MISTRA

EviEM Annual Report 2012

MISTRA EviEM

MISTRA COUNCIL FOR
EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT

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EviEM – the Mistra Council for Evidence-Based Environmental Management – was established in January 2012.

EviEM's aim is to improve the basis for environmental decision-making in Sweden by means of systematic reviews of a range of environmental issues.

EviEM has a Secretariat, based at the Royal Swedish Academy of Sciences in Stockholm, and is governed by an Executive Committee made up of international and Swedish researchers, experts and decision-makers in the environmental field.

EviEM is politically and financially independent and is funded by a grant from Mistra (the Swedish Foundation for Strategic Environmental Research), totalling SEK 60 million over the period 2012–2016.

EviEM launched three projects in 2012 that will shed light on three much-debated environmental questions.

Mistra EviEM – Mistra Council for Evidence-Based Environmental Management

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The Swedish Foundation for Strategic Environmental Research

Overview of best research for a better environment

> “Without a synthesis of the most reliable findings, you get stakeholder groups using evidence to support their entrenched views.”
>
> **Andrew Pullin**, professor at Bangor University, leading figure in evidence-based environmental management and a member of EviEM’s Executive Committee

Systematic reviews are a method of gathering and assessing the quality of all relevant research findings that shed light on a given question, and then summarising the outcome in an accessible report aimed at decision-makers.

Evidence-based environmental management is environmental management built on the best available scientific foundation.

READ MORE . . .

Wake-up calls and research

Fifty years ago, Rachel Carson’s *Silent Spring* was published. It would prove a wake-up call on the negative environmental impact of human activities. Almost a hundred years earlier, in 1864, George Perkins Marsh, the first US ambassador to a united Italy, had described in his book *Man and Nature* how humankind had ravaged the environment, chiefly by cutting down forests. Both books were to influence public debate, and both were based on the scientific knowledge of their day.

Over the last half-century, awareness of the importance of research in support of decision-making has steadily grown. Mistra’s initiative to set up EviEM has created a review function that will make it easier to arrive at environmental management decisions based on the best available scientific evidence. EviEM is focusing on questions of particular relevance to Swedish decision-makers, but we hope of course that they will be of interest far beyond this country’s borders.

The challenge is not only to conduct high-quality reviews, but also to involve stakeholders, so that the results have the impact we wish to see. In 2012, the EviEM Secretariat has laid the foundations for the networks of end-users that will be the key to success.

In one year, EviEM has learnt to crawl and walk. Next year, we’ll be running.

Thomas Rosswall
Chair
EviEM Executive Committee

PHOTO: DENNY LORENTZEN

The bigger picture, not entrenched views

■ ■ ■ Environmental management is often based on views or traditions, and rarely on the most reliable research findings, says Andrew Pullin. Stakeholder groups may simply dig out the research that best supports their cause. 'You end up with policy-based evidence, rather than evidence-based policy.'

In 2007, Andrew Pullin became the world's first professor in evidence-based conservation, that is, conservation informed by scientific findings. He began his research career studying how butterflies are affected by an increasingly fragmented landscape. Now he spends a lot of time fighting fragmentation, but in a slightly different way.

Ten years ago, realising how little use conservation organisations made of established research, he set up the Centre for Evidence-Based Conservation, CEBC, at the University of Birmingham, before moving to Bangor University in Wales, where he further developed a method that had long been used in medicine. Today, as part of the centre's systematic reviews, thousands of scientific articles are retrieved, analysed, quality-assessed and collated to form a basis for decisions by the agencies or organisations commissioning the reviews.

Environmental management is a large, wide-ranging field of research, yet the gap between what the best available science tells us and what actually reaches the public and decision-makers can be considerable.

'Some research is published in high-impact journals, some is not formally published, and much of it is read by very few people. Knowledge is disseminated in an uncontrolled way, not necessarily based on what is important,' says Professor Pullin. 'We create fragments of information. We may think we know what the evidence suggests, when we really don't have the bigger picture.'

