The value of ecosystem services

Introduction

In this activity students study diagrams and text from a Millennium ecosystem assessment report: *Ecosystems and human well-being: General Synthesis*. They then form 'cross-over groups' to explain an area of importance to each other.

This is a long and complex document and some students will find it challenging. The language of the report is quite specialised. All groups should be encouraged to work at understanding it. However in case of difficulty the Green Facts site provides a summary of the report using questions that match the chapter headings. It presents the information at three levels of complexity and includes a glossary.

Resources
http://www.maweb.org/documents/document.356.aspx. pdf
http://www.greenfacts.org/en/ecosystems/index.htm - 3

Students use note-taking techniques to represent information in a different format.

Group the students into four study groups, who will each study one of four sections of the report. Depending on numbers in the class, you may have one or more than one group per study area and 8 presentation groups. The groups should contain four students (or pairs of students if odd numbers) each, so that the cross-over allows the presentation groups to contain a mixture of students who have studied all 4 sections of the report. See student sheets for an explanation of a way of organising this.

Study group 1: *Examples of supporting, provisioning, cultural and regulating services should be included. Human well-being involves factors such as basic resources, health, social relations etc. Listed on pages vi, vii.*
Discussion should focus on the direct and indirect drivers.

Study group 2: *A discussion of the relative effects of loss of ecosystem services should emphasise the more direct reliance on services by rural communities relying on agriculture, those in low-lying areas susceptible to flooding and effects on nutrition and health. Wealthy populations may be insulated from*

How Science Works

Ad A set of repeat measurements can summarised by stating an average value (mean, **median, mode**) and an indication of the spread of values (range, **inter-quartile range,** average deviation, **standard deviation**). Useful visual representations are error bars on graph points, and box-and-whisker plot.**Ag** Data can be presented and analysed in a variety of formats including graphs with linear and logarithmic scales.

Ha Science-based technology provides people with many things that they value, and which enhance the quality of life or of the environment. Some technologies, however, have unintended and undesirable impacts. These need to be weighed against the benefits.

Hb Decision makers aim to make evidence-based decisions, taking into account factors that include: technical feasibility, benefits expected, economic cost, risks to human health and well-being, risks to the environment. Cost-benefit analysis is the process of estimating the size of the costs and the value of the benefits as a way of determining the best policy option. A cost-benefit analysis should consider which individuals or groups receive the benefits, and which suffer (or pay) the costs.**Hd** Some decisions about science and technology may need to comply with national and international agreements, legislation and agreed principles such as sustainable development.

He In practice much of the evidence available to decision makers is often uncertain. It is not possible to make accurate predictions about the future. The system may be too complex; some issues may not yet be well understood

Science explanations

Pi Some changes to ecosystems may lead to further changes that restore the system to stability; others can lead to irreversible disruption and large-scale effects.

some of these effects to a degree, but economic and cultural effects, and degradation of the environment (e.g. air quality) affect affluent and urban communities.

Study group 3: *If data is obtained directly e.g. from sampling, there can be more certainty about the inferences from the data. Other data, such as estimates from the past and predications of the future according to a range of scenarios will not be as certain.*

Study group 4: *Policy options include the need to influence the direct and indirect drivers of change. Importance of governance and enforcement of policies. Integration between environmental and other development goals, appropriate use of economic incentives. Social and behavioural policies, including population. Use of technologies and knowledge. The need for research.*

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Introduction

In this activity you will explore a section of a Millennium ecosystem assessment report: *Ecosystems and human well-being: General synthesis* in detail.
http://www.maweb.org/documents/document.356.aspx.pdf.
You will then explain it to other students, and listen critically to their report of a different section. It will help you to carry out this activity if you have skim-read the key questions and the summary of the report before being allocated a section and theme to explore in detail. This document has been summarised in the Green facts Digest .

The Green facts Digest of the report describes the context of the report as:

Human well-being is highly dependent on ecosystems and the benefits they provide such as food and drinkable water. Over the past 50 years, however, humans have had a tremendous impact on their environment.

