eco.mont - Volume 5, Number 1, June 2013
ISSN 2073-106X print version
ISSN 2073-1558 online version: http://epub.oeaw.ac.at/eco.mont

Lessons learnt from a monitoring endeavour in the UNESCO Biosphere Reserve Entlebuch

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Keywords: UNESCO Biosphere Reserve, Entlebuch, monitoring, success control, sustainability, indicator

Abstract

Monitoring is a key activity in biosphere reserves and other parks. It is often used as a basis for evaluating the development of a reserve and the success of the protected area management. Monitoring activities hold many pitfalls, as shown by results from a project in the UNESCO Biosphere Reserve Entlebuch. Creating a causal link between management activities and monitoring results is one major challenge. Additional difficulties arise from often used non-systematic data originating from external sources. Embedding the available data in a simple conceptual model that links aims and key system factors with sustainability indicators could alleviate some of the problems encountered.

Profile

Protected area

UNESCO BR Entlebuch

Mountain range

Alps

Country

Switzerland

Introduction

Since the establishment of the UNESCO Biosphere Reserve Entlebuch (UBE) in 2001, the protected area (PA) management has carried out a growing number of projects focusing on various aspects of sustainability and has achieved respectable results (Table 1). In 2011, for the 10-year anniversary, the management took the opportunity to review its completed and on-going activities and assess their impacts on the development of various sustainability parameters for the entire PA.

Generally, the development of biosphere reserves, which are composed of areas on a gradient from natural to human-dominated, can be tracked with a set of parameters that assess environmental, social and economic characteristics of the PA. These parameters are usually referred to as indicators because they quantitatively indicate integral aspects of a complex socioeconomic-environmental system. The scientific literature proposes different sets of such indicators as well as different methodologies for defining them (e.g. Singh et al. 2009).

Ideally, a monitoring scheme should link management activities with drivers, processes and properties of the PA's socioeconomic-environmental system and systematically derive monitoring indicators based on such a system analysis (e.g. Bossel 1999). In reality, however, it is safe to assume that the majority of PA authorities have not taken such an approach. The main reasons for this are that

- the system analysis is highly complex as it covers a wide range of factors with multiple interrelations and some unclear causal links to the management activities,
- data acquisition for such indicators is difficult, time-consuming, expensive and sometimes impossible, and
- there are high expectations from various stakeholders that money is invested in concrete measures rather than in data gathering that does not show any obvious management output.

Figure 1 – A peatland in front of the Brienzer Rothorn mountain range. © C. Perret

Thus PA monitoring activities usually rely on data which have been collected as part of a project or which originate from external sources, in most cases from governmental institutions (e.g. Schönthaler & von Andrian-Werbung 2008). Despite these data being non-systematic, compared to an exemplary dataset, important information can be retrieved from them. However, more caution is generally needed when working with such data. In the following sections, the development of some typical parameters from the UBE's 10-year monitoring is presented in order to illustrate critical issues associated with their assessment and evaluation. Conclusions are then drawn for other PAs that plan a similar endeavour.

Table 1 – Major management outputs from 10 years of management in the UBE. Data from Schnider (2012)

Field	Output descriptor	Achievements
Education	Participants of excursions	73 000 participants in public and private excursions as well as in advanced training and other courses held by the UBE staff
Education	Sustainability school programme „Schuelschätz"	1 day per year is mandatory in every primary and 2 days in every secondary school class, involving 250 teachers and 2 500 pupils
Conservation	Voluntary work	20 camps (since 2009) with school classes and companies
Conservation	Ecological compensation in farming	15% of the agricultural area is set aside for ecological compensation
Development	Regional products	291 certified products from 71 producers, ranging from dairy and meat products to pasta, jams, alcoholic and other beverages, to furniture, electricity and cosmetics
Development	Partners	38 businesses, including restaurants, producers of special goods, service companies, banks, etc.
Tourism	Attractions	5 autonomous thematic subregions (Water, Spirituality, Children, Energy, Culture)
Research	Research projects	9 projects, ranging from organic production, wetlands, the use of pictures in publications to ecosystem services
Research	Completed theses	7 PhD, 26 MSc, 20 BSc
Publicity	Media articles	7 000 articles in newspapers, journals and other printed media, with a total outreach to 212 million readers
Publicity	Friends of the UBE	Association with 667 members, 77 supporters; membership fee 40 euros per year
Participation	Participative discussion groups (fora)	6 active and self-organized groups on the themes of agriculture, education, forestry, energy, tourism, business

Development and interpretation of selected indicators

Ecological indicators

All the UBE's communes form part of an ecological networking project in which ecological compensation areas are promoted among farmers with the help of the PA management. Over the past ten years, areal increases from 12% to 650% have been observed for different types of compensation areas. Grasslands managed as ecological compensation areas, for example, increased by 13% (Figure 2). Despite this indisputable success, the European hare (*Lepus europaeus*), a typical indicator for intact farming landscapes, declined by 23% in the same period (Figure 2). Assuming that farming practices influence the hare population most significantly, the population decline indicates that the achievements in the project are as yet insufficient to support species with special habitat requirements. A closer look at the compensation areas reveals that the areas are still very unevenly distributed, with deficiencies mainly in the lowlands, where agricultural production remains intensive. This issue demonstrates the vital need for a critical appraisal of monitoring data and suggests that indicators should not be interpreted alone but in the context of a system of indicators.

