

**Título:** TIDAL STREAM ENERGY EXPLOITATION IN THE GALICIAN RIAS: PERFORMANCE, RESOURCE AND IMPACT

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**Resumen:** During the last years the interest of supplying the energy needs by means of renewable energy sources has risen sharply. Among them is tidal stream energy, which taps the kinetic energy of the currents caused by the tide in the coastal areas. The objective of this work is to investigate the exploitability of the tidal stream energy resource present in the Galician rias, assessing in detail: (i) the available resource, (ii) the performance of the Tidal Energy Converters (TECs) and (iii) the potential impacts on the hydrodynamics (transient and residual flows) derived from the tidal stream energy exploitation.

First, a procedure based on four parameters: the site-specific turbine efficiency, the availability and capacity factors, and the annual energy output is presented to compare the performance of different TECs (Evopod and the Gorlov Helicoidal Turbine) in a particular site in Ria de Arousa. For this purpose, a 2DH model of the ria

hydrodynamics is implemented and successfully validated based on field data of water levels and tidal flows. It is found that the Evopod takes better advantage of the available resource and yields a larger output. Finally, this procedure can be applied to any TEC and site of interest.

In order to investigate the potential impacts on the hydrodynamics derived from the tidal stream energy exploitation, Ria de Ribadeo is used as a case study. Again, a numerical model of the ria hydrodynamics is set up and validated. Then, the energy extracted by a tidal stream farm from the flow is accounted for by adding a momentum sink term in the equations of the model. The results obtained show that the disruptions caused on the water levels are negligible. On the other hand, the impacts on the transient and residual flows are much more noticeable both in magnitude and the size of the area affected, but their general structure is preserved.