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Greater Caribbean 2023

IDENTIFICATION | PROTECTION | RESTORATION | MANAGEMENT

JUNE 28th-30th, PANAMA

Science and technology for sustainablebeaches in a climate change scenario

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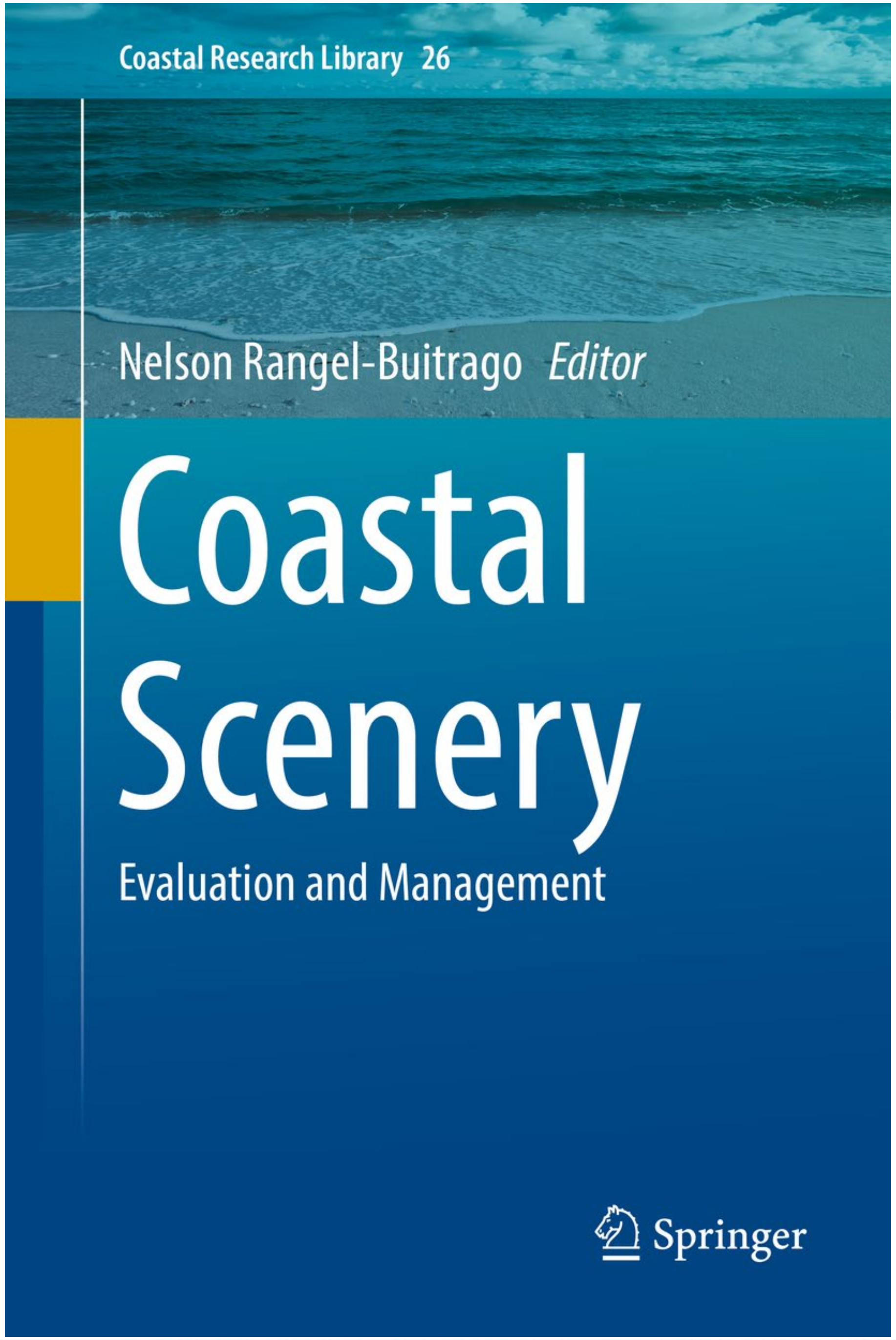
The Coastal Scenery Evaluation System (CSES) As A Tool for Integrated Coastal Management: The Caribbean Coast of Colombia as Study Case

NELSON RANGEL-BUITRAGO
Professor - Basic Sciences Faculty.
Universidad del Atlántico
AO: Ocean and Coastal Management Journal and Marine Pollution Bulletin
ELSEVIER

Universidad del Atlántico



Coastal Scenery

Evaluation and Management

Edited by Nelson Guillermo Rangel-Buitrago

Universidad del Atlántico

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Ocean and Coastal Management

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ELSEVIER

Can coastal scenery be managed? The Valparaíso region, Chile as a case study

Nelson Rangel-Buitrago[a,*], Manuel Contreras-López[b], Carolina Martínez[c], Allan Williams[d]

Ocean and Coastal Management 227 (2022) 106292

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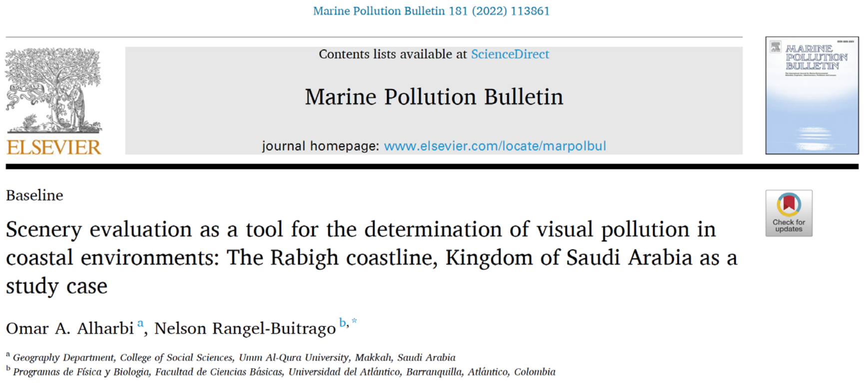
ELSEVIER

Not all that glitters is gold: Can the real scenic value of the Colombian Caribbean coast be restored?

Nelson Rangel-Buitrago[a,*], Allan T. Williams[b], Anton Micallef[c], William J. Neal[d], Orrin H. Pilkey[e]



Marine Pollution Bulletin 181 (2022) 113861

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ELSEVIER

Baseline

Scenery evaluation as a tool for the determination of visual pollution in coastal environments: The Rabigh coastline, Kingdom of Saudi Arabia as a study case

Omar A. Alharbi[a], Nelson Rangel-Buitrago[b,*]