TO DATE, THE CEBC has carried out some fifty systematic reviews of environmental issues. Some have proved highly controversial, such as when conservation organisations wanted to ban controlled burning of heather, practised by British landowners for over a century to optimise red grouse populations. Grouse shooting is a lucrative business with a turnover of millions, but conservationists argued that heather burning reduces biodiversity. The CEBC's review showed that there is no clear-cut evidence that it does.

'What surprises many is how much poor-quality evidence gets reported, and how hard it is to predict the effects of an intervention. Environmentalists have been complacent, often promoting action without evidence that it will be effective. They need a wake-up call.'

EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT is environmental management built on the best available scientific foundation.

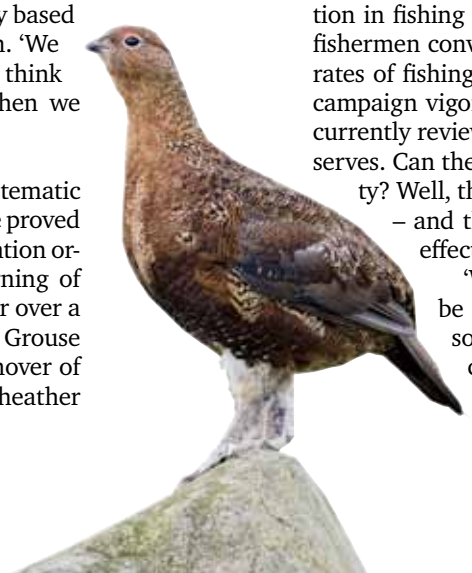
CONTROVERSY IS LIKELY to be par for the course for the CEBC, but to Andrew Pullin a successful systematic review is not one that avoids sensitive issues, but one that is done properly. He is a passionate advocate of syntheses as the best way of supporting politicians and government agencies in their environmental decisions. A synthesis of his own conclusions runs roughly like this:

'Without a synthesis of the most reliable findings, you get stakeholder groups using evidence to support their entrenched views. Without the bigger picture, you maintain those entrenched positions and never really solve anything.'

There are clear examples of this, fisheries policy being one. On one side, there are environmentalists calling for marine nature reserves and a reduction in fishing pressure, on the other, commercial fishermen convinced that continuing with current rates of fishing will not harm stocks. Both groups campaign vigorously for their views. The CEBC is currently reviewing the effectiveness of marine reserves. Can they protect fish stocks and biodiversity? Well, that depends, Professor Pullin argues – and the interesting thing is what factors effectiveness depends on.

'What kinds of marine reserves will be more effective than others? That's something we'll hopefully have an increased capacity to predict.'

One challenge for the future is



Main model in Bangor, Wales

Mistra EviEM aims to support evidence-based environmental management in Sweden by providing decision-makers with syntheses of the most reliable research findings on different environmental issues. In medicine, similar reviews have been produced for over 25 years. In 2007, a corresponding network was set up in the environmental field, the Collaboration for Environmental Evidence (CEE). Behind CEE is EviEM's principal model, the Centre for Evidence-Based Conservation (CEBC) at Bangor University, Wales. The centre's director is Andrew Pullin, professor in evidence-based conservation and a member of EviEM's Executive Committee.

> "Without the bigger picture, you maintain those entrenched positions and never really solve anything."

disseminating knowledge from systematic reviews. A basic requirement of scientific studies is that they must be repeatable. You have to be able to see exactly how they were performed. All the steps in a systematic review are documented, which can make for quite tedious reading.

'We need to find better ways to communicate the outcomes of our work. Trying to condense reviews into entertaining messages can cause problems. That's not what they are about – they are complex.'

SO, TEN YEARS on, what is his centre's biggest achievement?