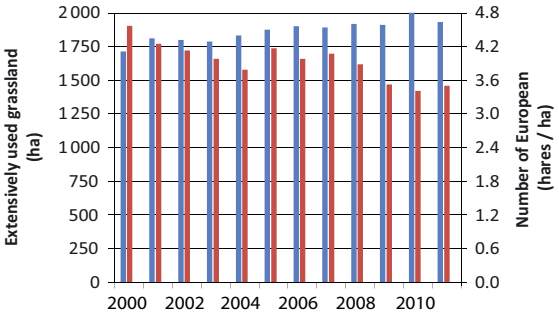

Figure 2 – Development of extensively used grassland in blue and the number of European hares (Lepus europaeus) *in red from 2000 to 2011. Data from the Cantonal Office for Agriculture and Forest, lawa, Lucerne*

While there are extensive data available for indicators related to forests, streams and agriculture, there is a lack of data for the UBE's flagship habitats, the peatlands. As a result, the impact of the park management's main activities in the ecological domain, which consist of measures for maintaining fens, bogs and mountain pastures, cannot be properly traced by any monitoring indicator. A major hurdle for not having introduced an UBE-internal data gathering system for these habitats is the large area to cover (2 000 ha) and the associated costs. The lack of sometimes very important information is one of the major limitations when monitoring activities have to rely on external data.

Social indicators

The main social aim of the UBE is to stop depopulation processes within the PA perimeter. The UBE management tries to pursue this aim with a number of measures, such as creating jobs, improving the region's image and raising the appreciation of local culture. The measures implemented have been very successful in terms of output: for example, the currently over 270 certified local products have led to job opportunities and improved regional self-esteem. However, the loss of 400 inhabitants between 2000 and 2007 (Schnider 2012) suggests that the management output didn't manifest as an impact on the indicator, i. e. the population continued to decrease in the first years after the UBE was established. The subsequent incipient population growth by 300 inhabitants since 2007 is very likely linked to investments in housing and retail. This has led to a positive feedback loop, increasing the appeal of the region for living and work. It is not known to what extent, if at all, the UBE influenced the decisions of the investors for the region.

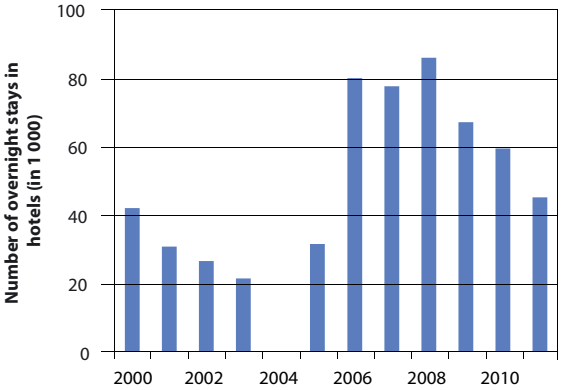

Figure 3 – Overnight stays in hotels from 2000 to 2011 in the UBE. Data from the Federal Office for Statistics, bfs, Bern. No data available for 2004

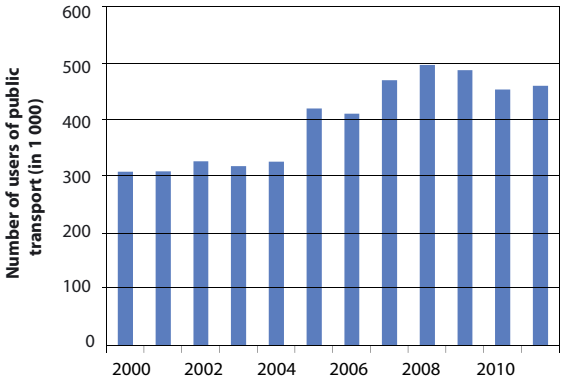

Figure 4 – Number of persons using the two most important bus lines of public transport in the UBE from 2000 to 2011. Data from Postauto Central Switzerland, Lucerne

This issue illustrates the key problem of sustainability indicators: they are often influenced by a multitude of external factors which render the causal link between the PA management activities and the monitoring data weak, unknown or absent – a phenomenon called the attribution gap.

Economic indicators

The tourism sector is one of the most prominent fields of activity of the UBE. A typical indicator for touristic development is the number of overnight stays (Figure 3). Finding reasons for the observed highly volatile trend is almost impossible. It does not correspond to the number of passengers on public transport (Figure 4), which is supposed to show a high correlation with the overnight stays but instead has increased steadily. On closer inspection of how the overnight stays data were gathered it turned out that the methods applied by the relevant authorities had changed several times and that one major accommodation provider had changed its business model in such a way that after 2009 these data were no longer taken into account. The data are thus not comparable between years and useless. This issue illustrates another prevalent problem of external data: data sources may be uncertain, inhomogeneous and the data may be gathered in a non-standardized way, which leads to limited data quality and data comparability.