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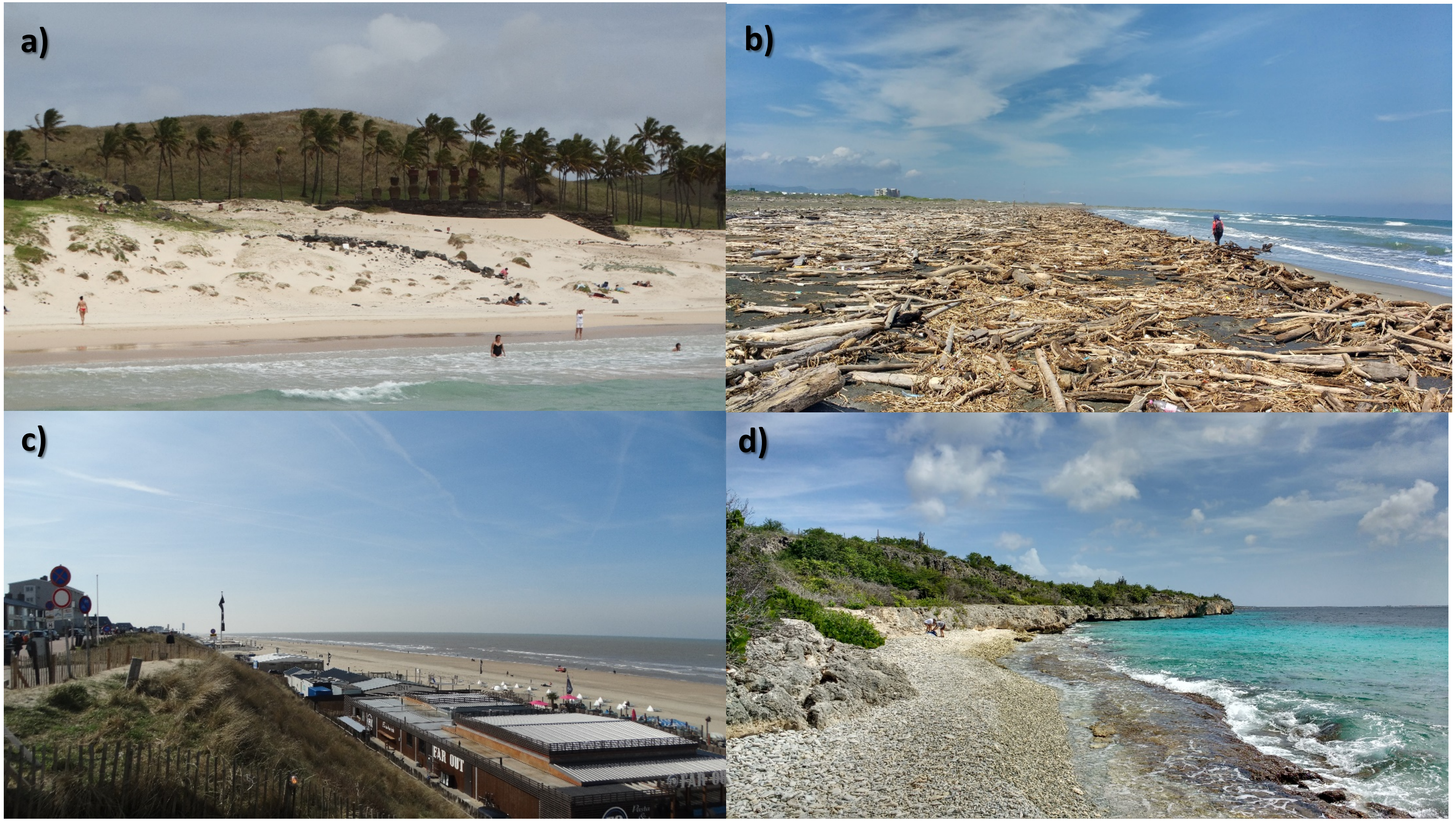
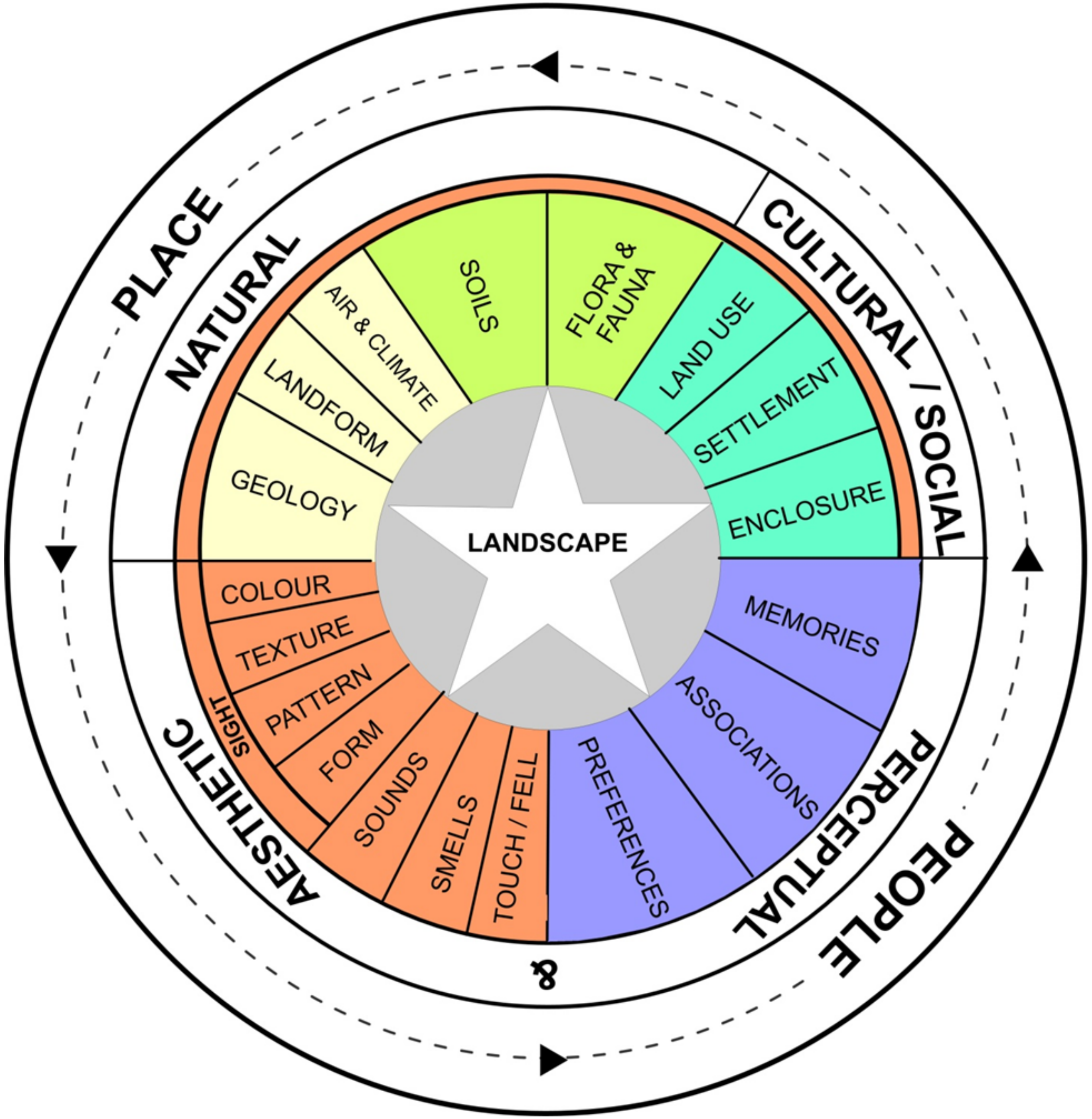
Which one?



LANDSCAPE

Coastal landscape can be defined as all the visible features of a coastal area, often considered in terms of their aesthetic appeal (Williams 2019).


PLACE
NATURAL
CULTURAL / SOCIAL
PERCEPTUAL
AESTHETIC
&
PEOPLE
SOILS
FLORA & FAUNA
AIR & CLIMATE
LANDFORM
GEOLOGY
LAND USE
SETTLEMENT
ENCLOSURE
LANDSCAPE
MEMORIES
ASSOCIATIONS
PREFERENCES
TOUCH / FELL
SMELLS
SOUNDS
SIGHT
FORM
PATTERN
TEXTURE
COLOUR

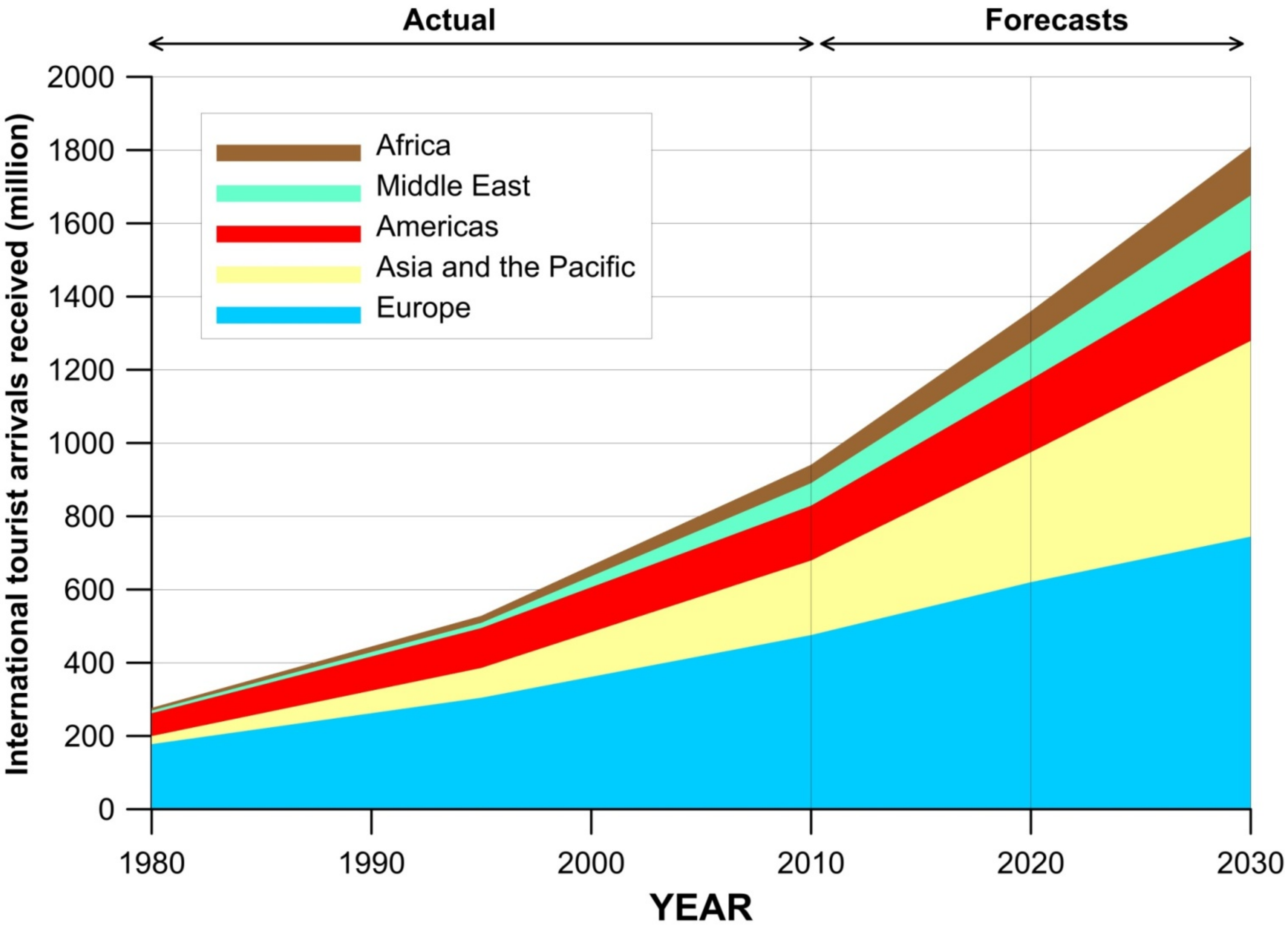
SCENERY

The general appearance of an area; the aggregate of features that give character to a landscape.

