Participatory Ecological Monitoring (PEM)

Participatory research methods for sustainability – toolkit #4

Participatory Ecological Monitoring (PEM) is a conservation methodology aiming to include local communities in the collection and analysis of biodiversity and threats data in a managed conservation zone. Often implemented annually, PEM optimises local knowledge to help understand ecological change which is an essential step towards assessing the success or failure of conservation activity and improving conservation effectiveness.

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Participatory Ecological Monitoring (PEM) is widely utilised as a conservation management methodology in many developing countries where communities rely heavily on natural resources for livelihoods. PEM is defined as the joint activity of a group of trained technicians and local community members; measuring threats and changes to biodiversity within a defined conservation zone using measurable indicators. PEM tracks environmental trends, resource use, and natural resource management processes relevant to community needs (Danielsen et al. 2022). Typically, PEM facilitates longer-term monitoring in ongoing conservation projects, and it can also be used to establish a state-zero data point, or as a baseline prior to new conservation projects. PEM data can support zoning of a managed area, development of conservation planning, or preparation of funding proposals. PEM approaches can be modified for areas under participatory natural resource management, responding to difficulties in pursuing environmental information for decision making in times of rapid change (Guijt 1999). Successful PEM programmes involve different stakeholders in the process, useful for both ecological and socioeconomic outcomes.

Adopting PEM in conservation planning can:

- improve the knowledge base in terms of threats and observed changes to biodiversity,
- provide opportunities to discuss monitoring results and strengthen collaborations with local communities,
- develop transparency and trust towards improving environmental law enforcement,
- enhance conservation strategies to reduce anthropogenic threats, and
- engage local communities in the management of their own environment, with a view to increasing engagement and compliance.

In this series, we aim to alert *GAIA* readers to useful toolkits for participatory research methods in sustainability science. If you would like to contribute a toolkit description, please contact **gaia@oekom.de**.

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Procedure

Typically, PEM methodologies directly involve community members in collecting pre-determined ecological and socio-economic data with supervision from trained technicians.

The PEM procedure consists of ten steps:

1 ***Geographically and administratively define the intervention area, and specific PEM objectives:*** Conservation managers and technicians should collate the existing knowledge on the managed area and associated natural resources (e.g., forest, lake/riparian ecosystem, marine/coastal wetland), to better understand the current status of conservation targets; facilitating the design of PEM methods, presentation of results/report, and prediction of logistical considerations (including access conditions, telephone coverage and safety/security). Technicians require clear definitions of the intervention zone, the site size, number of vil- >

lages, working conditions, and an understanding of the number of people benefitting from local ecosystem services.

2 ***Request research permits/permissions from appropriate authorities:*** Determining the willingness of authorities and "buy-in" for conservation initiatives is important for establishing good collaboration with local stakeholders. Preparing a work schedule to discuss with local project managers is essential, enabling them to make initial visits to communities and alert local and regional authorities of planned work.

3 ***Selection of indicators and sampling methods:*** Indicators should be co-developed with locals and must be measurable in time and space. Methods must be repeatable based on accepted scientific standards so that PEM data are comparable. Sample size is critical to balance effort with representativeness. The PEM must consistently quantify space, but the approaches can be adapted to specific site needs and requirements, such as transect lines, quadrats, or circular; ideally using a stratified random distribution.

4 ***Development of field data forms:*** Custom designed data collection forms can aid data collation. Hand-written hard copy field sheets can be used in remote areas with limited power and connectivity. However, simple digital field data collection, such as the *Open Data Kit* library[1], can help reduce human error particularly in low literacy areas.

5 ***Courtesy visits:*** Courtesy visits to regional authorities are essential to confirm that planned activities fit with government policy and support regional development. At district or municipality level, visits to the head of local government and local environment/fisheries services are recommended to ensure the team has a "green light" to work with communities. When visiting communities, teams will often be welcomed by local organisations/groups undertaking initiatives to save wildlife. It is also crucial to visit traditional leaders and the administrative chief of a village who needs a clear understanding of the reasons for the PEM, to ensure the team's work has been communicated to community members.

6 ***Community meeting:*** Prior to data collection a meeting with local communities and key stakeholders is essential. There, the purpose of PEM is explained and volunteers who wish to contribute to the implementation of the tool can be identified.

7 ***Training and practice run:*** Volunteers receive their technical briefing and are supplied with field equipment. A practice run will help them to be familiar with the PEM methodology. They are often given a subsistence payment for their time, with the value determined by local economic norms.

8 ***Field data collection:*** The exact procedure undertaken by the teams would be pre-determined from a set of approved methodologies, collated by the technicians and project manager. The techniques, materials, and indicators used can be adapted to fit a variety of aquatic and terrestrial habitats. An example protocol can be seen in box 1. PEM equipment will include maps, GPS receivers, binoculars, datasheet, pen (or tablet) and compass. The duration of a PEM campaign depends on the size of the managed area, the sampling frame and size. The start and finish times of each observation are timed to ensure data comparability and accuracy.

