Summer School on

Integrating Ecosystems in Coastal Engineering Practice (INECEP)

September 18 –29, 2017 Puerto Morelos, Mexico

GENERAL PROGRAMME

Funded by

Federal Ministry for Economic Cooperation and Development

exceed EXCELLENCE CENTERS FOR EXCHANGE AND DEVELOPMENT

DAAD

CONTENT

6.3. Proposed steps toward Ecosystem-Based Management
6.4. Matrix of Ecosystems and Services and its multiple applications
6.5. Environmental Port Management as an example of EBM implementation
6.6. Methodological approaches on natural coastal systems for eco-engineering based management
6.7. Elements for decision making

TOPIC 7: Coastal protection with nature-based and hybrid solutions

7.1. Ecological impact of traditional hard/engineering solution
7.2. Basic principles on the functioning of estuarine and coastal ecosystems
7.3. Introduction to ecosystem-engineers & implications.
7.4. Understanding biophysical interactions, and resulting ecosystem services: coastal defence & shoreline stabilization
7.5. How to integrate coastal ecosystems in coastal protection schemes? Soft & hybrid solutions

TOPIC 8: Ecosystem approach, integrated framework, tools and monitoring

8.1. Ecosystem approach to coastal protection and management
8.2. Integrative frameworks and tools for ecosystem approaches

TOPIC 9: Other ecosystem functions

9.1. Groundwater – Surface water relationship regulating environmental characteristics in coastal areas
9.2. Seagrass

PART 3: CASES STUDIES/LESSONS LEARNED AND CLOSURE

Cases studies by lecturers
Closing lecture and discussion

SCHEDULE

Day 1 – September 18

ALL DAY	Arrival of participants with "Ice Breaker" in the late afternoon

INTRODUCTORY SESSION

Day 2 – September 19

09:00 – 10:00	3.1. Welcome by Rodolfo Silva 3.2. Introduction of participants 3.3. "Rationale behind INECEP Summer School" by Hocine Oumeraci
TOPIC 1	**Coastal systems, Beach dynamics, Coastal risk, Coastal management**
Hocine Oumeraci (TU Braunschweig)	
10:00 – 11:30	1.1. Integrating ecosystems in coastal engineering: Where are we now, and where to go next?
Rodolfo Silva (II-UNAM)	
11:30 – 13:00	1.2. Coastal eco-engineering in Latin America: Problems, challenges and perspectives
13:00 – 14:00	LUNCH
Pedro Pereira (UFPE)	
14:00 – 15:00	1.3. Monitoring ecosystem changes in nature-based solutions: Sentinel indicators, strategies and techniques
Malva Mancuso (UFSM/FW)	
15:00 – 16:00	1.4. Groundwater ecosystem services & functions and impacts on coastal ecosystems: Processes, scales and challenges
16:00 – 16:30	COFFEE BREAK
Edgar Mendoza (II-UNAM)	
16:30 – 17:30	1.5. Conventional methods for coastal protection against flood & erosion: Problems and challenges
17:30 – 18:00	Discussions and feedback from participants

PART 1: Theoretical background, concepts and structuring framework

Day 3 – September 20

TOPIC 2	**Ecosystems: Ecological functioning and coastal protection efficiency**
Patricia Moreno (INECOL), Marisa Martínez (INECOL)	
09:00 – 10:00	2.1. Environmental gradients on the coast (salinity, flooding, sediments, ecosystems)
10:00 – 12:00	2.2. Beaches and coastal dunes (abiotic and biotic characteristics, functioning, regional variation, ecosystem, services)
12:00 – 13:00	2.3. Wetlands (abiotic and biotic characteristics, functioning, regional variation, ecosystem, services)
13:00 – 14:00	LUNCH
14:00 – 16:00	2.4. Mangroves (abiotic and biotic characteristics, functioning, regional variation, ecosystem services)
Ismael Mariño (CINVESTAV)	
16:00 – 18:00	2.5. Coral reefs · General overview of wave-generated dynamics at tropical coastlines and effects on coastal sediment dynamics. · The concept of roughness and the approaches to approximate it. How can we measure this in the field? · Estimations of roughness of natural reefs, and its effects on waves and currents.