Coastal scenery is a **resource**, partly because of the economic value and partly because it is an accepted component of resource assessment programmes.

R Kaye & J Alder (***Coastal Planning and Management***', 1999)

Coastal Scenery is a visual expression of the coast and is a great resource which has not been analysed in detail on any scientific basis



Coastal Tourism, also known as **Sun**, **Sand**, **and Sea tourism (3S)** is based on a very particular resource conjunction along the interface between land and sea. This kind of activity offers amenities, such as, good weather conditions, water, beaches, scenic beauty, biodiversity, cultural and historical heritage, healthy food, and **under optimal conditions** an **adequate infrastructure.**

Currently, tourism is one of the seven largest business sectors of the world economy (EEA 2006; UNTWO 2016). Their Gross Domestic Product contribution ranges from 2% for small scale tourism countries where tourism weighting can be significant, to more than 10% in countries where tourism is well developed (Briguglio 1995; Honey and Krants 2007). The industry generates one in twelve jobs globally, and between 35 - 40% of the world's export services (UNTWO 2016). Since 1990, international tourism receipts have grown by 365%, moving from 271 to 1,260 Billion US$ (UNTWO 2016).

Coastal Scenery Evaluation System (CSES)



18 Physical → Geomorphology

P (physical) = { P1, P2, P3… P18 }

8 Anthropogenic → Human Occupation

H (human utilization) = { H1, H2, H3…H8 }



Coastal Scenery Evaluation System (CSES)

No	Rating						
	Physical parameters		1	2	3	4	5
1	Cliff	Height	Absent	> 5– < 30 m	3– < 60 m	61–90 m	> 90 m
2		Slope (°)	45°–55°	55–65°	65–75°	75–85°	Circa vertical
3		Special features*	Absent	1	2	3	Many > 3
4	Beach Face	Type	Absent	Mud	Cobble/boulder	Pebble/Gravel (± sand)	Sand
5		Width	Absent	< 5– > 100 m	5– < 25 m	25– < 50 m	50–100 m
6	Rocky Shore	Colour	Absent	Dark	Dark Tan	Light Tan/Bleached	White/Gold
7		Slope	Absent	< 5°	5–10°	10–20°	20–45°
8		Extent	Absent	< 5 m	5–10 m	10–20 m	> 20 m
9		Roughness	Absent	Distincly jagged	Deeply pitted and/or irregular (uneven)	Shallow pitted	Smooth
10	Dunes		Absent	Remnants	Fore-dune	Secondary ridge	Several
11	Valley		Absent	Dry valley	(< 1 m) Stream	(1–4 m) Stream	River/Limestone Gorge
12	Skyline landform		Not Visible	Flat	Undulating	Highly undulating	Mountainous
13	Tides		Macro (> 4 m)		Meso (2–4 m)		Micro (< 2 m)
14	Coastal landscape features**		None	1	2	3	> 3
15	Vistas		Open on one side	Open on two sides		Open on three sides	Open on four sides
16	Water colour and clarity		Muddy Brown/Grey	Milky Blue/Gren; Opaque	Gren/Grey Blue	Clear Blue/Dark Blue	Very clear Turquoise
17	Natural vegetation cover		Bare (< 10% Vegetation only)	Scrub/Garigue/Grass (marram/gorse/ferns/ bramble/meadow etc)	Bushes, Coppices, Maquis	Wetlands ± mature trees	Variety of mature trees/Forest-a 'Patcwork Quilty'
18	Vegetation debris		Continuous > 50cm High	Full strand line	Single accumulation	Few scattered items	None
	Human parameters						
19	Noise disturbance		Intolerable	Tolerable		Little	None
20	Litter		Continuous accumulations	Full strand line	Single accumulation	Few scatterd items	Virtualy absent
21	Sewage discharge evidence		Sewage Evidence		Some Evidence (1–3 items)		No evidence of sewage
22	Agriculture***		None, bare (> 10% Vegetation) greenhouses	Field crops (Wheat, Corn, etc) Hedgerows Monoculture	Vineyards, Terracing, Tea, etc.	Shrub type Plants-Date Palm, Pineapples etc.	Orchards-Apples, Cherries etc.
23	Built environment****		Heavy industry	Heavy tourism and/or urban	Light tourism and/or urban and/or sensitive industry	Sensitive tourism and/or urban	Historic and/or none
24	Acces type		No Buffer Zone/Heavy Traffic	No buffer zone/light traffic		Parking lot visible from coastal area	Parking lot not visible from coastal area
25	Skyline		Very unattractive	Unattractive	Sensitively designed high/low	Very sensitively designed	Natural/historic features
26	Utilities*****		> 3	3	2	1	None

*Cliff Special Features: indentation, banding, folding, scree, irregular profile, etc.
**Coastal Landscape Features: Peninsulas, rock ridges, irregular headlands, arches, windows, caves, waterfalls, deltas, lagoons, islands, stacks, estuaries, reefs, fauna, embayment, tombolo, etc.
***Agriculture: where No agriculture can be seen and the Natural Vegetation Cover parameter has scored a 5, then the 5 box should be ticked in this line. If the Natural Vegetation Cover box ticked was a 2, 3, 4 then tick the 3 bo here.
***Built Environment: caravans will come under Tourism, Grading 2: Large intensive caravan site, Grading 3: Light, but still intensive caravan sites, Grading 4: Sensitively designed caravan sites.
****Utilities: power lines, pipelines, street lamps, groynes, seawalls, revetments, etc.

Class	D Values	Main Features of the Coastal Sites
I	D ≥ 0.85	**Top natural**: extremely attractive sites with very high landscape value.
II	0.85 > D ≥ 0.65	**Natural**: attractive sites with high landscape value.
III	0.65 > D ≥ 0.40	**Natural - Urban**: average sites with medium landscape value (with some exceptions of urban sites with exceptional scenic characteristics – well designed).
IV	0.40 > D ≥ 0.00	**Mainly urban**: poor sites with medium landscape value and light development.
V	D < 0.00	**Urban**: poor sites with low landscape value and intensive development.