The lack of meaningful data to illustrate the promised positive development of the tourism sector in the UBE represented a serious problem for the PA management. It therefore created conditions for improved future tourism indicators: standards for counting the overnight stays were designed in collaboration with the local hotels and tourism authorities. In addition, a research project (which can be repeated after 10 years for monitoring purposes) was conducted to assess the current economic impacts of tourism. This study (Knaus 2012) revealed that currently an estimated 280 000 guests visit the UBE in summer and autumn, of which a considerable number, i.e. 45 000, travel to the region because of the biosphere reserve. These guests create an added value of 4.3 million euros, highlighting the economic importance of the biosphere reserve for the region. This is the only monitoring indicator that shows a clear causal relation to the management activities of the UBE, however, at a cost of ca. 40 000 euros for the study. Such a sum can only be raised for an indicator in exceptional circumstances.

Difficulties with evaluations

To identify whether the trends observed in the monitoring results can be potentially linked to the PA management activities, a reference trend for comparison is usually required. Other than comparing observed trends with regional or national trends

Infobox

UNESCO Biosphere Entlebuch
Established in 2001, representative for Alpine peatlands and karst mountain systems

Region: Central Switzerland, Canton of Lucerne

Main habitats:
15 600 ha forest
11 000 ha intensive cattle pastures and meadows
7 200 ha extensive grazing areas
2 000 ha fens and raised bogs
2 300 ha rocks and carst, unproductive
1 200 ha settlements
300 ha rivers and lakes

Location: 46° 46’31” N to 47° 02’12” N and 07° 51’25” E to 08° 09’53” E

Total size: 39 600 ha, of which 3 170 ha core zone, 16 630 ha buffer zone and 19 800 ha transition zone

Altitudinal range: 595 to 2 350 m

Number of inhabitants: 16 700

Economic structure: 7 800 jobs
Primary sector: 34%, secondary sector: 26%, tertiary sector: 40%

Management office and information point: Chlosterbuel 28, 6170 Schuepfheim, Switzerland with 10 employees

which are rather general, a comparison with a similar region without a PA label and management could be appropriate. However, such a comparison is problematic as it is impossible to find regions with exactly the same socioeconomic-environmental system attributes. Hence, reference trends have a severely limited potential for disentangling the impacts of external factors and those of management activities.

Further problems emerge from evaluating indicators that have ambiguous correlations to different pillars of sustainability. The slow but continous decrease in livestock in the UBE (Knaus 2011), that has been observed since 2004, for example, is ecologically beneficial (less intense agriculture) but detrimental in economic and social terms (reduction of farmers' incomes). These ambiguities or trade-offs pose a serious problem for evaluating a trend for its desirability or sustainability. In practice this cannot be resolved.

Concluding suggestions

Putting together a monitoring scheme holds many pitfalls as illustrated by the few examples above, the major ones being data quality and the attribution gap. Nevertheless, monitoring endeavours still offer considerable opportunities and remain an important management tool. Based on the experiences from the UBE 10-year monitoring project, the following procedure can be proposed in order to improve monitoring approaches:

1. based on the fundamental aims of your PA, design a conceptual model / system that links the aims with a neat and rather simple socioeconomic-environmental system of your PA (e. g. FOS 2009). This model is important for understanding the system that drives the PA region and allows for coarsely assessing the PA management's scope of impact on the monitoring indicators;
2. search for relevant monitoring data in all available sources and filter for data that are comparable over time;
3. link the monitoring data with the conceptual model;
4. try to make rough estimates on the possible contribution of the park management to the development of the monitoring indicators based on the causal influences that the system indicates for the relevant indicators;
5. evaluate the monitoring data in the context of your PA's aims, the regional or national trends and the sustainability paradigm in general whilst taking into account the limited scope of influence found in step 4;
6. derive measures for fields of activity where your aims have not been achieved;
7. identify knowledge gaps for important fields of activity, define indicators for them and set up a data gathering system that assesses these data sensitively in the future.

In this way a practical set of indicators can be identified and managed that gives sound information on the sustainability of the PA's development. By complementing these with data on the management activities, their outputs and outcomes, you can illustrate the effective potential to influence a region by the PA management, identify successes as well as failures and justify them.

The 10-year monitoring project of the UBE has illustrated many of these aspects and highlighted that within 10 years a respectable management output can be achieved, see Table 1. At the same time, it has become clear that it is difficult to change tack in a region where existing regulations have a big impact and subsidies exceed the PA budget by far.

Acknowledgements

I thank Thomas Hahn (ETH Zürich), Theo Schnider and Dr. Annette Schmid (both UBE) for their useful comments on earlier versions of the manuscript.

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