'Setting up the Collaboration for Environmental Evidence (CEE),' is his swift response. CEE was launched in 2007 as an international network linked to the CEBC, partly to get completed reviews out to a global audience. The Collaboration also develops new guidelines for systematic reviews and publishes an open-access journal on the subject. Two centres similar to the one in Bangor have been established in South Africa and Australia.

'Having a whole new generation of scientists who can conduct systematic reviews will make a big difference to the effectiveness of environmental management.'

Andrew Pullin is the prime mover behind evidence-based systematic reviews of environmental issues.

PHOTO: DENNY LORENTZEN

11 steps to a systematic review

A systematic review follows strict scientific rules. Transparency is key. That means that the whole process has to be very carefully planned and documented, to allow detailed scrutiny of the outcome after the review is completed.

8 The review team write a draft review report. If there are insufficient data to answer the question unequivocally, the report may instead identify a knowledge gap that needs to be filled.

SYSTEMATIC REVIEWS are a method of gathering and assessing the quality of all relevant research findings that shed light on a given question, and then summarising the outcome in an accessible report aimed at decision-makers.

7 The data that are usable are collated and analysed.

6 Studies that are not relevant or not of sufficient scientific quality are excluded. After this screening process, perhaps only a few dozen articles and reports will remain.

5 The review begins by identifying all the available data, chiefly scientific articles, but also other reports and even unpublished data. It may be a matter of hundreds, perhaps thousands, of studies.

4 The review team prepare a draft plan, or protocol, for the review. Decision-makers and other stakeholders are given the opportunity to comment, after which the protocol is finalised and published.

3 The Executive Committee decides to conduct a systematic review. A team of researchers is appointed to carry it out.

2 The EviEM Secretariat carries out a pilot review to assess the feasibility of a systematic review of the question.

1 A public agency, organisation etc. identifies an environmental issue that needs to be examined.

EviEM's first systematic reviews are concerned with the mountain environment and with ways of reducing eutrophication, for example by creating wetlands or removing large numbers of fish from nutrient-rich lakes.

11 The EviEM Secretariat prepares and disseminates popular summaries of the review's conclusions.

10 The review report is finalised and published. No recommendations are made; the aim, rather, is to offer a reliable basis for decisions.

9 Decision-makers and other stakeholders have a new opportunity to comment, this time mainly on how the results are presented.

Autumn saw launch of first

Mistra EviEM's first three systematic reviews got under way in the autumn of 2012, each of them run by a review team appointed by the Executive Committee. EviEM hopes to shed light on the following questions:

How do reindeer affect mountain vegetation?

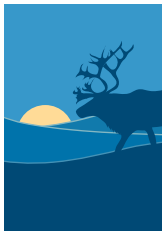
BACKGROUND: In the early 1990s, researchers and conservationists alike warned that there were now too many reindeer in Scandinavia's mountains, and that overgrazing threatened the sensitive vegetation there. Today, environmental managers believe that this overgrazing was local and rarely caused lasting damage. The general view is that reindeer grazing can in fact enhance species richness.

SITUATION TODAY: Many environmental managers are now concerned, rather, that some mountain areas could become overgrown because there are not enough reindeer. Yet reindeer numbers are not much lower today than they were around 1990.

PROPOSER: At the Swedish Environmental Protection Agency's suggestion, EviEM began a systematic review in autumn 2012 of what science has to say about the impact of reindeer grazing on mountain vegetation.

QUESTIONS: How far is Sweden's mountain landscape in fact 'characterised by grazing', and in what way? How would the species richness, cover and biomass of vegetation be affected if there were no reindeer, or more of them than at present?

ABOUT THE REVIEW: Started in October 2012. Chaired by Professor Jon Moen, ecologist at Umeå University. During the planning phase, chaired by Professor Annika Hofgaard, plant ecologist at the Norwegian Institute for Nature Research (NINA).



ENVIRONMENTAL OBJECTIVE
'A Magnificent Mountain Landscape' calls for a 'landscape characterised by grazing' to be maintained in mountain areas.