TERMOELECTRICA

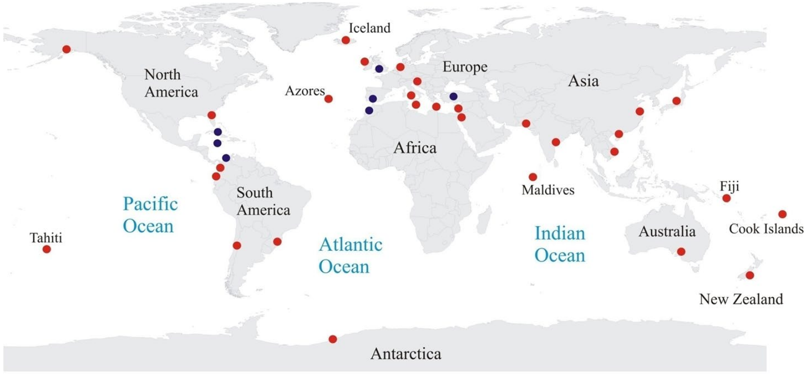
Assessment Matrices

No;	Assessment Parameters – Physical		Graded Attributes	Weights Of Parameters	Input Matrices d_i					Grade Matrices G_i – Attributes (1-5): 1	2	3	4	5	Fuzzy Weighted Assessment Matrix R_m – Attributes (1-5): 1	2	3	4	5
1	Cliff Height	(1-1)	1	0,02	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,019	0,000	0,000	0,000	0,000
2	Cliff Slope	(1-2)	1	0,02	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,017	0,000	0,000	0,000	0,000
3	Special Features	(1-3)	1	0,03	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,028	0,000	0,000	0,000	0,000
4	Beach Type	(2-1)	5	0,03	0	0	0	0	1	0,00	0,00	0,00	0,00	1,00	0,000	0,000	0,000	0,000	0,034
5	Beach Width	(2-2)	3	0,03	0	0	1	0	0	0,00	0,20	1,00	0,20	0,00	0,000	0,006	0,029	0,006	0,000
6	Beach Color	(2-3)	3	0,02	0	0	1	0	0	0,00	0,00	1,00	0,60	0,00	0,000	0,000	0,024	0,014	0,000
7	Shore Slope	(3-1)	1	0,01	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,014	0,000	0,000	0,000	0,000
8	Shore Extent	(3-2)	1	0,01	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,015	0,000	0,000	0,000	0,000
9	Shore roughness	(3-3)	1	0,02	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,022	0,000	0,000	0,000	0,000
10	Dunes	(4)	3	0,04	0	0	1	0	0	0,00	0,00	1,00	0,00	0,00	0,000	0,000	0,039	0,000	0,000
11	Valley	(5)	1	0,08	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,079	0,000	0,000	0,000	0,000
12	Landform	(6)	3	0,08	0	0	1	0	0	0,00	0,60	1,00	0,60	0,00	0,000	0,051	0,085	0,051	0,000
13	Tides	(7)	5	0,04	0	0	0	0	1	0,00	0,00	0,00	0,00	1,00	0,000	0,000	0,000	0,000	0,036
14	Landscape Features	(8)	1	0,12	1	0	0	0	0	1,00	0,20	0,00	0,00	0,00	0,121	0,024	0,000	0,000	0,000
15	Vistas	(9)	4	0,09	0	0	0	1	0	0,00	0,00	0,00	1,00	0,30	0,000	0,000	0,000	0,095	0,029
16	Water Color	(10)	3	0,14	0	0	1	0	0	0,00	0,50	1,00	0,50	0,00	0,000	0,070	0,140	0,070	0,000
17	Vegetation Cover	(11)	3	0,12	0	0	1	0	0	0,00	0,20	1,00	0,20	0,00	0,000	0,023	0,117	0,023	0,000
18	Seaweed	(12)	3	0,09	0	0	1	0	0	0,00	0,00	1,00	0,20	0,00	0,000	0,000	0,086	0,017	0,000
	FUZZY WEIGHTED AVERAGES MATRIX FOR SUBSET PHYSICAL V_P														0,316	0,174	0,519	0,277	0,098
	Human																		
19	Disturbance Factor	(1)	4	0,14	0	0	0	1	0	0,00	0,20	0,00	1,00	0,20	0,000	0,027	0,000	0,137	0,027
20	Litter	(2)	4	0,15	0	0	0	1	0	0,00	0,00	0,20	1,00	0,20	0,000	0,000	0,030	0,149	0,030
21	Sewage	(3)	5	0,15	0	0	0	0	1	0,00	0,00	0,20	0,00	1,00	0,000	0,000	0,030	0,000	0,149
22	Non-built Environment	(4)	1	0,06	1	0	0	0	0	1,00	0,00	0,20	0,00	0,00	0,064	0,000	0,013	0,000	0,000
23	Built Environment	(5)	1	0,14	1	0	0	0	0	1,00	0,00	0,00	0,00	0,00	0,137	0,000	0,000	0,000	0,000
24	Access Type	(6)	5	0,09	0	0	0	0	1	0,00	0,00	0,00	0,20	1,00	0,000	0,000	0,000	0,018	0,091
25	Skyline	(7)	2	0,14	0	1	0	0	0	0,40	1,00	0,20	0,00	0,00	0,055	0,137	0,027	0,000	0,000
26	Utilities	(8)	3	0,14	0	0	1	0	0	0,00	0,20	1,00	0,00	0,00	0,000	0,027	0,137	0,000	0,000
	FUZZY WEIGHTED AVERAGES MATRIX FOR SUBSET HUMAN V_H														0,255	0,191	0,236	0,305	0,297

Fuzzy Weighted Averages Matrix

Elements of Fuzzy Weighted Averages Matrix	Weights Of Subsets W_F		Attributes (1-5): 1	2	3	4	5
Fuzzy Weighted Averages Matrix of Subset Physical V_P	1/2	Matrix K	0,316	0,174	0,519	0,277	0,098
Fuzzy Weighted Averages Matrix of Subset Human V_H	1/2	Matrix K	0,255	0,191	0,236	0,305	0,297
Final Fuzzy Assessment Matrix (W_F x K)							
Final Assessment Matrix (C)			0,286	0,183	0,378	0,291	0,198

FINAL D VALUE FOR TERMOELECTRICA 0,07



● Distribution of assessed sites: Antarctica, Australia, Brasil, Chile, China, China - Hong Kong, Cook Islands, Croatia, Cyprus, Ecuador, Egypt, Fiji, Iceland, India, Ireland, Italy, Italy - Eolian Islands, Japan, Jordan, Maldives, Malta, New Zealand, Pakistan, Peru, Poland, Portugal, Portugal- Azores, Tahiti, United Kingdom, Florida (USA) and Vietnam

● Large covered areas: Bonaire, Caribbean Colombia, Cuba, Andalusia (Spain), Mediterranean Morocco, Mediterranean Turkey and Wales

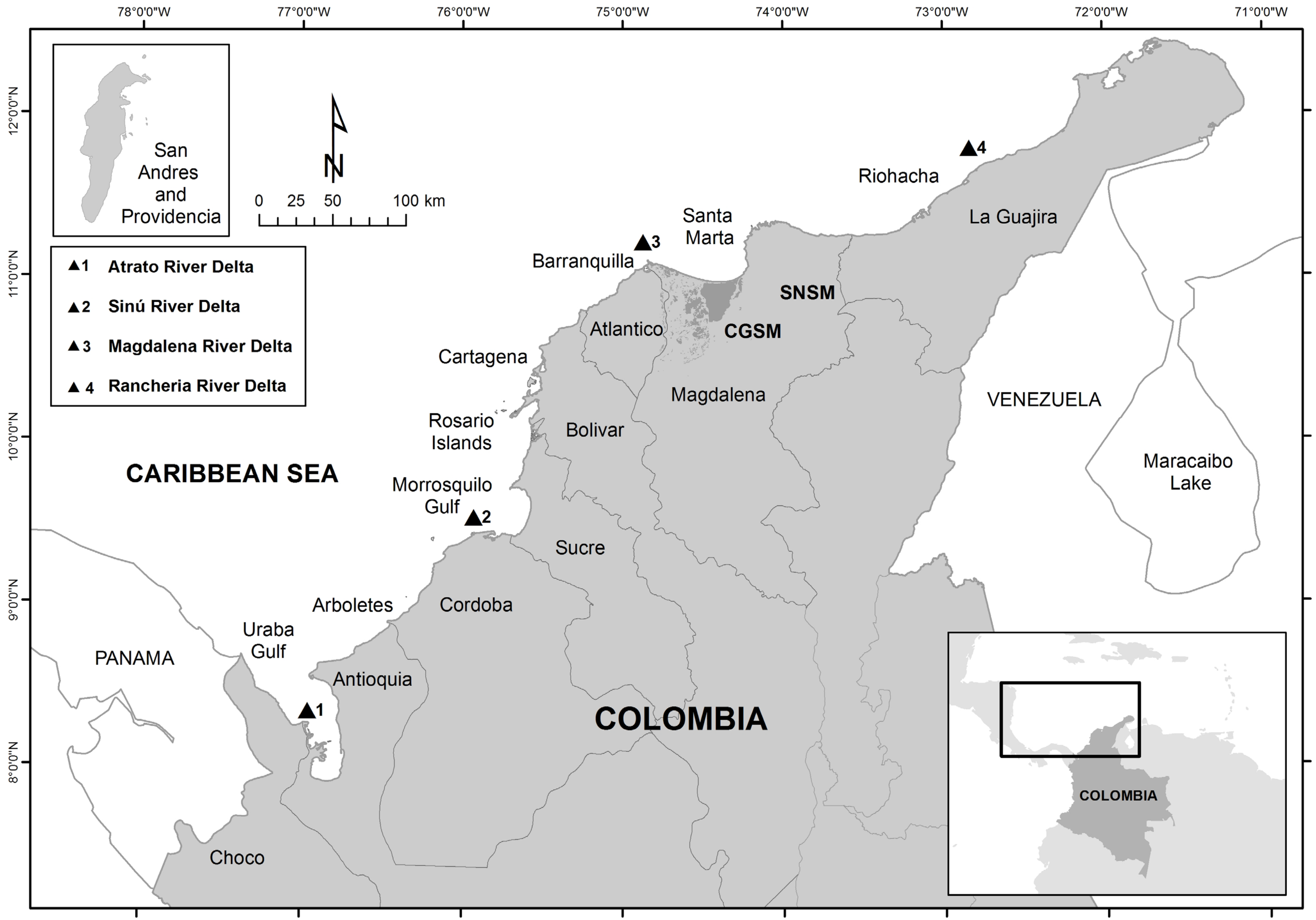

c)

b)

