_carib

Regional Needs

- High investments, compared to traditional technologies.
- Strong policy design.
- **Careful environmental analysis**