Lecture 14: Ecosystem service payments

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Today we're going to talk about ecosystem services again and this time we're going to be talking about valuations and payments.

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Learning Outcomes for this session, you should be able to give a case for valuation of ecosystem services, why should we do it.

You should be able to understand the framework for evaluating ecosystem services.

And be able to name some models and tools to value ecosystem services.

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When we're valuing ecosystem services, we need to be aware that a piece of land or an ecosystem provide different services and there are likely to be many conflicts between different stakeholders. In the previous lecture, we saw that a conifer plantation can offer a range of services and that private owners and environmental groups value different services. This may mean that enhancement of some ecosystem services lead to degradation of others, and often it is the non-market ecosystem service that will lose out.

Interestingly, in the Mekong Dam projects, the opposite has occurred. The dam in Cambodia has been postponed for 10 years, much to the relief of the people who have campaigned for its suspension. 60 million people depend on the resources of the Mekong Dam, as well as the huge biodiversity that it supports.

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But why do we value nature? What is the point? Some may argue that if we put $1 figure on a service that makes it easier to be destroyed and the local owner paid off. But there are compelling reasons for valuing ecosystem services. I'd like you to pause the video here and have a think about the reasons.

Make a list for each question. We will discuss this next week.

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So why do we need to value ecosystem services? Well, like it or not, we need to make use of our natural assets and sometimes destroy them. A growing population needs space for living and for growing food. A valuation of nature enables decision makers to make the best decisions in terms of which ecosystems or areas are more valuable in their natural state or converted for some purpose.

People who set government policy often do not have a background in ecology or conservation and their decisions will be swayed by powerful developers. By creating the ecosystem approach and valuing ecosystem services as an idea, a fairer balance can be struck. Informed choices can be made by systematically evaluating each ecosystem service.

The framework also enables evaluation of changes in the quality of the ecosystem service over time or after some kind of intervention. This is critical to sustainable management of ecosystems. Fundamentally human society is dependent on the natural environment. On one level, it is therefore of infinite value.

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Valuing can help policy decisions by determining whether a policy intervention that alters an ecosystem condition delivers net benefits to society by providing evidence on which to base decisions, and value for money and prioritizing funding.

Choosing between competing uses for example of land use.

Assessing liability for damage to the environment.

And wider communication, for example, to the public and land managers on the phone view of the environment.

An ecosystem service framework allows the analyst to link ecosystem services with human welfare systematically. While many challenges in valuing ecosystem services remain, the framework is seen as a good start.

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The impact pathway is a practical guide to the key steps to be taken in valuing ecosystem services from a policy perspective. When making a policy, the decision maker will consider the difference between making no change to the ecosystem, and the outcomes of various policy decisions. They will perform a cost benefit analysis.

The figure here shows an overview of an impact pathway of policy change. The changes we are considering are quite small, which reflects normal practice. So it would be a change to an existing service, for example, an extra hectare of existing woodland. We establish the environmental baseline from which a given policy change will start. We identify and provide the qualitative assessment of the potential impacts of policy decisions on ecosystem services. We quantify the impact of policy options on specific ecosystem services. We then assess the impact on human welfare.

Finally, we can apply economic values to the change in ecosystem services.

We need to consider the spatial scale of the service and the way they interact with other services. If you degrade one service, will it then affect other services. For example, if you reduce pollination by preventing these from foraging. This may negatively affect food plants that depend on bees for pollination.

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Assessing the relative value of ecosystem services is an interesting problem. Remember the threshold approach to multifunctionality in the previous lecture. That is important because there may be conditions that must be fulfilled for a service to be delivered, and anything that does not meet that condition results in no service. So for many ecosystem services, the relationship between the size of the ecosystem and the service might be linear. For example, if we need trees for climate regulation, we could assume that a 10 hectare area of forest, as we see here provides 10 times the amount of climate regulation as a one hectare forest. But what about the presence of a predator often described as a keystone species. They need a range of a certain size: you would not see one in the small patch of forest. Once the forest gets to a certain size then a predator might move in. Therefore, there is a threshold. These thresholds are quite difficult to account for. There are also likely to be many regulating services that are difficult to value. If you remember that these are things like bioremediation and erosion control. For things like this, we may need to do a qualitative assessment, rather than a quantitative one and perhaps use models or expert judgment.

Supporting services such as soil formation also need to be taken into account. These are known as intermediate services they will not be valued directly, but by taking into account of the other services that are more directly used.

We may need to consider which groups in society will be affected by changes in ecosystem services. And finally, we need to think about spatial scales and temporal scales the impact of the change could start small but be very strongly felt in later years.

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When we come to valuing an ecosystem, we first check the literature to see if there are any assessments for similar systems that can be used. So for rainforest, you can check those in Indonesia Cameroon or Brazil to see if there are any matching ecosystem valuations.

This diagram shows the total economic value framework. It considers both used ecosystem services and non-used ecosystem services. The framework refers to the total gain in wellbeing from a policy measured by adding together willingness to pay and willingness to accept. It is divided into use values, where the ecosystem service is used, and non-use values where they are not used but maintained.

Direct use value is where people make actual or planned use of a service. This could be food, fuel or some kind of cultural experience.

Indirect use is the services that are typically not noticed by people until they are damaged or lost, such as climate regulation, erosion control and so on. These can be difficult to measure or poorly understood.

An option value is the value people place on being able to use the service in the future. This could be a park where the people do not immediately plan to visit, but would like to one day.

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The total ecosystem value can be mapped onto the Millennium Ecosystem Assessment categories. The total ecosystem value can be used to explore what types of value we need to calculate for each ecosystem service.