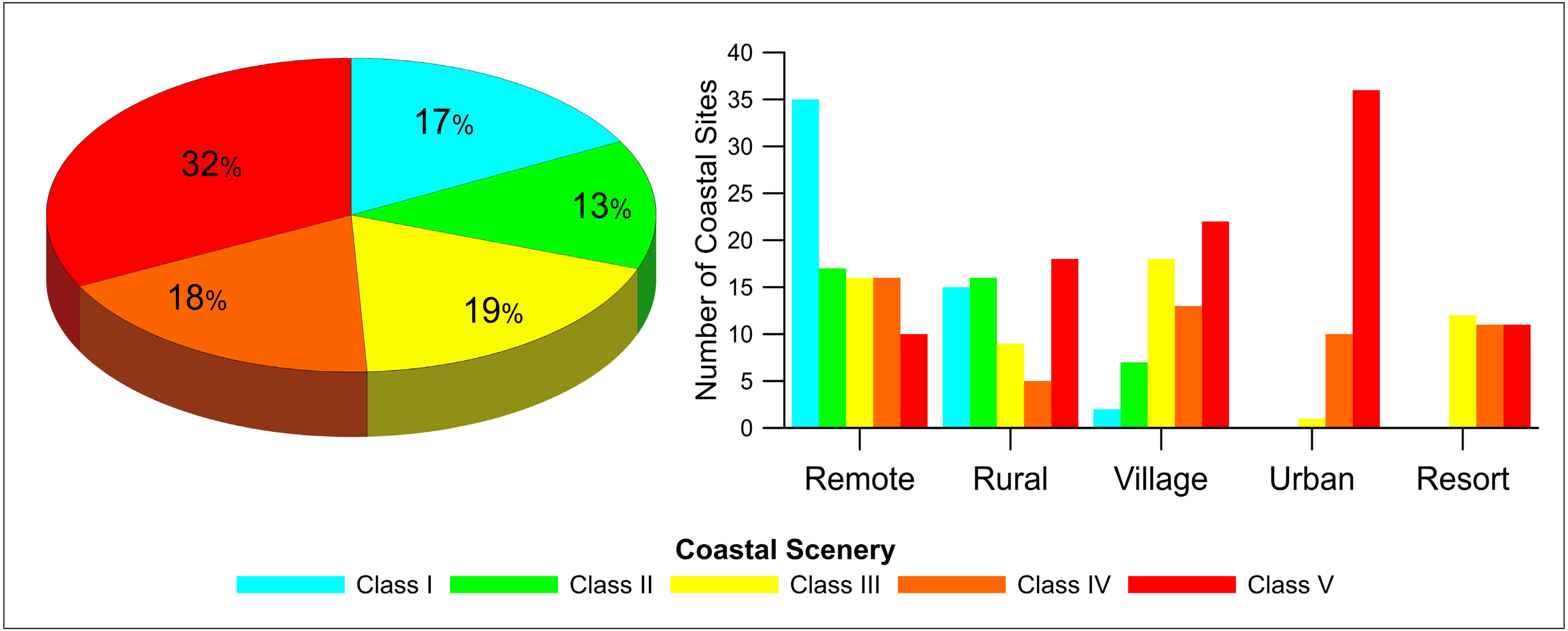
b)

b)


The Caribbean Coast of Colombia



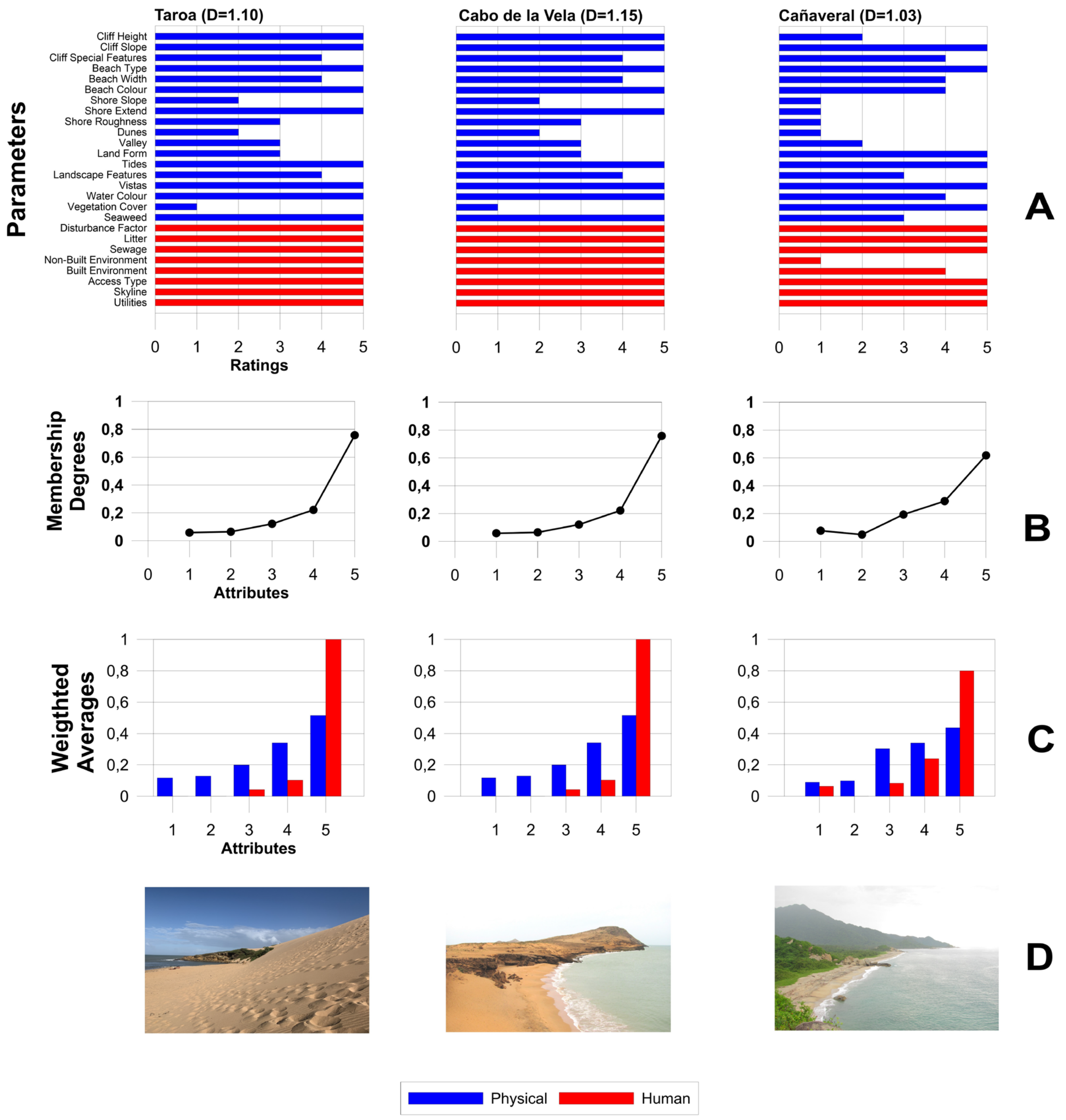
The Caribbean Coast of Colombia



Three hundred coastal sites were categorized in the Caribbean coast of Colombia with the scenic evaluation sites organized into five classes. 52 sites (17.3%) appeared in Class I; 40 (13.3%) in Class II; 56 (18.7%) in Class III; 55 (18.3%) in Class IV and 97 sites (32.3%) in Class V.

Class I: Fifty-two remote, rural, and village coastal sites (out of 300) were categorized into Class I. Twenty-eight are in La Guajira, nineteen in Magdalena, and the remaining five in Choco and Providencia. This class encompasses stunning scenic natural sites with high landscape values (D>0.85). The high scores reached result from unique physical features with a minimal - almost null- human influence.

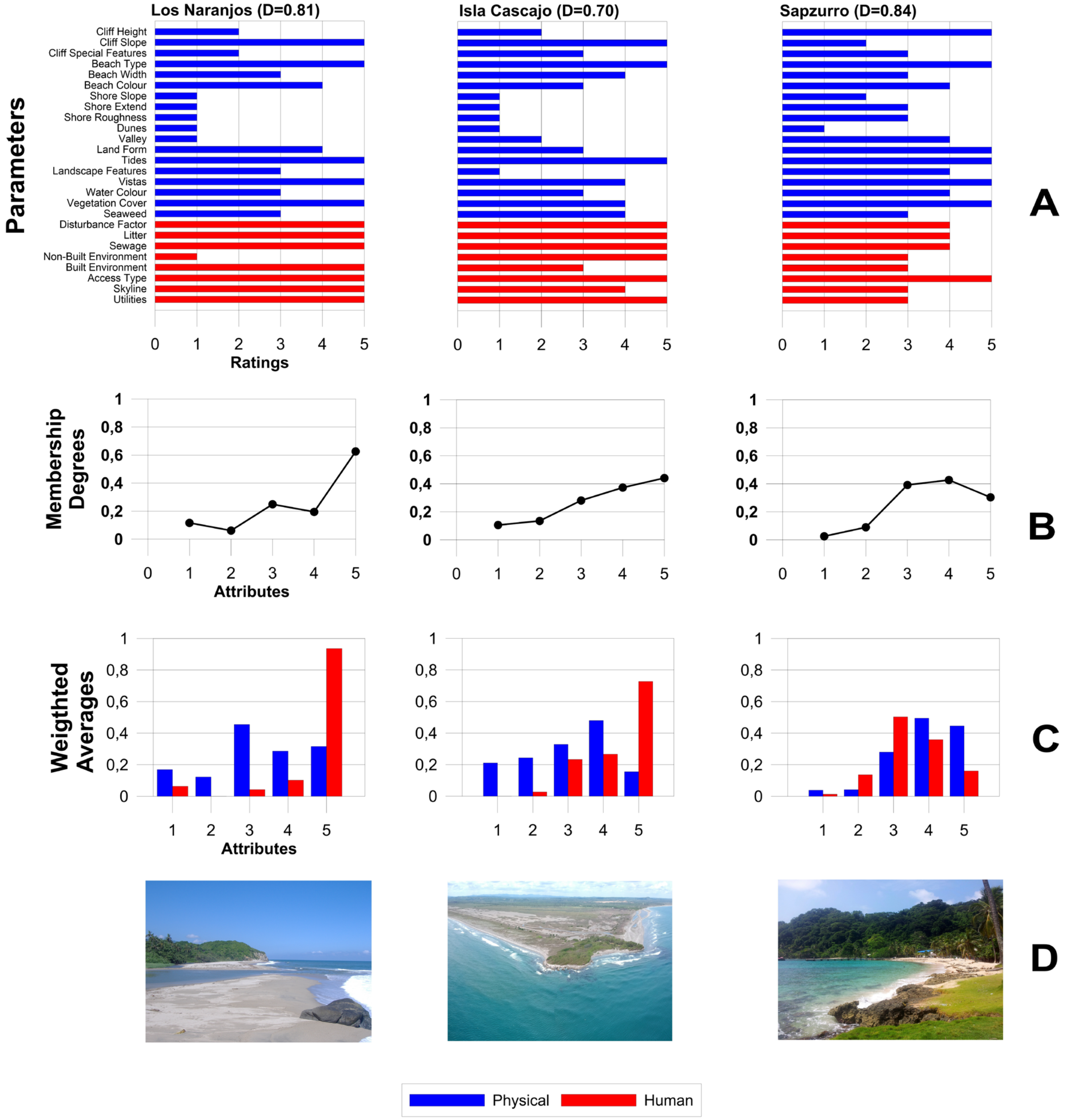
Unique geologic settings and distinctive geomorphologic characteristics of sites within this class are essential. Parameters such as "cliffs" and "rocky shore" are linked to the presence of high rocky coasts and mountainous landscapes. In contrast, in low shores, the dominant parameters are "dunes" and "watercolor”.