	· The coastal protection service provided by coral reefs and future tendencies
18:00 – 19:00	**Presentations of case studies by attendees: Session A** 3.4. Karoline Angélica Martins (Federal University of Pernambuco) The role of coral reefs in coastal protection: case of Pontal do Cupe beach, Brazil 3.5. Johann Khamil Delgado Gallego (National University of Colombia) Wave energy dissipation on the Caribbean insular coral reefs of Colombia 3.6. Oriana Daza Brito (Fundación Universidad del Norte) Modelling morphodynamic variability on in artificial beaches 3.7. Laíssa Baltazar (Federal University of Rio de Janeiro) Multi-channel estuarine system at the Amazon and Pará Rivers
Day 4 – September 21	
TOPIC 3	**Modelling framework "Ecopath with Ecosim and Ecospace" (EwE-E)**
Sheila Heymans (Scottish Marine Institute)	
09:00 – 13:00	3.1. Introduction to EwE-E · Using EwE models and procedure on applying Ecopath, Ecosim and Ecospace in combination · Limitations of EwE-E modelling and challenges for applications to EBM 3.2. Overview, capabilities, limitations and best practice of EwE-E modelling framework · Ecopath: Theoretical background, software, capabilities, limitations and implementation steps, best practice for creating, balancing and using EwE models · Ecosim: Theoretical background, implementation steps, capabilities and model fitting
13:00 – 14:00	LUNCH
14:00 – 16:30	· Ecosim (Continued): Best practices for fitting and using an Ecosim model, uncertainty testing using Monte Carlo routines 3.3. Ecospace: Potential applications for environmental impact assessment and coastal protection · Ecospace: theoretical background, capabilities, data needed. Case studies for environmental impact assessment of marine/coastal infrastructures
16:30 – 18:00	· Capabilities and limitations for applications to assess the ecological impact of coastal protection · Challenges for research and software developments · Overview of related research programmes and ongoing/future projects in UK
18:00 – 19:00	**Presentations of case studies by attendees: Session B** 3.8. Ana Patricia Ruiz Beltran (UNAM) Impact and recovery assessment of the mangroves affected by Hurricane Patricia 3.9. Mireille del Carmen Escudero Castillo (UNAM) Protection services of the ecosystems of Sian Ka'an at south of Tulum, Mexico 3.10. Yandy Rodríguez (UNAM) Changes in coastal ecosystems' role against hurricane and storm surge at Ana María Gulf, Cuba
19:00 – 19:30	FIELD WORK 5.1. Preparatory course for field work
Day 5 – September 22	
TOPIC 4	**Ecosystem services with a focus on coastal protection**
Katie Arkema (Stanford University)	
09:00 – 13:00	4.1. Overview of services/benefits of ecosystems for coastal protection: · Types of ecosystems to reduce wave action and coastal erosion · Resilience/adaptive capacity of selected coastal ecosystems · Limitations for extreme events & necessity of hybrid solutions · Case studies from U.S. Gulf of Mexico and Belize 4.2. Concepts methods/models for quantifying/ valuing ecosystem services · Marine EBM concept and framework · Methods/concepts/practice for ecosystem quantification/valuation in the US · Overview of research programmes in the US