Review team:

Jon Moen, Department of Ecology and Environmental Science, Umeå University, Sweden
Kari Anne Bråthen, Norwegian Institute for Arctic and Marine Biology, University of Tromsø, Norway
Bruce Forbes, Arctic Centre, University of Lapland, Rovaniemi, Finland
James Speed, Museum of Natural History and Archaeology, Norwegian University of Science and Technology, Trondheim, Norway
Claes Bernes (project manager), EviEM, Stockholm, Sweden

three projects

PHOTO: MAGNUS LAND

Constructed wetland in the Bergius Botanic Garden, Stockholm, within walking distance of Mistra EviEM's headquarters at the Royal Swedish Academy of Sciences.

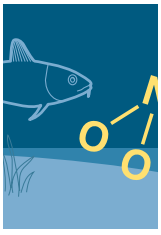
How good are wetlands at trapping nutrients?

BACKGROUND: Of the wetlands Sweden had in the 19th century – mires, wet woodlands and meadows, and wet transition zones between land and water – only a fraction remain. Northern Sweden has plenty of mires, but in coastal areas of the south 80–90 per cent of wetlands have been lost, either drained or filled in to make farming and forestry more efficient. Once they helped to absorb nutrients such as nitrogen, preventing them reaching the sea.

SITUATION TODAY: Since the 1990s, many wetlands have been restored or created to reduce the spread of nutrients and further purify treated domestic and industrial waste water. Most are agreed that wetlands can remove nitrogen from the water passing through them, but it is not always known how efficiently they do so, or how individual wetlands should be constructed to be most effective.

POTENTIAL: An overview of how different wetlands work would make it easier to plan more effective water conservation.

PROPOSER: A review of the effectiveness of man-made wetlands as nutrient traps was suggested at a meeting between EviEM and a number of environmental organisations. Key stakeholders are the Swedish Board of Agriculture and Swedish Agency for Marine and Water Management.



ENVIRONMENTAL OBJECTIVE
Wetlands reduce nutrient loads and help achieve the environmental objective 'Zero Eutrophication'.

QUESTIONS: How much nitrogen and phosphorus can individual wetlands absorb? How large are the variations? Does retention differ from one type of wetland and one type of water to another?

ABOUT THE REVIEW: Started in December 2012. Chaired by Emeritus Professor Wilhelm Granéli, a limnologist at Lund University.

Review team:

Wilhelm Granéli, Aquatic Ecology, Lund University, Sweden
William Mitsch, Everglades Wetland Research Park, Florida Gulf Coast University, USA
Jos Verhoeven, Institute of Environmental Biology, Utrecht University, The Netherlands
Carl Christian Hoffmann, Department of Bioscience–Freshwater Ecology, Aarhus University, Denmark
Karin Tonderski, Department of Physics, Chemistry and Biology, Linköping University, Sweden
Anders Grimvall, Department of Computer and Information Science, Linköping University, Sweden
Magnus Land (project manager), EviEM, Stockholm, Sweden

PHOTO: JOHAN FORSSBLAD

ENVIRONMENTAL OBJECTIVE
Reduced algal blooms will help meet the objective 'Zero Eutrophication'.

Does biomanipulation improve water quality?

BACKGROUND: Thousands of Swedish lakes are affected by eutrophication, mainly due to the last hundred years' sewage discharges from towns and nutrient run-off from farmland. These inputs have declined, but many lakes still suffer from algal blooms and oxygen depletion. Phosphorus that has built up in benthic sediments can leak into the water, keeping it eutrophic for decades.

SITUATION TODAY: Removing roach, bream and other cyprinid fish to restore eutrophicated lakes is a form of 'biomanipulation' that has been tried in many parts of the world, with at least 40 cases in Denmark alone. In Sweden, the method has so far been confined to a few lakes in southern and central regions of the country. But interest is now growing, not least since the introduction of the EU's Water Framework Directive, which requires tougher action on eutrophication.