Class II: are areas with D values 0.85 > D > 0.65 usually including natural or semi-natural remote/rural/village sites with a high scenic values and low human impact (e.g, an acceptable level of human activities/well-designed structures).

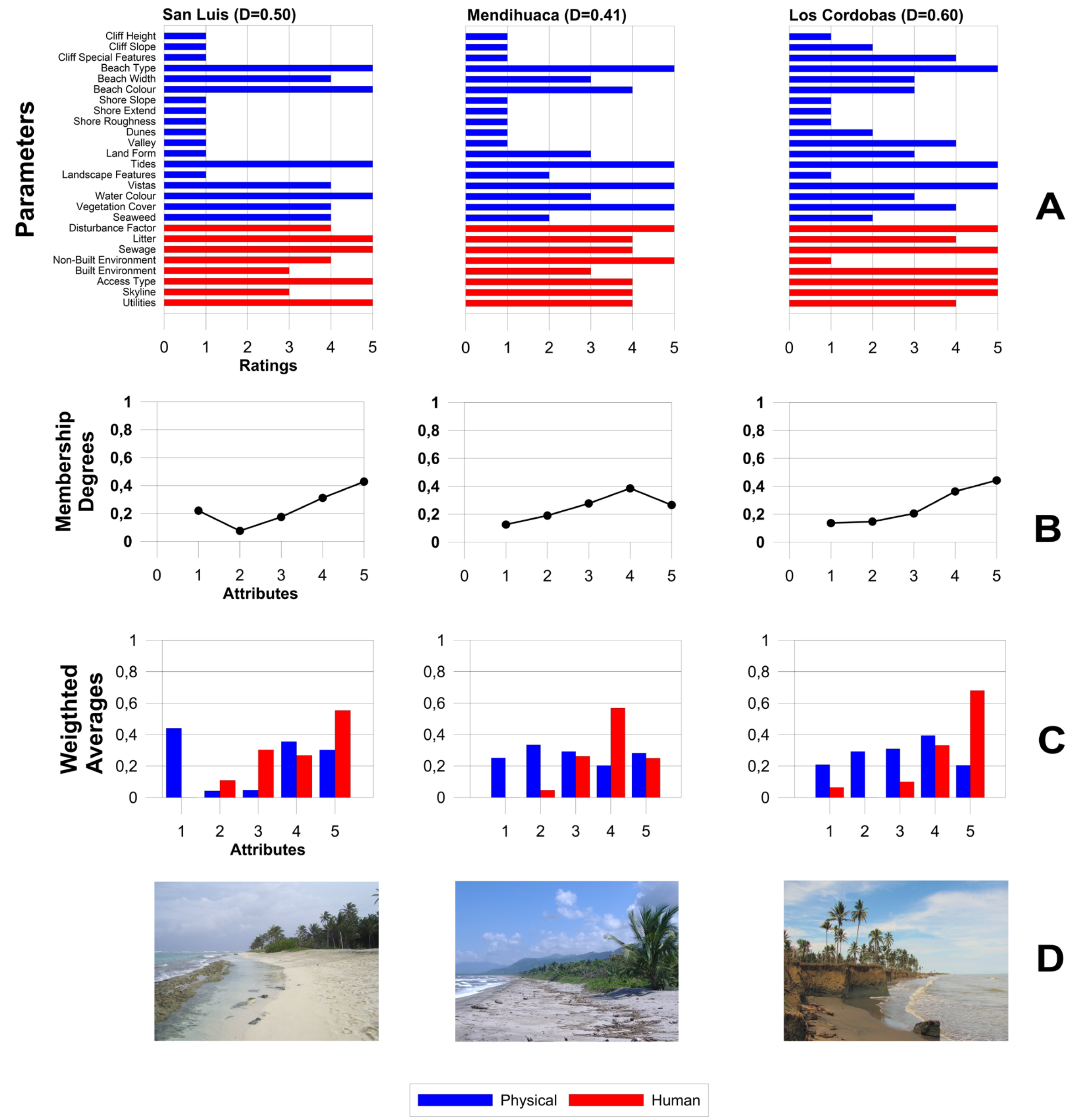
Forty of 300 surveyed coastal sites (13.3%) were classified within this category. These sites can be found in remote (17), rural (16), and village (7) locations and are distributed in eight of the nine departments that compose the coastline. (The Atlantico department does not have any Class II sites). As in Class I sites, many of these sites are under conservation status, but these sites rate lower than Class I due to lower scores in parameters, such as, "landscape features" or "natural vegetation cover." Class II sites have high scores concerning water and sediment parameters and good scores linked to natural settings with a minimum human influence.

Twelve Class II sites are under a conservation status (National Natural Park). Specifically, these 12 sites are located inside Bahia Portete, Tayrona, Acandi and Old Providence McBean Lagoon Natural National Parks.



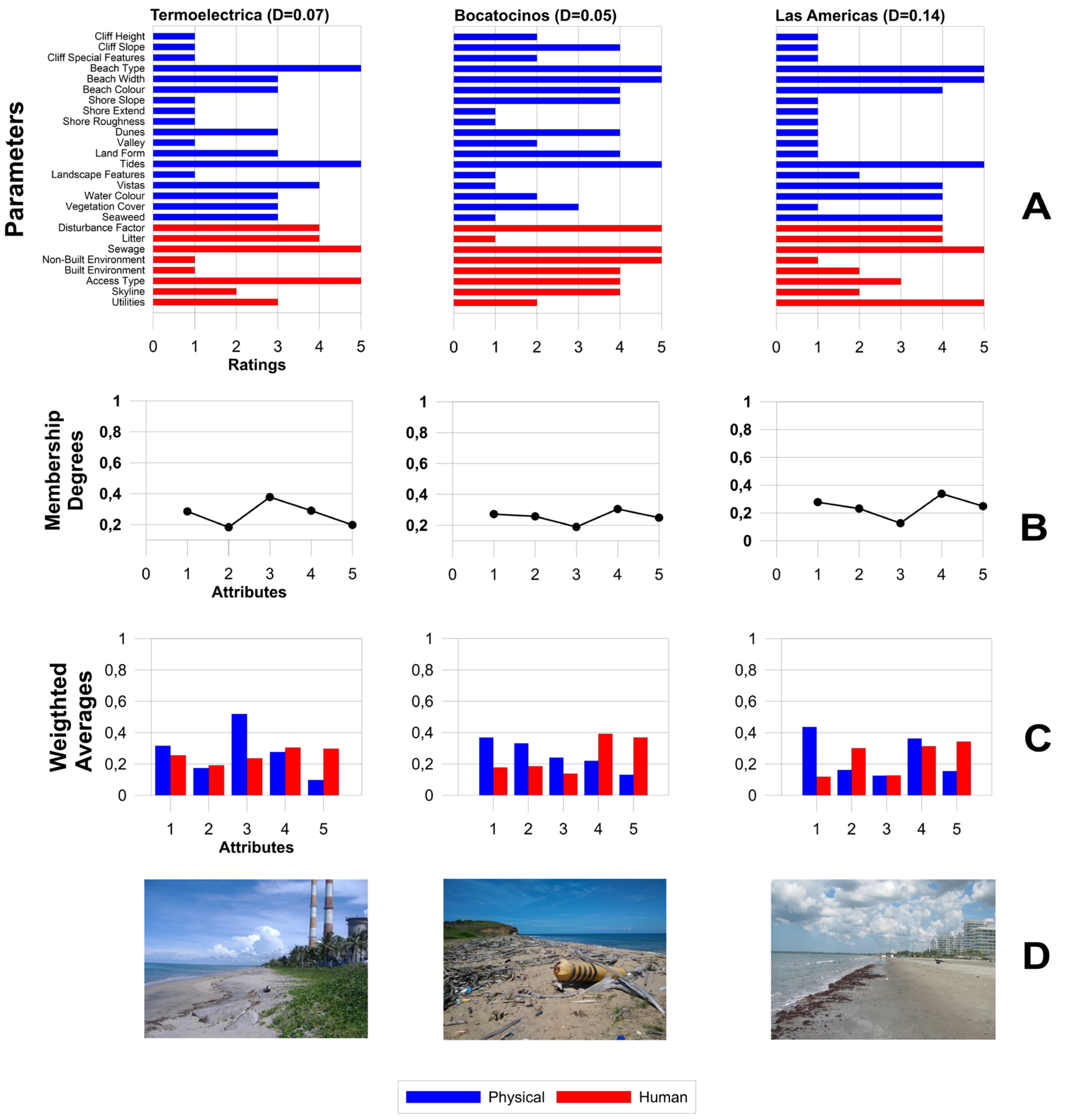
Class III: are sites with D values that range between >0.40 and <0.64. Along the coast, 56 of 300 sites reach this class (18.7%). These are distributed in village (18 locations), remote (16), resort (12), rural (9), and urban (1) locations.