	4.3. Efficiency of coastal protection ecosystems against waves, floods and erosion: · Role of modelling for quantifying coastal protection of ecosystems · Importance of locations/index-based models for identification of suitable areas/case studies
13:00 – 14:00	LUNCH
14:00 – 16:30	· Overview of capabilities/limitations of existing models/future needs 4.4. Ecological modelling: Introduction and overview · Types of available ecological models-A brief overview · Introduction to InVEST model suite: modules/ structure/capabilities/limitations
16:30 – 18:00	· Example applications/case studies using InVEST, e.g. from NatCap
18:00 – 19:00	**Presentations of case studies by attendees: Session C** 3.11. César Acevedo Ramirez (CINVESTAV) Wavelet as roughness indicator for bathymetric profiles 3.12. Alejandro Astorga Moar (II-UNAM) Coastal dynamics under coral reef scenarios 3.13. Cesia Jaqueline Cruz Ramírez (UNAM) Numerical modeling of artificial reefs in Chuburna, Yucatan 3.14. Juan David Osorio-Cano (Universidad nacional de Colombia at Medellín) Coastal ecosystem services provided by coral reefs at Tesoro Island, Colombia
19:00 – 19:30	FIELD WORK 5.1. Preparatory course for field work (Continued)
FIELD WORK	
Day 6 – September 23	
TOPIC 5	**Field work: Coral reefs/Wetlands/Beach/Dunes**
09:00 – 18:00	5.2. Monitoring and visits to selected sites http://medellin.unal.edu.co/inecep/img/INECEP2017Mexico-Field_work_Programme.pdf
Day 7 – September 24	
SUNDAY	Tentatively free
PART 2: Ecosystem-based coastal protection: Modelling/implementation/monitoring/management	
Day 8 – September 25	
TOPIC 6	**Management and legal issues**
Milton Asmus (FURG)	
09:00 – 13:00	6.1. The ecosystem base for Coastal Management 6.2. From a sectorial to an ecosystem-based approach 6.3. Proposed steps toward Ecosystem-Based Management 6.4. Matrix of Ecosystems and Services and its multiple applications 6.5. Environmental Port Management as an example of EBM implementation
13:00 – 14:00	LUNCH
Andrés Osorio (UNAL)	
14:00 – 16:30	6.6. Methodological approaches on natural coastal systems for eco-engineering based management · From wind waves (full spectrum behaviour) to nearshore hydrodynamics around natural ecosystems (coral reefs and mangroves) · From small scales (species) to large scales (nearshore ecosystem): · knowledge and limitations · Combination from laboratory experiments and field works

	· Roughness effect on coastal management objectives (manage flooding and erosion) (ICZM strategy) · Numerical engineering models and how to use them for decision making (ICZM strategy)

Edgar Mendoza	
16:30 – 18:00	6.7. Elements for decision making
18:00 – 19:00	**Presentations of case studies by attendees: Session D** 3.15. Angel Kuc Castilla (UNAM) Design of strategies for the control of beach erosion with an ecosystem-based management approach 3.16. Nadia Selene Zamboni (Federal University of Rio Grande do Norte) Economic value estimation of mangrove areas: a study case in northeast of Brazil 3.17. Débora Libertad Ramírez Vargas (UNAM) Elements that induce a coastal squeeze on the coasts of Sabancuy, Campeche, Mexico
19:00 – 19:30	FIELD WORK 5.3. Field data processing and analysis
Day 9 – September 26	
TOPIC 7	**Coastal protection with nature-based and hybrid solutions**
Edgar Mendoza	
09:00 – 10:30	7.1. Ecological impact of traditional hard/engineering solutions · Ecological impact of hard structures and possible improvements · Ecological impact of beach/dune nourishment & improvements · Coastal squeeze and ecosystem remediation
Tjeerd J. Bouma (Groningen University)	
10:30 – 13:00	7.2. Basic principles on the functioning of estuarine and coastal ecosystems · Relevant ecosystems & organisms · Spatial organization · Changing ecosystem structure and functioning due to climate change & human impacts 7.3. Introduction to ecosystem-engineers & implications. · General concept of habitat modification by ecosystem engineers · Examples of ecosystem engineering · Implication of ecosystem engineers for system dynamics
13:00 – 14:00	LUNCH
14:00 – 16:30	7.4. Understanding biophysical interactions, and resulting ecosystem services: coastal defence & shoreline stabilization · Efficiency & reliability of nature-based coastal defence · Long-term sustainability of nature-based coastal defence · Uncertainty due to human impacts and climate change
16:30 – 18:00	7.5. How to integrate coastal ecosystems in coastal protection schemes? Soft & hybrid solutions · Knowledge and techniques regarding · Ecosystem management · Governance issues
18:00 – 19:00	**Presentations of case studies by attendees: Session E** 3.18. Talia Schoonees (Leibniz University Hannover) Ecosystem-based adaptations for stepped revetments: an application to Strand, South Africa 3.19. Babette Scheres (RWTH Aachen University) Enhancing the ecological value of dikes at the German coast 3.20. Angélica Felix Delgado (UNAM) Natural/hybrid solutions for beach erosion of Holbox at Yucatan peninsula 3.21. Francisco Fabián Criado Sudau (Universidade Federal de Rio de Janeiro)