POTENTIAL: With fewer cyprinids, more of the zooplankton that form their staple diet survive. These zooplankton in turn eat more phytoplankton. The result is improved transparency and oxygen levels in the water.

PROPOSER: EviEM has decided to systematically review how biomanipulation can curb algal blooms and similar problems in eutrophicated lakes. A key stakeholder is the Swedish Agency for Marine and Water Management.

ABOUT THE REVIEW: Started in December 2012. Chaired by Per Larsson, professor of aquatic ecology at Linnaeus University, Kalmar.

Review team:

Per Larsson, School of Natural Sciences, Linnaeus University, Kalmar, Sweden
Stephen R. Carpenter, Center for Limnology, University of Wisconsin, Madison, USA
Anna Gårdmark, Department of Aquatic Resources, Swedish University of Agricultural Sciences, Öregrund, Sweden
Lennart Persson, Department of Ecology and Environmental Science, Umeå University, Sweden
Christian Skov, DTU Aqua, Technical University of Denmark, Silkeborg, Denmark
Ellen Van Donk, Nederlands Instituut voor Ecologie, Wageningen, The Netherlands
Claes Bernes (project manager), EviEM, Stockholm, Sweden

Bream caught in Lake Finjasjön.

PHOTO: CLAES BERNES

On 24 September EviEM met some of the stakeholders who could benefit from its work.

Questions that can be reviewed

- Environmental issues that are controversial or have attracted particular attention
- Questions given priority in environmental policy
- Questions that are incompletely studied, or where results are disputed
- Interventions that are particularly costly or otherwise demanding of resources
- Environmental impacts or interventions affecting valuable natural assets or large areas
- New forms of environmental impact, change or management
- Interventions that benefit the environment in some respects, but are harmful in others
- Environmental problems that are tackled using several different methods.

Stakeholders in from the start

The main practical beneficiaries of Mistra EviEM's reviews will be authorities, decision-makers and other stakeholders in the environmental sector. That is why they are involved from the start. They can for example suggest questions for review.

The importance of involving end-users of the results from the very outset was underlined in the study that proposed setting up Mistra EviEM. Both Dutch and British models have stressed how vital this is, not least when it comes to formulating questions.

EviEM held two stakeholder meetings in 2012. The first, in January, resulted among other things in the three projects launched during the year. The second was in September, with people from the Swedish Environmental Protection Agency, Swedish Chemicals Agency, Swedish Institute for the Marine Environment, Ministry of the Environment and other bodies. A wide range of areas were discussed. How are the seas affected by plastic and other marine litter? What role does thiamine deficiency play in bird die-offs? And does the 'Swedish model' work in Swedish forestry?

One of those attending, Professor Lena Gustafsson of the Swedish University of Agricultural Sciences, described her experience of systematic reviews. She has studied whether 'woodland key habitats', the roughly 80,000 habitat patches of biological value inventoried by the Swedish Forest Agency, can be said to be 'hotspots' for red-listed species. The research literature reviewed showed that they can.

'We had a clear question and a sufficient number of studies,' said Professor Gustafsson, who also listed some of the advantages of systematic reviews:

'Researchers are forced to formulate precise questions, describe exactly how they search for and select literature, and analyse data from several similar studies.'

A well-formulated question, it emerges, is crucial to a successful review. In addition, the reviews Mistra EviEM conducts have to be relevant to conditions in Sweden.

> "Advantage to be forced to formulate precise questions."

Mistra EviEM scours the research literature

The initiative to study the feasibility of a Swedish council for evidence-based environmental management came from Mistra, the Swedish Foundation for Strategic Environmental Research, following calls from researchers and research users.

'Environmental research is politically charged. Researchers are not always entirely objective, and findings tend to be served up one at a time. There was a need for someone to produce comprehensive syntheses,' says Kjell Danell, emeritus professor at the Swedish University of Agricultural Sciences, who was involved in the study that gave rise to Mistra EviEM.