These areas show a scenario commonly affected by no buffer zones and features, such as non-attractive/poorly designed buildings, noise, and litter. Weighted average and membership degree graphs show optimal scores at high attribute values. This means positive impacts of the physical/human parameters and average values at lower attribute values, highlighting an adverse effect of physical/human parameters, particularly low scenic characteristics.



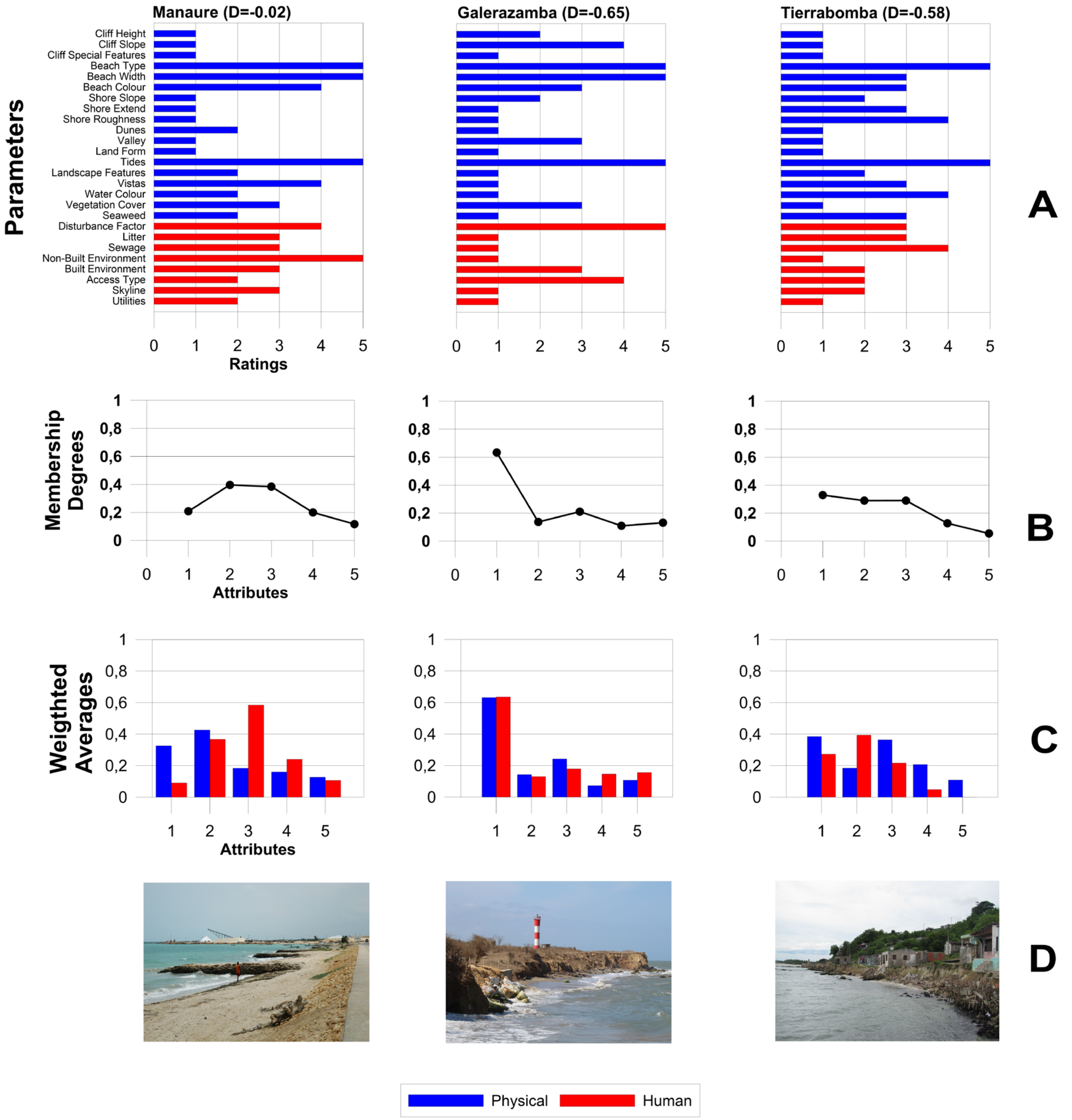
Class IV: encompasses sites with 0<D<0.4 values and corresponds to coastal areas with low landscape values that have been damaged due to high human pressure. Sites with low scores in natural parameters were often observed along the whole study area, all being sites with litter, coastal erosion problems, armoring, sewage, and noise.

Along the study area, 18.3% (55 of 300 sites) can be categorized in this category. These sites are distributed in remote (16 locations), village (13), resort (11), urban (10), and rural (9). Low scores in Class IV sites were due to low physical settings giving low ratings for parameters such as "skyline landform," "valley," and "vistas." In the same way, parameters such as "width" and “watercolor" were low.



Class V: This category includes sites with D values lower than 0 that have low to very low scores for natural and human parameters. The main factors responsible for the low D qualification in are extreme human pressures such as litter, noise, coastal erosion, sewage presence, noise, and extreme urbanization.

This class included the most significant number of surveyed coastal locations, with 97 sites out of 300 (32.3%). These sites are distributed in remote (10), resort (11), rural (18), village (22), and urban areas (36). Scenic evaluation histograms reflect the low values for natural and human parameters, Low averages in attributes 1 and 2 generate low scenic value. The membership degree vs. attribute curve presents a left skewered curve, evidencing the low scenic values that define this category of sites.



WHAT IS AFFECTING THE SCENIC VALUE OF THE COLOMBIAN CARIBBEAN COAST?

A clear relationship between anthropogenic interventions and scenery degradation has been found in this work. The dominance of class III, IV, and V coastal sites (208 sites of 300 - 69.3%) highlights the significant influence of human-induced processes/activities over the current coastal scenery degradation. Of these, **extreme urbanization**, **coastal erosion**, **engineered shore hardening**, **woody debris and marine wrack**, **litter**, **sewage**, **noise**, and **beach driving** are significant along this coastal area of Colombia.

Extreme Urbanization

Coastal urbanization is the development associated with the increase of urban population over time in proportion to a region´s rural population (Burt et al., 2019). World human populations are heavily concentrated on shorelines, and growing urbanization is putting increasing pressure on coastal ecosystems. While the continued growth of coastal cities can provide some economic benefits (UNEP 2002), these often come at considerable costs to the environment, especially to scenery (Duarte et al., 2008).

Extreme Urbanization

- Migration to coastal areas, where four cities (Cartagena, Barranquilla and, Santa Marta, Riohacha) have been the highest recipients of industrial, port, commercial and tourism activities.

- Migration to coastal areas after retirement (mainly people that move to Antioquia, Sucre, Bolivar, and Atlantico from inland).

- Inter-city migration to the village and rural areas from capital settlements searching for a better quality of life.

- Construction of secondary homes by people from inland cities (mainly from Bogota, Medellin, and Cali).

- Construction of eco-hotels and bungalows.

- Construction of resorts (‘elite’ tourism), where local and foreign investors are increasingly active.