	Rip currents in an intermediate beach with a natural submerged rocky ban
19:00 – 19:30	FIELD WORK 5.3 Field data processing and analysis (Continued)
Day 10 – September 27	
TOPIC 8	**Ecosystem approach, integrated framework, tools and monitoring**
Angel Borja (AZTI)	
09:00 – 12:30	8.1. Ecosystem approach to coastal protection and management · Grand challenges in marine ecosystems ecology. 8.2. Integrative frameworks and tools for ecosystem approaches. · Necessity of tools to monitor and assess status of marine waters/ecosystem components · DPSIR/nested SPR: Strengths/limitations/ refinements as structuring framework for ecosystem-based coastal protection. Incl. *example applications/lessons learned* · Development of indices, concept of reference conditions, & overview of different assessment methods: The Ecosystem Approach- Theory and Practice
13:00 – 14:00	LUNCH
14:00 – 16:00	· Introduction to the "Catalogue of Marine Biodiversity Indicators" developed in DEVOTES project · Using assessment tools for single ecosystem components: Ecological indices based on macro-benthos- the case of AMBI and M-AMBI in assessing seafloor integrity status (possibly also for intertidal zone), including practical exercises for using AMBI and M-AMBI software.
16:00 – 18:00	· Using assessment tools for integrative assessment of multiple components: Introduction to *NEAT* 'Nested Environmental status Assessment Tool', including example applications and best practice using NEAT software and lessons drawn from case studies performed in DEVOTES Project and other applications (EIA, etc.).
Milton Asmus	
18:00 – 19:00	· Integrated monitoring: methods and techniques: A proposed model to evaluate environment risk as the "risk to lose ecosystem services"
19:00 – 20:00	**Presentations of case studies by attendees: Session F** 3.22. Aalaa Amr (Mansoura University) Impact of pollution on the plankton community in coastal waters Hurghada Red Sea, Egypt 3.23. Gabriela Buraschi (Federal University of Rio de Janeiro) Challenges and strategies to model marine litter in the Guanabara Bay 3.24. Manuela König (TU Braunschweig) Desalination plants - the environmental impact on coral reefs in the northern Red Sea
Day 11 – September 28	
TOPIC 9	**Other ecosystem functions**
Eleonora Carol (CONICET-UNLP)	
09:00 – 11:00	9.1. Groundwater – Surface water relationship regulating environmental characteristics in coastal areas · Groundwater and surface water (tidal flow) hydrodynamics in coastal environments (marshes, coastal lagoons, coastal levees, etc.). Factors regulating these processes such as geomorphological, lithological, biological, etc. · Geochemical processes in coastal environments determined by groundwater- surface water interaction. · Environmental characteristics related to the exchange between groundwater and tidal flows. Modifications of hydrological functioning by engineering works.
Brigit van Tussenbroek (ICMYL-UNAM)	
11:00-13:00	9.2. Seagrass · The role of seagrass meadows in the regulation of coastal dynamics · Case-studies on (Mexican) Caribbean coasts

