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The Tyrolean Alps LTSER platform – connecting science and people

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Abstract

Facing serious global changes, Long-Term Socio-Ecological Research (LTSER) can provide valuable insights into human-nature interactions. This scientific knowledge is urgently needed and can be used for protected area management to address complex issues such as biodiversity loss. Within Tyrol large areas are under protection. The Tyrolean Alps LTSER platform currently consists of 9 research sites aiming to provide long-term data records and most sites are located within at least one protection category. A joint working strategy among scientists of the Tyrolean Alps (TA) LTSER platform and protected area managers could be very profitable for better area management.

Key words

Long-Term Socio-Ecological research (LTSER), protected areas, management, ecosystem services (ES), global change

Introduction

Global changes require advanced scientific approaches, extending the usual project duration of 3-5 years to longer periods. To observe how ecosystems respond to severe impacts such as climate change, biodiversity loss or resource depletion long-term observation and projection are urgently needed. Having this in mind, the first Long-Term Ecological Research (LTER) network was established back in the 70s in the United States aiming to provide long-term ecological data along with scientific expertise (LTER 2016). For Europe though, with its higher population density compared to the US and its long history in land-use, the initial idea had to be adapted as it became soon obvious that the society-nature interaction needs to be observed in a more comprehensive way (SINGH et al. 2013). This led to a 'next-generation network' (MIRTL et al. 2010). Within this network traditional LTER sites are combined with LTSER (Long-Term Socio Ecological Research) platforms allowing the incorporation of the social (human) dimension into the preceding concept. Thus, social, economic and historical usage aspects are combined with traditional long-term ecological research within the LTSER-concept (MIRTL et al. 2010). LTSER further aims to connect scientists from different kind of disciplines as well as local stakeholders in order to achieve best possible results for relevant issues. Hence, LTSER platforms can therefore act as valuable institutions bridging science and protected area management.

The Tyrolean Alps (TA) platform

In 2002 the Austrian Society for Long-Term Ecological Research was founded and some years later the Tyrolean Alps LTSER platform, next to the Eisenwurzen LTSER platform and other traditional LTER-sites within Austria, was build up.

The Tyrolean Alps are well known for their highly diverse ecosystems and landscapes which are especially sensitive to global change issues such as climate change or changes in land-use (e.g. EEA 2004). Due to the intricate structure and the feature of extreme living conditions of mountain habitats the area provides various ecosystem services to people. Ecosystem services are direct benefits to people derived from nature such as fresh drinking water, protection from natural hazards, timber supply, carbon storage, or natural pollination, to name but a few. Nevertheless, severe impacts coming from direct socioeconomic activities such as winter and summer tourism, changes in land-use and agricultural practice, hydropower generation, transport etc. affect ecosystem service provision. Not only for their extraordinary flora and fauna but also for their cultural heritage it is only reasonable that large parts of the Tyrolean Alps region are under protection. Hence, protection areas are central elements of the Tyrolean Alps.

The LTSER Tyrolean Alps platform consists of 3 clusters, i.e. 'Glaciers', 'Alpine lakes' and 'Gradients in the alpine area'. Within those clusters currently 9 LTER-Sites (Fig.1) are embedded. Among the sites are several glaciers, a glacier foreland, grasslands at different altitudes, two lakes, and a treeline site.

In Tyrol 8 different protection categories are in use: (Hohe Tauern) National Park, individual elements within a Protected Landscape, Nature reserves, Conservation areas, Special protected areas and Ramsar-Protected areas. Most research sites are located within at least one protection area category (Tab. 1).