Its recommendations were presented in 2011, and on 1 January 2012 Mistra EviEM was established. The Council consists of a Secretariat, based at the Royal Swedish Academy of Sciences, and an Executive Committee made up of Swedish and international experts. The Committee decides which environmental areas are to be looked into.

> "It puts researchers, and the media, on their toes."

The main task is to critically review all the research findings in the area concerned and give an overall picture of them, providing a better basis for Swedish environmental decision-making.

'It puts researchers, and the media, on their toes,' Professor Danell believes. 'A journalist who knows that heavyweight syntheses are on the way won't pounce on every titbit of research and blow it up into a big headline.'

The aim is to get environmental managers to use the methods that do most good, so popular versions of the syntheses will also be published.

'That way, there's great potential to reach and influence policy- and decision-makers.'

Evidence-based health care a well-tested model

Mistra EviEM's models are to be found both abroad and in other fields. In medicine, evidence-based methods have existed for over 25 years. Sweden was one of the first countries to set up a special agency to systematically review research results and methods in health care, the Swedish Council on Health Technology Assessment (SBU). The initiative came from the Ministry of Health and Social Affairs. Health economist Egon Jonsson gave a lead, as did Professor Lars Werkö, a major figure in Swedish medicine.

'Egon Jonsson had picked up on the international trend towards evidence-based medicine, and drew attention to the economic benefits,' says Professor Kjell Asplund, chair of SBU's Scientific Advisory Committee and a member of EviEM's Executive Committee.

'Lars Werkö wanted to bring order to the scientific data. He knew that many methods were chosen to suit people's own world views. And pharmaceutical companies were keen to publish results they could make money from.'

SBU soon showed, for example, that routine preoperative tests were not universally beneficial, and recommended individual testing as and when needed. This brought savings of millions.

'In one year, it saved several times SBU's annual budget,' Professor Asplund recalls.

The very latest SBU assessment could also save lives. A review of drug treatment for schizophrenia shows four new drugs to be more efficacious than older ones. What is more, one of them, clozapine, reduces the risk of suicide and has fewer side effects than the others.

> "It saved several times the annual budget."

A&E waiting times cut

A recent systematic review by SBU lent scientific support to various measures to reduce waiting times in hospital emergency departments. One is a 'fast track' for patients with moderately severe conditions, which speeds up the overall patient flow. Setting up mini-labs and letting nurses rather than doctors write X-ray referrals are other simple measures that have proved to cut waiting times.

PHOTO: CLAES BERNES

19 JANUARY AND 24 SEPTEMBER. *EviEM invited stakeholders to two meetings in the Tower Room of the Royal Swedish Academy of Sciences, Stockholm, to get their suggestions for environmental questions to be reviewed. The first seminar resulted in EviEM's first three projects. At the second, the strengths and challenges of systematic reviews were discussed. In future, a stakeholder meeting is to be held every September.*

PHOTO: CLAES BERNES

28 AUGUST–2 SEPTEMBER. *The European Congress of Conservation Biology (ECCB) was hosted in Glasgow, Scotland. EviEM introduced itself to international colleagues and caught up on the latest environmental research from around the world.*

The year in brief

11 JUNE. *EviEM's website was launched: www.eviem.se. The site explains how we work, describes our projects, and offers news of systematic reviews in the environmental field. An important channel for spreading the word about evidence-based environmental management.*

PHOTO: CLAES BERNES

13–15 MARCH. *Study visit to the Centre for Evidence-Based Conservation (CEBC) in Bangor, Wales, EviEM's principal model. The centre shared its experience of systematic reviews of environmental issues. The visit underlined the importance of international cooperation in achieving wider adoption of evidence-based environmental management.*

PHOTO: DENNY LORENTZEN

15 OCTOBER–11 NOVEMBER *Neal Haddaway, from the CEBC at Bangor University, spent a month during the autumn as a guest researcher at EviEM. He worked with us on an update of the systematic review guidelines produced by the Collaboration for Environmental Evidence (CEE). 'Enlightening to see how reviews have gradually become more robust and reliable,' was his comment as the work drew to a close. The guidelines are available from www.environmentalevidence.org.*

