

Project 3
MSc IWRM, REM, NRM

Implementation of a community-based coastal zone concept in Corinto/El Realejo, Nicaragua

Introduction

Globally, coastlines are under pressure due to urbanization processes, land use intensification and impacts of climate change. This results in a higher risk for people and their assets due to natural hazards and geomorphological processes such as storms, coastal floods, level rise, and coastal erosion (Perkins *et al.*, 2015; Cooper *et al.* 2016; Renaud *et al.* 2016).

Cologne's twin town Corinto/El Realejo in Nicaragua is highly affected by storms, coastal floods and tsunamis. Due to the severe flood risk, the town developed a strategy together with its partners from the City of Cologne to ensure the protection of the population and their properties. Accordingly, a first coastal protection project was implemented with the objective to repair and secure the existing dike and avoid further erosion of the coastline through so called "Geotubes".



*Figure 1: Geotubes on the beach in Corinto
(Source: Städtepartnerschaftsverein Köln/Corinto)*

Over a distance of more than 4.2 km "Geotubes" break the waves and reduce them in speed and power so that less erosion is taking place or eroded coastal soils can be retained. Even though this engineered infrastructure project was the first of its kind in Central America, already after a short period of time, the positive effects in the regeneration of the beaches indicated the success of the measure. Today, the project is nationally well known and rewarded and, as a pilot project, justified the financing of further coastal protection projects in Nicaragua.

Besides engineered infrastructure, Corinto/El Realejo also implemented a nature-based solution. The town is surrounded by mangrove forests, which play an important role in the functioning of the local ecosystem: mangroves do not only store and sequester large amounts of carbon dioxide, but also



*Figure 2: Collection of mangrove seedlings
(Source: Städtepartnerschaftsverein Köln/Corinto)*

provide habitat and breeding grounds for fish, bird and crustacean species and protect the coastline from erosion. As in many parts of the world, illegal logging - in Corinto/El Realejo particularly for cooking and building purposes - led to mangrove deforestation and degradation. Today there is substantial evidence that natural infrastructure such as healthy mangrove forests enhance coastal resilience by providing important protective functions and many other ecosystem services (Sutton-Grier *et al.* 2015).

It is well known that mangrove ecosystems have valuable functions in wave and storm attenuation, erosion control and long-term coastal profile protection (Spalding *et al.*, 2014). Consequently, a second project was initiated by the City of Cologne and Corinto/El Realejo with the objective to preserve and protect the local mangroves. In cooperation with the University of Cologne a local awareness campaign was initiated including an education tool box with information material, a quiz and an animation film dealing with mangroves. In line with this campaign a yearly mangrove festival was organized, that quickly turned into a special event for the whole city and its inhabitants. Several afforestation events have been organized and executed by students from Corinto and Cologne since then.



Figure 3: Afforestation of mangroves with students from Cologne and Corinto/El Realejo
(Source: Städtepartnerschaftsverein Köln/Corinto)

Management concepts that integrate multiple instruments (as mentioned above) to achieve a set of objectives through relevant policies, the involvement of stakeholders or business sectors while considering terrestrial and marine components over a period of time within a broader area, are usually referred to as Integrated Coastal Zone Management (ICZM).

A comprehensive international definition is provided by the European Commission (1999): “ICZM is a dynamic, continuous and iterative process designed to promote sustainable management of coastal zones. ICZM seeks, over the long-term, to balance the benefits from economic development and human uses of the Coastal Zone, the benefits from protecting, preserving, and restoring Coastal Zones, the benefits from minimizing loss of human life and property, and the benefits from public access to and enjoyment of the Coastal Zone, all within the limits set by natural dynamics and carrying capacity.”

Although referring to “management,” ICZM covers an iterative cyclic process of information collection, planning, decision making, management, and monitoring of implementation. The term “planning” is meant in a broad sense as strategic policy development. Participation of all interested and affected parties (stakeholders) is a core element in ICZM (Schernewski, 2014).