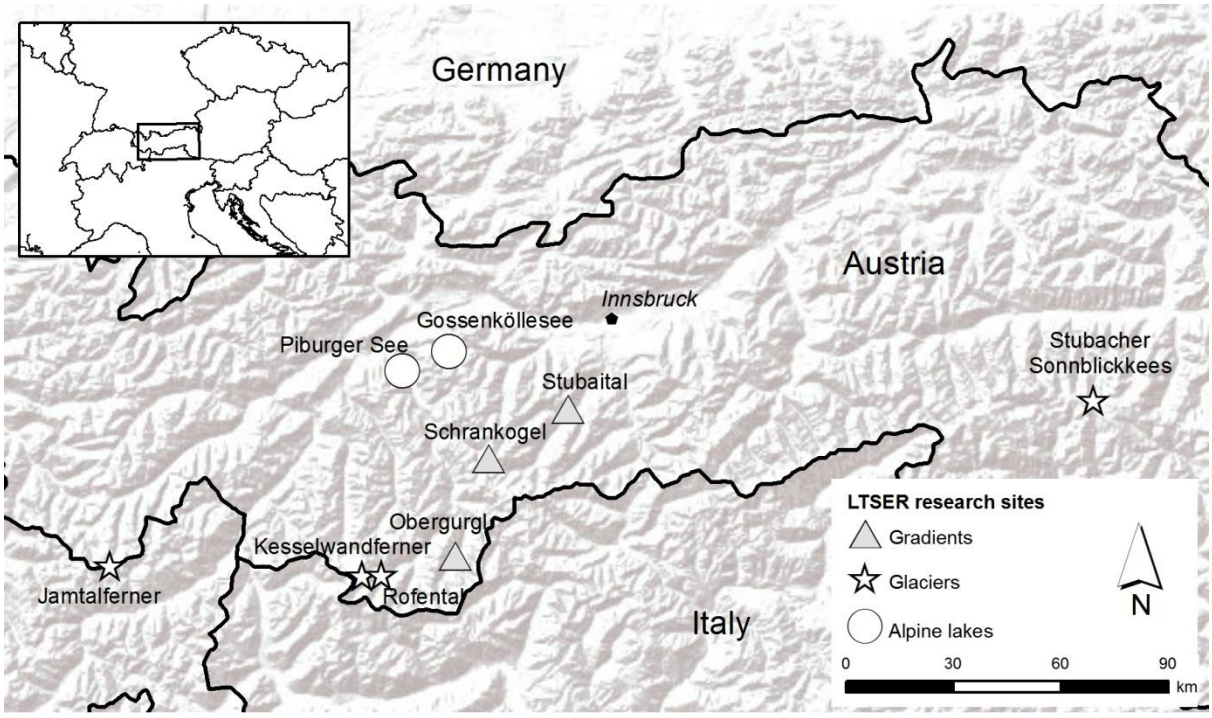

Figure 1: Map for the Tyrolean Alps LTSER platform: Research sites and their cluster affiliation. Source: LTSER & ESRI, USGS, NOAA; Map design: Johannes Rüdisser.

Cluster	Research site including protection status	Main research focus
Glaciers	Jamtalferner -	Mass and energy balance
	Kesselwandferner *Refugia, Natura 2000*	Ice velocity, mass balance
	Stubacher Sonnblickkees *Hohe Tauern National Park*	Mass balance, water budget estimations
	Rofental *Refugia, Natura 2000*	Cryospheric, atmospheric and hydrological processes
Alpine lakes	Gossenköllesee *Refugia*	Long-term alterations of alpine lakes, streams, catchments
	Piburger See *Nature reserve*	Hydrology, water chemistry, sediment, phyto- and zooplankton, zoobenthos, fish ecology, microbial food webs
Gradients in the alpine area	Obergurgl *Natura 2000*	Microclimate processes, colonization measurements, biodiversity and physical properties
	Schrankogel *Refugia*	Vegetation mapping, micro-climate, influence of global change drivers
	Stubai *Refugia, Nature reserve*	Greenhouse gas fluxes, productivity, water balance, N-cycling, C-sequestration, socio-economic studies

Table 1: The Tyrolean Alps (TA) Long-Term Socio-Ecological research platform: Hierarchical structure including protection status (italic) and main research focus. Source: adapted after KERLE & TAPPEINER (2017).

The TA LTSER platform provides databases on hydrology, permafrost biodiversity, demography, agro-economy, historical land-use changes, and tourism. This data records are fed into DEIMS, which is a central platform gathering relevant long-term data from LTER sites all over the world. This might be of special interest for protected area managers as this data is freely available and studies revealed that free data records coming from protected areas are rare (BERTZKY & STOLL-KLEEMANN 2009). In order to achieve the preservation objectives in protected areas, long-term data sets are needed for future scenario modelling, allowing the development of appropriate protected area management strategies, addressing complex issues such as biodiversity loss or the issue of invasive species. Moreover, science can help legitimate protected areas and their management.

Conclusion

Collaboration between scientists and protected area managers should be further strengthened (MÜLLER 2010) as both sites benefit from this transdisciplinary work. On the one hand protected areas are well suited for global research as severe direct human impact is prohibited, while at the same time external forces such as atmospheric changes interact with ecosystems. On the other hand managers can use scientific outcomes in order to achieve conservation goals and justify/improve protected area legitimacy. Hence, the TA LTSER platform, being an interdisciplinary and multi-institutional entity, could act as a bridging institution connecting science and protected area managers where outcomes could be applicable beyond platform boundaries.

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