9 ***Data consolidation and feedback meeting:*** After the PEM data is collected, a public feedback meeting is organised. The local volunteers from each subgroup are invited to report the results of their observations, describing their actions. It is important for government department representatives to remind all those present of the official status of the managed area and related policy, with examples of law enforcement. To end the meeting, local officials are invited to voice their own conservation messages which often aim at social cohesion, improved behaviour, and mutual trust.

10 ***Dissemination:*** Disseminating monitoring results (figures, tables) for example through local media or displaying them at local government offices is important, so that local authorities and those passing through from nearby communities become aware of the PEM activity and its outcomes. This will help to reduce the risk of corruption and lead to increased conservation buy-in. Technicians can now update the PEM database and move on to other communities.

Skills and resources needed

A successful PEM requires technicians and conservation managers to be hard working, open with local communities, and have an understanding of evaluation methods. Critically, managers must not undervalue or take the place of local communities' knowledge and experience; rather PEM is more effective if technicians engage deeply with communities to build trusting and equitable partnerships.

Communication is key; consulting community managers about their conservation targets is essential to gain a clear understanding of previous activities, in a bid to control threats and increase viability. Before going to the field, technicians should be aware of regulations related to management, for example, protected area zoning, prohibited tree categories, official hunting/fishing period etc. It is important to review relevant scientific papers or technical reports and look at existing management plans to identify potentially beneficial changes.

PEM is simple, cost-effective, and can enable stimulating discussions at local level (Evans and Guariguata 2008). Conservation managers should budget for continuity of funding as ter-

1 *https://getodk.org*

BOX 1: Participatory Ecological Monitoring (PEM) in Menabe Antimena protected area in Madagascar

The *Durrell Madagascar Programme* has conducted PEM annually in ten villages in Menabe Antimena (210,000 hectares) since 2004, managed by the NGO Fanamby. Demonstrating clear conservation targets and associated management plans and structures, the programme aims to understand levels of anthropogenic threats, while protecting wetlands, dry forests, and their endangered species (e.g., giant jumping rat, lemurs, water birds, flat tailed tortoise).

Volunteers collected data on *biodiversity:* occurrences of observed lemurs by species, active/inactive giant jumping rat's burrow, selected bird species; *threats:* recent deforestation, size of burned area, number of signs of illegal hunting, signs of oxcarts; *social:* rate of participation of women in village meetings.

An example PEM for Kiboy Village in Menabe took five days, including a village meeting, three days of fieldwork, and a community feedback meeting. The PEM team consisted of nine people (six local volunteers split into pairs and supported by a trained technician). Each group lines up along a selected transect (the length of the transect is determined by the conservation manager and depends on habitat visibility and survey resolution). Volunteers participated because of their personal desire to save wildlife. They were given a subsistence allowance of about three US dollars per person per day. Durrell has incorporated PEM results into public quizzes and developed annual inter-village competitions with prizes awarded in the form of infrastructure improvements designed to reinforce social cohesion, enhancing local pride, and community well-being.

FIGURE 1: Herizo Andrianandrasana in a PEM feedback meeting in Kiboy village, Menabe, western Madagascar in 2014.

minating a PEM project without warning could result in significant disappointment, damaging local motivation. If possible, financing the PEM programmes through social enterprises that generate sustainable revenue to local communities, not relying on external funding, will guarantee long-term and more successful results.

It is important to ensure the presence of traditional and administrative village leaders in village meetings, to achieve the intended conservation impacts. The PEM team should avoid work on days of cultural or traditional significance in order to guarantee maximum public participation. These factors are key for maintaining a good relationship with communities and influencing their attitudes.

Strengths and weaknesses

The feedback meeting (figure 1) is a great opportunity for local PEM managers to raise public awareness of the importance of wildlife for future generations and inform decision making.

- PEM can support the respect of traditional practices that make a positive contribution to wildlife conservation to maximise the overall conservation outcomes.
- PEM helps harmonise conservation and development efforts, based on real local needs.
- The PEM method is often criticised as less rigorous, thus not generating accurate data for estimating population decline, species density, etc. However, if conducted with scientifically acceptable methods, PEM can give a better overall chance of achieving significant conservation results, especially as PEM may even be more statistically powerful than "scientific" monitoring if there are greater numbers of sample units and monitoring continues for a longer period.
- Local communities may be disappointed if there is no feedback from the government after they officially report illegal activities.
- PEM may present a risk of abuse of power by volunteers, especially those provided with uniforms. Care should be taken so that they do not act beyond their role.
- It is hard to control confidentiality of some data when running PEM in a park that has species threatened by smuggling or international traffic; location of these species cannot be disclosed publicly.

In conclusion, it is suggested that a wider use of PEM could make a significant contribution to resolving some of the world's environmental and conservation challenges.

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