To better understand the consequences of current changes to ecosystems and to evaluate scenarios for the future, UN Secretary General Kofi Annan has launched a comprehensive scientific study, the Millennium Ecosystem Assessment.

What actions could be taken to limit harmful consequences of ecosystem degradation?

Two terms that all groups will need to understand are: *Ecosystem services* and *Drivers.* The glossary section of the Green facts Digest will help you with these and any other terms you do not understand.

The activity

1) In your group, study the section of the report you have been allocated. Use note-taking techniques such as representing text as a visual (table, flow chart, diagram) or making bullet points from a diagram to help you understand and summarise the section.

2) Each member of your group will then join another group, and will explain your section of the report as simply as possible. In turn, you will hear other students present about their section. You should listen to the other presentations and ask questions until you understand the new section's content.

Study groups:

| 11 | 2 2 | 3 3 | 4 4 |
| 11 | 2 2 | 3 3 | 4 4 |
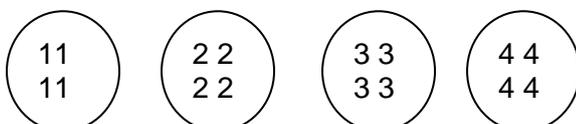
Cross-over for presentations:
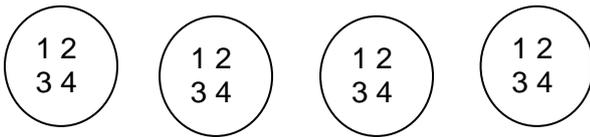
Study group 1: Your brief is to consider the value of ecosystem services and some of the reasons for the degradation of ecosystems. Your report should include:
- examples of ecosystem services and how they contribute to human well-being
- description of the threats to human well-being as ecosystems are degraded or are used unsustainably.
- explanation of the idea of direct and indirect 'drivers' of such change in ecosystems.

    o Use Figures A and B on pages vi and vii,
    o Use pages 1-7 and page 16.
    o You may also find Questions 2 and 4 of the Green Facts summary useful

Study group 2: Your brief is to compare and contrast the effects of loss of biodiversity and ecosystem services on rich and poor countries and communities. Your report should include:
- examples of how degradation of ecosystem services is harming different aspects of human well-being particularly in poorer communities. You may find the four aspects given in Figure A on page 50 helpful.
- examples of the drivers of degradation in different ecosystems
- a discussion of how richer countries may often benefit or be able to protect themselves against the effects of ecosystem degradation
- a discussion of the differences between rich and poor in their vulnerability to degradation of ecosystems.

    o Use pages 12- 14
    o Use pages 55-62.
    o You may also find Question 3 of the Green facts summary useful.

Study group 3: Your brief is to explain some of the most important uncertainties in the data and predictions that are used to determine policy on ecosystem degradation. Your report should include:
- a clear distinction between uncertainties in data about the past and uncertainties in prediction about the future, using scenarios
- an explanation of the different scenarios used to make predictions and the assumptions about drivers that each scenario contains
- examples of the different reasons for uncertainty in current data
- examples of the different reasons for uncertainty in predictions form scenarios

    o Read the explanation on the degree of certainty of statements in the last paragraph in the readers' guide page x.
    o Use Figure 3, page 4
    o Read the description of MA scenarios in box 1 on page 15
    o Use pages 101-102
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Study group 4: Your brief is to explain the different policy options available to protect ecosystems and some of the problems that are associated with implementing them. Your report should include:
- an explanation of how scenarios are used to make predictions

- a discussion of the way in which the scenarios all include assumptions about policies and examples of the range of policy areas included.
- examples of the way in which some of the policies are expected to change the drivers of ecosystem change and therefore the outcome for ecosystems
- an overview of the main policies recommended in the report and the expected outcomes
- examples of the problems that are likely to be associated with implementation of these policies

  o Read the description of MA scenarios in box 1 on page 15
  o Use pages 18 – 24
  o Look at Green Facts digest Question 8.