13:00 – 14:00	LUNCH
14:00 – 15:00	**Presentations of case studies by attendees: Session G** 3.25. Saber Elsayed (TU Braunschweig) Modelling and management of storm-driven saltwater intrusion in freshwater aquifers: The case of near Bremerhaven, Germany 3.26. Jéssica Formentini (Federal University of Santa Maria) Numerical modeling applied to the industrial use of groundwater in coastal aquifer 3.27. Arlett Rosado Torres (CINVESTAV) Submarine groundwater discharges and their influence on benthic cover and reef roughness at Puerto Morelos reef lagoon 3.28. Iris Neri-Flores (Universidad Veracruzana) Groundwater fluctuations and its interactions with rivers and wetlands in coastal zones
15:00 – 16:00	**Presentations of case studies by attendees: Session H** 3.29. Diana Berriel (CINVESTAV) Oceanographic conditions linked to the arrival and departture of *sargassum sp*. on a fringing reef lagoon in Puerto Morelos, Quintana Roo 3.30. Sanaz Hadadpour (TU Braunschweig) Numerical modelling of wave attenuation performance of coastal vegetation 3.31. Weiwei Zhou (Beijing Normal University) Physiological and biochemical responses of saltmarsh plant spartina alterniflora to long-term wave exposure 3.32. Alejandro Cáceres Euse (Universidad Nacional de Colombia) Development of the Kelvin-Helmholtz instability to the passage of an oscilatory flow on a seagrass canopy
16:00 – 17:00	**Presentations of case studies by attendees: Session I** 3.33. Silke Andrea Judith Tas (TU Delft) Biomanco: Bio-morphodynamic modelling of mangrove-mud coasts (large scale) 3.34. Alejandra Gijón Mancheño (TU Delft) Biomanco: bio-morphodynamic modelling of mangrove-mud coasts (small scale) 3.35. David Sanchez (Universidad Nacional de Colombia, Sede Caribe) Coastal erosion control in fringe mangroves affected by logging in the Colombian Caribbean 3.36. Valeria Chávez Cerón (UNAM) Performance of mangroves as coastal protection elements in La Mancha, Mexico
17:00 – 18:00	**Presentations of case studies by attendees: Session J** 3.37. Marianella Bolívar Carbonell (Fundación Universidad del Norte, Colombia) Erosion of Puerto Colombia coast by maritime activities 3.38. Román Canul Turriza (UNAM) Development of a methodology for the control of erosion and decrease of coastal vulnerability: a focus on large scale 3.39. Johnny Ferreira (Centro Universitário Tabosa de Almeida, Brazil) Shoreline erosion in the Boa Viagem Beach, Northeast Brazil 3.40. Luis Fernando López Arias (University of Costa Rica) Moin beach and his morphological change due to Moin Container Terminal project

PART 3: CASES STUDIES/LESSONS LEARNED AND CLOSURE

Day 12 – September 29

Cases studies by lecturers

09:00 – 10:00	3.41. Milton Asmus Cases on intending to produce the ecosystem base for EBM in Southern Brazil coastal areas
10:00 – 11:00	3.42. Andrés Osorio Wave energy dissipation on natural ecosystems: several cases studies from small (laboratory) to large scales (field)

11:00 – 12:00	3.43. Eleonora Carol Salinization of marshes in Argentina: natural vs anthropic factors
12:00 –13:00	3.44. Ismael Mariño Wave energy dissipation on natural coral reef systems of varying roughness
13:00 – 14:00	LUNCH
14:00 – 14:50	3.45. Pedro Pereira The erosion case of Carne de Vaca beach.
14:50 – 15:40	3.46. Edgar Mendoza Developing ecosystem based alternatives for wetland protection. Carmen-Pajonal-Machona wetland, Tabasco, Mexico
15:40 – 16:30	3.47. Marisa Martínez Long-term beach and coastal dune dynamics in response to natural and human-made factors
Closing lecture and discussions	
Hocine Oumeraci and Rodolfo Silva	
16:30 – 18:00	3.48. Summary and conclusions of the course, including final discussions 3.49. Evaluation of the course and suggestions for future collaboration
20:00 – 23:00	Farewell dinner and attendance certificates
Day 13 – September 30	
SATURDAY	Departure

http://medellin.unal.edu.co/inecep/