



At the University of Göttingen, Chair of Cartography, GIS and Remote Sensing, Department of Geography, the following position is to be filled as soon as possible:

M.Sc. Thesis Student - also open as Student Assistant/HiWi position (m/f/d)

Urbanisation is associated with mangrove encroachment into saltmarsh across New South Wales estuaries: a multi-decade remote sensing analysis.



Mangrove forests are expanding landward at the expense of saltmarsh communities across many temperate and subtropical coastlines. In south-east Australia, saltmarshes are listed as an endangered ecological community, and its decline is increasingly attributed to encroachment by mangroves. While climate-driven factors such as sea-level rise and rising temperatures are recognized global drivers, mounting evidence points to a mechanistic role of anthropogenic catchment modification: nutrient-enriched and freshwater-augmented runoff from urban and agricultural land use promotes mangrove growth and competitive vigor at the mangrove–saltmarsh ecotone. Experimental work has demonstrated that elevated soil nutrient concentrations below stormwater outlets directly stimulate mangrove establishment and reduce saltmarsh cover, while recent modelling frameworks confirm that nutrient enrichment shifts the competitive balance toward mangroves by enhancing their height and reducing sensitivity to marsh-suppression effects. This project tests whether estuaries in heavily modified, urbanised catchments — with higher runoff, nutrient loads, and freshwater influx — experience significantly greater mangrove encroachment and saltmarsh loss than pristine ones. Using satellite and aerial image analysis, it maps change across a unique multi-decade archive of 24 NSW estuaries, spanning aerial photography from 1960 and 2012 and newly acquired 2025 satellite imagery, to quantify how catchment urbanisation has reshaped these coastal wetlands.

Thesis Goals

- ❑ Refine and extend the existing land-cover classification of mangrove and saltmarsh for all 24 estuaries (1960 – 2025)
- ❑ Quantify multi-decadal change in mangrove and saltmarsh extent per estuary and link observed encroachment rates to catchment urbanisation / modification gradients
- ❑ Statistically test the mechanistic hypothesis by comparing encroachment trajectories between modified and pristine estuaries
- ❑ Compile a thesis manuscript to current international peer-review publishing standards, with the aim of publication
- ❑ **Up to 200 h of HiWi work** can be used to preprocess data. Master thesis will be on a related but separated analysis.

Candidate Profile

- ❑ Student in Data Science, Environmental Sciences or related fields.
- ❑ Strong interest and foundational knowledge in R programming
- ❑ Basic knowledge of scientific writing and literature management

Application

Please express your interest via email (best to include CV and a brief statement on your motivation). For inquiries, please contact Dr. Rene Heim (rene.heim@uni-goettingen.de) or Dr. Ina Heim (ina.heim@uni-goettingen.de) at the front office.