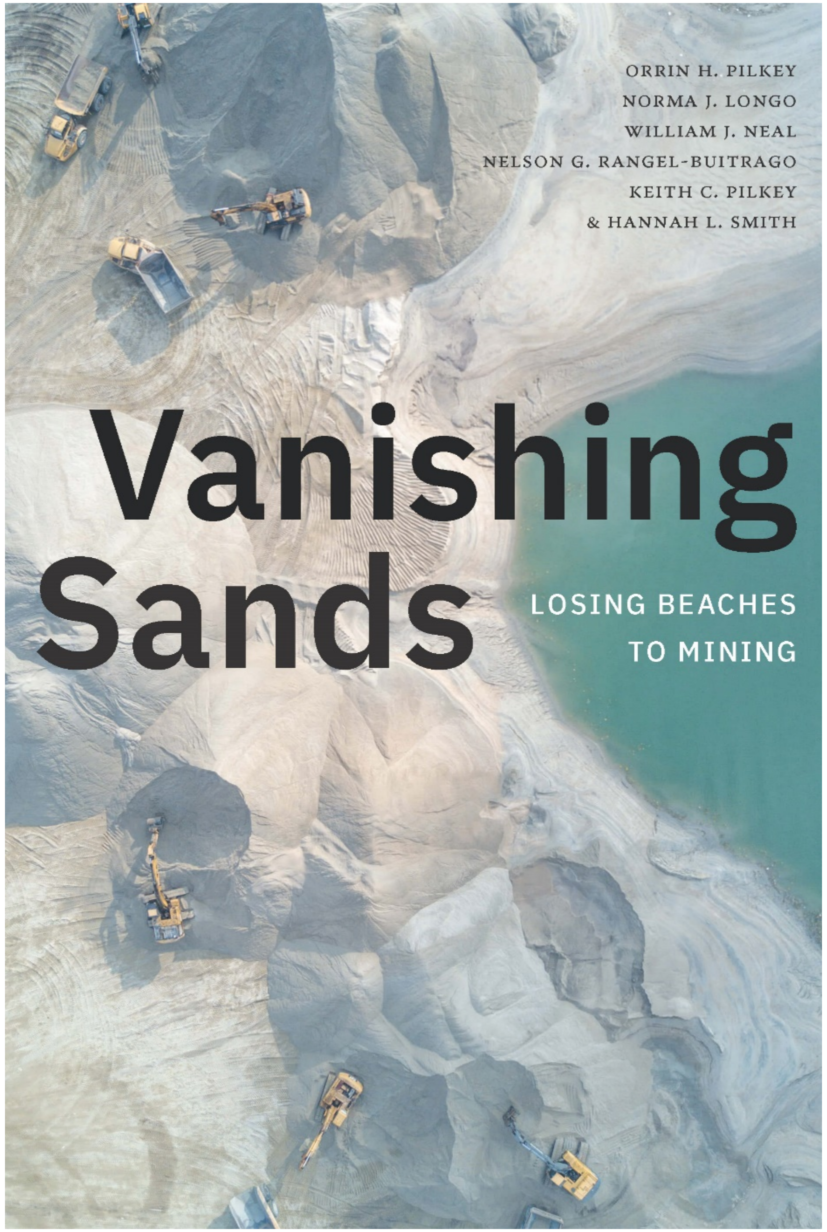
COASTAL EROSION AND THEIR MANAGEMENT

A big problem!

Just few days ago!

Intervienen enrocado en km 19 para evitar colapso de la vía por la erosión

Invías informó que las obras son para proteger la vía entre Ciénaga y Barranquilla.



natural resources | *environmental activism*

Vanishing Sands

Losing Beaches to Mining

ORRIN H. PILKEY, NORMA J. LONGO, WILLIAM J. NEAL, NELSON G. RANGEL-BUITRAGO, KEITH C. PILKEY, and **HANNAH L. HAYES**

"We're used to thinking of sand as an endless resource—even the metaphor for an endless resource, 'as plentiful as grains of sand on a beach.' But as this book makes clear that view is sadly and completely mistaken. It's time to understand how valuable sand really is."—**BILL MCKIBBEN**, author of *The End of Nature*

"A real eye-opener into the latest tragedy happening to our coast—the theft of sand on a massive scale as entire beaches and dunes are trucked and shipped away. Globally researched and richly illustrated, this book exposes and documents the ongoing tragedy, occurring at a time when our coasts need more sand than ever to combat extreme stress of massive coastal development and climate changes. A must read for anyone who cares about the coast."—**ANDREW D. SHORT**, author of *Australian Coastal Systems: Beaches, Barriers, and Sediment Compartments*

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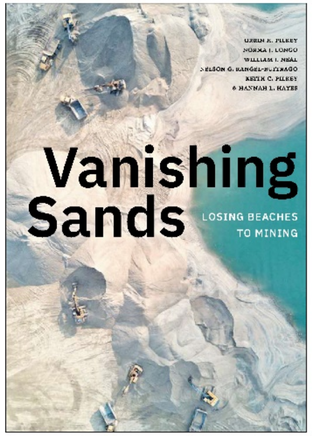

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Orrin H. Pilkey is Emeritus James B. Duke Professor of Earth and Ocean Sciences at Duke University and the author and coauthor of many books.

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William J. Neal, Emeritus Professor of Geology at Grand Valley State University, is an expert on ocean and Great Lakes shoreline evolution and coauthor of many books with Pilkey.

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Keith C. Pilkey, an attorney concerned with legal issues of coastal development, is coauthor of two books about sea level rise.

Hannah L. Hayes is a scholar of changing land rights, disaster capitalism, and risk management in Barbuda and Fiji.

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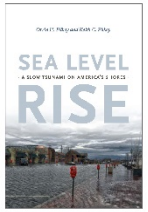

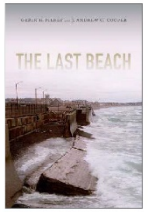

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Woody debris on beach environments: Magnitudes, collateral effects, and management
Nelson Rangel-Buitrago a,b,*, Anubis Velez Mendoza b, Adriana Gracia C. b, William J. Neal c, Orrin H. Pilkey d

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Nelson Rangel-Buitrago a,b,*, Anubis Velez-Mendoza b, Adriana Gracia C. b, William J. Neal c

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Baseline
Plastic pollution on the Colombian central Caribbean beaches
Nelson Rangel-Buitrago a,b,*, Anubis Velez Mendoza b, Egna Mantilla-Barbosa c, Adriana Gracia C b, Harry Arroyo-Olarte c, Victoria Andrea Arana c,d, Jorge Trilleras c,d, Allan T. Williams f, William J. Neal e

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Viewpoint

The Plasticene: Time and rocks

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ABSTRACT

Plastics, "yesterday's hero... today's villain" or "the contemporary symbol of modernity," were invented in the early 20th century by Leo Hendrik Baekeland from macromolecules (resins, elastomers, and artificial fibres) of formaldehyde and phenol. This synthetic organic polymer took hold of daily human life and transformed the modern world with an ever-widening range of applications. Plastics are the third most-widely manufactured material in the world after cement and steel, and they have become widespread in our society with excessive production and consumption to meet demand. Plastics use is so dominant that they are inappropriately considered essential in the world consumers marketplace. Plastics are a clear indicator of the Anthropocene and can be considered the marker of the upper subdivision of this stage: the Plasticene.

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Baseline

Decoding plastic pollution in the geological record: A baseline study on the Caribbean Coast of Colombia, north South America

Nelson Rangel-Buitrago [a,*], Felipe Lamus Ochoa [b], Rubén Darío Beltrán Rodríguez [b], Jose Brito Moreno [b], Jorge Trilleras [c,d], Victoria Andrea Arana [c,d], William J. Neal [e]

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Litter
Caribbean Coast
Colombia

ABSTRACT

This study presents the first report of plastics in the geological record (rocks and formations composed of plastics) along the central Caribbean Coast of Colombia, northern coast of South America. These novel records of pollution include two rock types (plastiglomerates and quartz plastisandstones), two altered plastic types (pyroplastics and plasticrusts), two soil types (plasticlasts and anthrosols), and a series of artifacts (fossils) found near human settlements. All of them were analyzed using Fourier Transform Infrared (FTIR) spectroscopy. Polyester, high-density polyethylene, and copolymers of alkyl acrylates or methacrylates were identified as the principal polymers forming these rocks. This research provides new insights into the petrology of these emerging new forms of pollution, for which humans are primarily responsible for their generation and distribution. Similarly, the results presented emphasize that plastics are generating a deluge of pollutants in terms of variety and volume, overwhelming natural environments globally. Controlling or even eliminating their use has become one of the most significant challenges of the 21st Century.

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Discussion

A geological perspective of plastic pollution

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ABSTRACT

The Anthropocene, the most recent geologic time division, marks humanity's profound impact on Earth. Amidst debates, the Anthropocene Working Group recommended its inclusion in the International Chronostratigraphic Chart (ICC). This period is characterized by the mid-20th century Great Acceleration Event Array (GAEA), which includes widespread presence of pollutants such as radionuclides, organochlorine pesticides, PCBs, and plastic production. The Anthropocene concept should raise public awareness of these threats, with plastic pollution being a primary concern. Plastics are now pervasive and serve as a marker for the Anthropocene Epoch or Age. Understanding their entry into the geological record requires considering the "Plastic Geological Cycle," which encompasses extraction, production, use, disposal, degradation, fragmentation, accumulation, and lithification. This cycle reveals the transformation of plastics into new forms of pollution characteristic of the Anthropocene. With 91 % of discarded plastics never recycled, they accumulate in the environment and enter the geological record through processes like photodegradation, thermal stress, and biodegradation. The proposed Plasticene stage within the Anthropocene is defined by the post-World War II surge in plastic production and their incorporation into sedimentary processes and rocks. The study of plastics in the geologic record serves as a warning of their negative impacts and highlights the urgency of addressing plastic pollution for a sustainable future.


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Coastal Scenery Management Plan

Step 1	Set Goals
Step 2	Define the Geographic Extent
Step 3	Evaluate the Coastal Scenery
Step 4	Develop and Compare Alternatives
Step 5	Institutional Arrangements
Step 6	Alternative Evaluation
Step 7	Alternative Selection and Implementation
Step 8	Monitoring

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