Geomorphological changes in Puerto Madryn coast (Chubut, Argentina) as a consequence of urban growth during the last decades

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Abstract

The study area is located in the western coast of Nuevo gulf, Chubut province, Argentina. Puerto Madryn city (42°46'20''S; 65°0'48''W) has grown very quickly during the last decades, both in number of inhabitants and urbanized area. This urban development has changed intensely the natural landscape of the coast, modifying and destroying the original geomorphology. The evolution of the coast has been done through the analysis of aerial photographs (1942, 1957, 1971, 1988, 1998, 2011), current satellite images and field observations.

Puerto Madryn population has grown from 6,110 to near 82,000 between 1970 and 2010, estimating that it is near 100,000 by now. This number doubles every year during the tourism period. The urban area (from north to south and from east to west) has increased 25% only between 2002 and 2014, while the lenth of coast occupied grew from 0.8 km to 11.2 km since 1940. The coastal dunes originally developed over a marine terrace (beach ridges) has been almost completely destroyed. The coastal dunes (parcially active and stabilized by vegetation) reached a width of about 700 m by 1942 and a length of 3,150 m from north to south. Currently, that extension has been reduced by 30% in length and 90% in width, reaching 60 m where it is conserved.

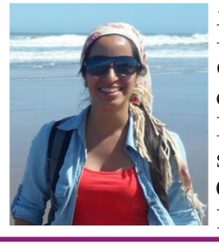
It has been observed that the recharge of the beaches depends on the conservation of coastal morphologies due to there is no external sediment source or coastal drift inside the gulf. The destruction of the dunes field altered the sediment balance with the coast and beach erosion could be seen in a near future. Despite this and the importance of coastal resources conservation, urbanization continues (coastal roads, hotels, spas, restaurants, drains to beaches) and it is urgently necessary to develop an integrated coastal management plan.



Figure 1. Evolution of the urbanization of Puerto Madryn between 1942 and 1988. Both photographs were georeferenced over the current satellite image in order to see the morphological changes. It can be seen how the coastal dunes were destroyed along the years and the urban area began to grow. This can be taken as an example of enviromental impacts on natural coastal landscapes.

Recent Publications

1. Bunicontro, M. P. (2015). Coastal models development for the environmental evaluation and management of the area between Cerro Prismático and Cerro Avanzado, Golfo Nuevo, Chubut. VI Argentinean Congress of Quaternary and Geomorphology. Ushuaia, Tierra del Fuego, Argentina. p. 237.
2. Bunicontro, M. P. (2015). Effect of urban growth in Puerto Madryn (Chubut) on the coastal dune field. IX National Conference of Sea Sciences. Ushuaia, Tierra del Fuego, Argentina. Cd.
3. Degorgue, G. (2006). Restoratios and conservation of coastal dunes in the city of Puerto Madryn, Chubut. Final report, Natural Patagonian Fundation. 20p.
4. Monti, A. (2013) Risk and complexity management in the urbanized coast of Puerto Madryn. Environmental Studies Journal, 1 (1): 27-43.
5. Weiler, N. and Gomez-Simes, E. (2005). Enviromental analysis of beach area and dunes of Puerto Madryn city, Chubut pronvince, Argentina. Geographic Paragraphs 4 (4): 190-206.



Biography

María Paula Bunicontro is geologist at Buenos Aires University and has her expertise in coastal geomorphology and environmental evaluation. She has developed her reseaches in urbanized coast of Buenos Aires analysing the effects of coast defense structures on the natural hidrodynamic, and is currently working in Patagonian coast of Chubut province. She works in the Institute of Basic, Applied and Environmental Geology of Buenos Aires as PhD student and is also assistant profesor in *Geomorphology* and *Geology and Environmental Ecology of Coastal Areas* subjects. She has been member of several reseach proyects and has participated as organizer of scientific dissemination activities. She is also Editorial Secretary in Argentinean Journal of Geology applied to the Engineering and the Environment.

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