Executive Committee

PHOTO: DENNY LORENTZEN

Seated from left: **Katherine Richardson**, Professor in Biological Oceanography and leader of the Sustainability Science Centre, University of Copenhagen, Denmark, **Andrew Pullin,** Professor in Evidence-Based Conservation and Director of the CEBC, Bangor University, United Kingdom, **Eva Thörnelöf**, Head of the Research and Assessment Department, Swedish Environmental Protection Agency, Sweden, **Jacob Fant**, brand consultant, Sweden, and Professor **Kjell Asplund**, Chair of the Scientific Advisory Committee, Swedish Council on Health Technology Assessment (SBU), Sweden.

Standing from left: **Jerry M. Melillo,** Director Emeritus of the Ecosystems Center, Marine Biological Laboratory, Woods Hole, Massachusetts, USA, **Thomas Rosswall** (chair), former Executive Director of the International Council for Science (ICSU) and former Vice-Chancellor of the Swedish University of Agricultural Sciences (SLU), Sweden, and Professor **Henrik Smith**, Director of the Centre for Environmental and Climate Research, Lund University, Sweden.

Secretariat

PHOTO: DENNY LORENTZEN

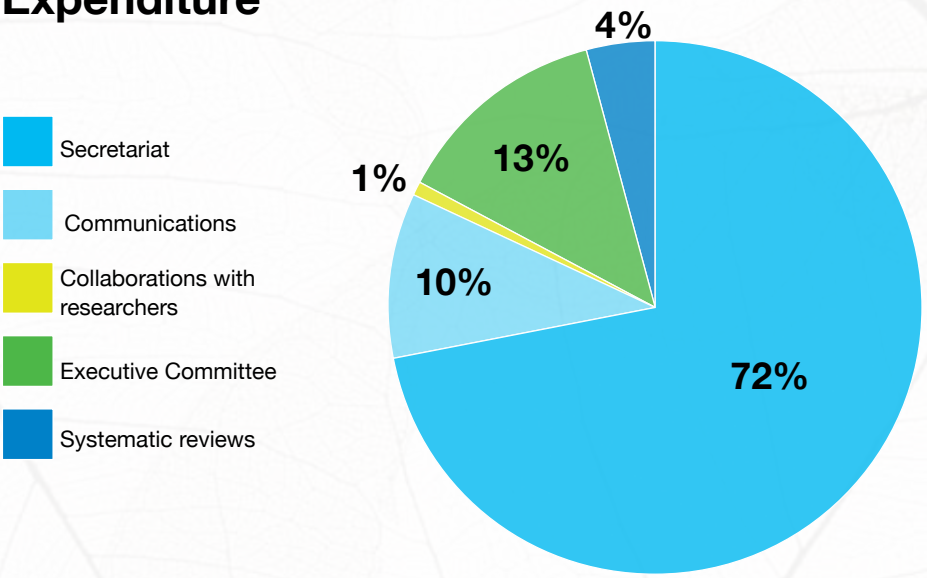
From left: **Matilda Miljand**, Coordinator, **Magnus Land**, Project Manager, **Sif Johansson**, Director, and **Claes Bernes**, Project Manager.

Financial summary 2012

Income and expenditure SEK

Income	5,985,000
Secretariat	4,011,000
Communications	584,000
Collaborations with researchers	34,000
Executive Committee	719,000
Systematic reviews	202,000
Total expenditure	**5,550,000**

Expenditure



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Mistra EviEM conducts systematic reviews of environmental issues identified as important by public agencies and other stakeholders. These provide an overall assessment of the state of scientific knowledge and help to improve the basis for environmental decision-making in Sweden. Three reviews began in 2012, including one examining the impact of reindeer grazing on mountain vegetation.