A previous project report (Project II, SS 2019) indicates that there is neither adequate data available to collect the necessary information for effective planning measures, nor are the coastal zones in Corinto well-defined, which results in conflicts between socio-economic activities and ecosystems or coastal protection functions. Nevertheless, the city of Corinto is in need to find a sustainable and effective way to manage its coastal regions and ICZM is a powerful tool, to do so. Hence, a recommendation section was included in this report, about how to measure the success of already existing infrastructure and how to implement an integrated coastal zoning system.

Objectives

So far, the project implementation approach has been mainly characterized by the urgent need to find quick solutions for the problems caused by natural hazards and poor coastal management. Surprisingly, the existing projects were intuitively designed in a way, which is closely related to the basic concept of ICZM. The students working in this Project III will provide their academic knowledge and analyzing capabilities to complement this rather practical approach with a scientific perspective on ICZM and its contextual implementation.

The project work will focus on the following objectives:

- i. **Analysis of the existing management of the coastal zone of Corinto/El Realejo with respect to:**
 - Mapping of stakeholders involved in coastal management (stakeholder mapping)
 - Analysis of existing legal frameworks and planning procedures
 - Analysis of the coastal management concept in place
 - Assessment of existing coastal protection measures (engineered/nature-based/hybrids)
 - Analysis of gaps and needs for integrated coastal zone management

- ii. **Draft a reasonable community-based coastal zone concept taking into account the various uses of coastal areas in Corinto:**
 - Definition of criteria and indicators for sustainable coastal zoning
 - Development of a concept for community participation
 - Design of a possible coastal zoning for Corinto/El Realejo in a GIS

- iii. **Discuss with local experts to what extent it is possible to implement your zoning concept and which strengths, deficits and risks it has.**

Participants

All participants interested in Integrated Coastal Zone Management approaches and the specific challenges Corinto/El Realejo faces, are welcome to register for this project, which will be executed in close collaboration with the City of Cologne and the town of Corinto/El Realejo. Some Spanish skills are beneficial to communicate with the partners in Nicaragua, but not obligatory.

Students who are interested in a master's thesis on a topic of coastal zone management have the opportunity to continue working with the City of Cologne, the Cologne/Corinto City Partnership Association and the partners in Nicaragua.

Case Study Area

Corinto is situated on a peninsula. The city has a size of 49 km² and about 20,000 inhabitants. Most parts of Corinto are on average only 2.5 m above sea level. Trade and fishery are the most important economic sectors of the city. Two bridges connect the peninsula with the mainland and Corinto's twin

town El Realejo, which was the former port, but was cut off by changes on the coast. Corinto is 152 km from Managua and the average temperature varies between 30 and 36°C. Corinto was founded in 1858 when the coastline around El Realejo was increasingly sanded up and it became impossible to navigate to the originally important harbor. With Corinto a new gateway to the world was created and in the 19th and 20th century the city became the most important port in Nicaragua. Today, two thirds of all maritime imports and exports are carried out in “Puerto Corinto”.

Tutors

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Assessment

The assessment will be based on

- a written report to be delivered at the end of the project
- status quo presentations (according to milestones set by the group) (not graded) on topical advances, methodological considerations and choice of methods (reflexivity and learning curve)
- documented self-management (project-management, tasks, deadlines) of the group and final (anonym) group evaluation of each group members performance

References:

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Schernewski, G. (2014) 'Integrated Coastal Zone Management', pp. 3–7. doi: 10.1007/978-94-007-6644-0.

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Sutton-Grier, A. E., Wowk, K. and Bamford, H. (2015) 'Future of our coasts: The potential for natural and hybrid infrastructure to enhance the resilience of our coastal communities, economies and ecosystems', *Environmental Science and Policy*. Elsevier Ltd, 51, pp. 137–148. doi: 10.1016/j.envsci.2015.04.006.