There are two types of evaluation method. We are going to get into economics a little here and I can offer more resources if you are interested in reading further.

The economic evaluation attempts to find public references for changes in the environment in monetary terms.

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There are two main types of evaluation, economic and non-economic. Economic is looking at financial terms and uses a mixture of actual prices and information from asking people in order to arrive at an overall value. Revealed preferences rely on actual market prices while stated preferences are those obtained from questionnaires to discover people's preference for a given change. These values are hypothetical but useful.

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How can we provide rewards for providing ecosystem services? There are two main points, payments for ecosystem services and charges for ecosystem damage.

Payments for environmental services provide the incentive for individuals and businesses to maintain or improve land in order to provide ecosystem services. This would be a scheme by local or national government.

If you damage the ecosystem there are proposed costs to that as well. For example, the carbon tax in Australia or cap and trade, which is an emissions trading market based approach to reduce pollution and emissions. This is a problem because cap and trade will harm the economy and you could argue that by trading unused emissions, you do not get much net reduction. This is a very heated topic, and one that is still unresolved.

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Now we'll move into assessment of natural capital and some of the tools used. I have included some spreadsheets from the UK to show how some organizations value ecosystem services and natural capital. There are many tools and ways to do it. So I'll just pick three examples.

The first is the InVest model. This tool is freely available and easy to use. It is used all over the world for both land based and freshwater ecosystems. We are going to look at the InVest model used to understand the population dynamics of the Sumatran tiger in Indonesia. Here, the authors of the study mapped tiger habitat and ecosystem services in Sumatra. They carried out spatial analyses comparing the distribution of five ecosystem services based on a land use land cover analysis. There were two scenarios of land management under consideration, the conservation friendly Green Vision,

and the less conservation friendly Spatial Plan by the Indonesian Government.

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Here we see the true state of Sumatra in 2008 on the left. And the outcome of the two future scenarios on the right. These are calculated from the model. We see that the conservation Vision would double the area under forest relative to 2008 through protection and restoration and is based on the Sumatra 2020 roadmap. The government Spatial Plan is based on province level zoning plans.

While it would maintain the forest of the 2008 level, it would not prioritize biodiversity or ecosystem services. The remaining area would be used for plantations and production forestry. These two scenarios do not take into account other drivers of land use land cover such as climate governance or commodity prices.

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Here is the status of the tiger habitat and the five ecosystem services in 2008. As you can see the tiger habitat is very similar to the forest cover. Important points also to note are that carbon is highest in the north east of the island where there are extensive peatlands. In the west and south of the island, there are mountains and these have a lot of forest and therefore retain sediment. So erosion is low.

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These are the results of the two different scenarios as predicted by the InVest model. At the top is the more conservation based scenario and we see an increase in tiger habitat as well as increases in carbon, nitrogen and phosphorus. The government plan is more patchy and depends a lot on the location. The land type and the location of mountains and lowlands will have more of an impact in this model, especially in the middle of the island. The conclusion is that neither scenario would meet environmental and social goals across the entire landscape. More refinement is needed. There are also difficulties with who owns the land, with conflicts between local communities, forest departments and plantation companies. The author suggests that payments for ecosystem services would be the best way to reduce deforestation.

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Now move on to the Enabling a Natural Capital Approach (ENCA) formulated by Defra in the UK. I'm showing you here the template for the assessment of a given ecosystem. This template is designed to gather information for each step in an impact pathway approach. I am showing you this in case you would like to adapt it for use in Myanmar ecosystems. I have included the ENCA services data book as well, which is a really excellent resource. This would need adopting for Myanmar as well. But overall, it is a very useful guide.

The first step here is to understand the relevant natural systems that may be affected, and the environmental context of the land use change proposed. The habitat categories are in a drop down box so there is a fixed set. Each category is described further in the assets databook. I invite you to start thinking about how you can adopt this for Myanmar.

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The second step is to understand the changes in location extent, condition and so on, of natural assets. This is a good starting point for the appraisal and economic valuation. In step two, you will identify the type of natural assets that might be affected, selecting them from the drop down box. You will consider whether the spatial effect will be local or widespread, and whether it will be one effect or many. You will consider whether these effects are risks or opportunity and the timeframe of effects.

Then we move on to welfare implications. How will the changes affect the benefits society gains from ecosystem services? We might need to assess multiple impacts.

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Finally, we consider what is uncertain. These uncertainties are risks that must be costed and managed. Consideration should also be given to effects on the sustainable use of natural assets. For example, the exploitation of fish stocks should be monitored. Ecological tipping points where catastrophic loss could occur need to be highlighted.

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Finally, the ecosystem service transfer toolkit by Natural England also offers an Excel spreadsheet that I've shared with you. This one is helpful because it contains lots of information on the effects of changes on ecosystem services. This is the first sheet here, and you just choose your habitat and the planned intervention, and all the tabs along the bottom will update to show the correct information for that habitat. It is intended to enable people making land management decisions to assess the full range of effects on ecosystem services. Again, this is aimed at the UK, but it will have applications to ecosystems in Myanmar.

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Now there is obviously a lot of information here to cover and I've tried to give you a taste. If you'd like more resources, please let me know.

So in summary, when valuing ecosystem services, we need to consider both economic and non-economic services.

Valuing nature is important for making decisions about changes.

One key consideration is where the ecosystem services increase in a linear way or whether there are thresholds where you gain or lose services.

And there are many different tools to help calculate changes in land use.

Reading

Sumatran tiger- InVest model

ENCA datasheets

WWF Amazon ecosystem service evaluation

Discussion

1. Why should people value ecosystem services?

2. Can valuing ecosystem services help people understand that they are worth looking after?

3. Will valuing ecosystem services help conservation?