

One PhD position in **recreation ecology, geomorphology, and GIS** within the project: “Geomorphological effects of tourism and recreation: quantification and monitoring of trail impacts in mountain areas” funded by the Polish National Science Centre.

**Project context and motivations:** Mountain protected natural areas (PNAs) such as national parks often constitute regions rich in bio- and geodiversity with beautiful scenery. They are currently under increasing pressure to supply both conservation and recreation, which frequently leads to conflicts of interest. Recreation often brings substantial revenues for conservation and human health, so excluding visitors from PNAs is not a solution that is possible everywhere. However, recreation unavoidably leads to negative impacts (Fig. 1). Therefore, management needs to have detailed data about these impacts to minimise conflicts between recreation and conservation. Yet, methodologies to collect comprehensive data about recreational impacts to inform management activities' prioritisation have received little attention in the previous studies, and this gap in the knowledge is addressed in our project.



*Fig. 1. Examples of trail impacts: (A) deposition of material due to improper trail drainage; (B) muddy section and water puddle; (C) exposed roots and rocks on the too-narrow section of the trail, forcing visitors to trample trail sides; (D) erosional rill along the trail tread; (E) deep erosional gully reaching bedrock; (F) erosional gully with exposed rocks: Due to uncomfortable walking condition, visitors created an informal path next to the designated trail.*

Recreational trails are a key element of infrastructure, which enable visitors to travel through recreation areas and engage in various activities such as hiking, biking, and horse riding. In this project, we will develop and test a novel framework for high-resolution mapping and monitoring of recreational impacts in mountain areas to derive spatially coherent information about indicators of recreational trail conditions. Our approach includes 3D reconstruction of the trail surface and its vicinity based on low-altitude aerial images from unmanned aerial vehicles (UAV, i.e. drones) combined with terrestrial images, and subsequently processed through the structure-from-motion photogrammetry to generate detailed digital elevation models and linked with qualitative data about visitors' behaviour. Implementing this framework in a wide range of benchmark settings will enable us to understand and quantify the dynamics of landscape response to direct human impacts.

**Your responsibilities:** As a PhD Student, you will be responsible for implementing the developed framework to collect data on different levels of use and various intensity of rainfalls (experimental settings) and collecting data on trail conditions in real-world settings. You will then utilise the collected data to investigate factors affecting trail conditions and classify trail degradation. PhD Thesis (tentative scope: “Mapping and monitoring recreational trail condition using a combination of UAV-based and ground-based photogrammetry”) will be supervised by Aleksandra Tomczyk (<https://www.webofscience.com/wos/author/record/AAU-3965-2020>) and Marek Ewertowski (<https://www.webofscience.com/wos/author/record/I-6883-2012>). Your tasks will include the following:

- Designing and conducting the experiments for investigations of changes of trail surfaces resulting from different types and levels of use and different intensity of rainfall events;
- Taking part in the data collection in a real-world setting;
- Performing statistical analysis of factors influencing trail conditions;
- Classification of trail degradation based on collected data;

**Your profile:** We invite applications from candidates interested in tourism and recreation, GIS, geomorphology and remote sensing. Applicants must hold a Master's degree at the time of document submission. Demonstrated experience in a GIS environment is preferred. Geomorphology knowledge or previous field experience will be a further advantage. The successful applicants must be able to work independently and in a structured manner and demonstrate good collaborative skills.

#### **What we offer:**

We offer a 3-year PhD full-time position (with a possible one-year extension) starting on 1<sup>st</sup> October 2023 at the earliest. The scholarship funded from the project is 5000 PLN gross per month (about 3700 PLN net per month). PhD candidates are enrolled at Adam Mickiewicz University (AMU) Doctoral School of Natural Sciences (<https://phdstudies.amu.edu.pl/snp/?lang=en>), which provides education, contact with other PhD students and opportunities to gain additional skills (courses are taught in English).

The successful applicant will join the Faculty of Geographical and Geological Sciences at Adam Mickiewicz University in Poznań, Poland ([wngig.amu.edu.pl](http://wngig.amu.edu.pl)). Our Faculty is located just next to the AMU Sports Centre (swimming pool, sports halls, gym), and neighbouring parks and communal forests offer perfect opportunities for walking/running – so there is plenty of options for recreation during breaks or after work. Full research training in appropriate techniques (GIS, drones, photogrammetry, field survey, remote sensing) will be provided depending on the student's interests and needs. We will assist you in preparing grant applications and establishing cooperation with renowned research centres in Poland and abroad. You will also have the opportunity to participate in international conferences, courses and workshops to further improve skills related to the project and develop your future scientific career.

#### **Application deadline: 14 July 2023**

Application is through the recruitment system:

<https://usosirk.amu.edu.pl/en-gb/offer/SD-2023/programme/SD-NZS-G2/>

#### **Additional information:**

For more information, please get in touch with Aleksandra Tomczyk ([alto@amu.edu.pl](mailto:alto@amu.edu.pl))



*Fig 2. Examples of trail degradation in high mountain, fragile environments. Andes, Peru.*