

Exercise 2: Calculating Ecosystem Services Values

The exercise involves the calculation of a set of ecosystem services values for an upland area in the region, using real data from Viet Nam. The area is mostly forested and is inhabited by ethnic minority communities who have livelihoods that combine farming with gathering products from the forests near where they live. The area contains ecosystems of outstanding ecological value and is also important for the protection of downstream water resources for hydropower, farming and water supply.

The goal of this exercise is to fill in the table below with ecosystem services values for each of the land cover types and the area as a whole. The different data for making these calculations is provided below. Once the values are calculated and entered, please write a short comment on the significance of the different values in the table.

Land Cover Type	Total Area (ha)	Provisioning Services: Timber & Crop Values (\$/year)	NTPF Values (\$/year)	Watershed Protection Values (\$/year)	Biodiversity Values (\$/year)	Carbon Sequestration Values (\$ total)	Totals
Forest Rich	169,763						
Forest Medium	126,048						
Forest Poor	46,821						
Shrub & Grasslands	75,717						
Agricultural Land	20,705						
Wetlands & Water	2,271						
Totals	441,324						

Comments:

Data for Calculating Service Values

Land Cover Type	Wood Standing Volume (m ³ /ha)	Biomass: tons of carbon per hectare
Forest Rich	280.6	182.2
Forest Medium	163.9	143.3
Forest Poor	80.2	96.9
Shrub & Grasslands		16.8

Crops:

2 crops/year: 1 season paddy & 1 season cassava

Paddy: 5 year average yield: 4.88 tons/ha: value (export price) \$472/ton

Cassava: 5 year average yield: 13.6 tons/ha: value (export price dried = 50% original weight) \$183/ton

Timber:

Commercial timber = 50% of total standing wood volume

Timber value: \$100/m³: calculate total stock value and sustainable yield value, based on assumption of a 30 year harvesting cycle (i.e. 1/30th of total volume can be harvested each year)

Fisheries and Water Plants/Animals:

Wetlands and water bodies can be highly productive in terms of their biomass outputs and often play an important role in the livelihoods of local people in terms of fishing, gathering crustaceans and other animals and gathering useful plants. Most of these products do not enter markets but their value can be calculated by their replacement costs: how much it would cost to buy equivalent products on the market. There are many studies in the region or further afield but most are of lowland wetlands or coastal mangroves which usually have a higher value in terms of direct products than upland wetlands and water bodies. Based on this, a value of **\$1,000/ha/yr** is assumed as the value of wetlands and water bodies in terms of their provisioning services potential.

Non-Timber Forest Products:

A wide variety of plants and animals valued for local livelihoods and, in some cases, commercial markets. Includes gathered foods (hunted animals, insects, honey, edible plants etc.), medicinal plants, fuelwood, construction materials, bamboo & rattan, fodder, others.

These products play a central role in the livelihoods of local communities in the area, who mostly gather from the forests close to their homes. Most of the potential values are

consequently not currently used but the calculation here is for the total potential NTFP value of the forests in the area. Several studies from across the Mekong Region have been used to estimate total potential NTFP values of:

- \$150/ha/yr for rich forests
- \$100/ha/yr for medium forests
- \$50/ha/yr for poor forests

Watershed Protection:

This is a vital service that upland areas such as this provide and generates both direct and indirect economic values for downstream communities and economic activities such as farming, hydropower, flood control, water supply and ecosystems conservation. Calculating these values can be difficult given the large number of potential beneficiaries and the wide range of possible services. For this example, the values used in the Payment for Forest Ecosystem Services programme in Viet Nam have been used as these are based on well-defined studies in pilot projects. The most detailed study, from Da Nimh Watershed, calculated a value for forest of \$69/ha/year for the value of soil protection and water regulation in the study area. These values are used here as a base, with values for different forest quality (based on the “K-coefficient” developed for the Viet Nam PFES programme) of:

- Forest High Quality: \$69/ha/year
- Forest Medium Quality: \$65/ha/year
- Forest Poor Quality: \$61/ha/year

Grasslands and shrublands are less effective for water and soil conservation but do have a role to play. An estimate, based on a wide range of international studies, is that this could be assumed to be 50% of the effectiveness of a full forest cover, giving a value for grasslands and shrublands of **\$34/ha/year**.

Wetlands and Water Bodies are of great importance in watershed protection purposes, acting as natural (or man-made in the case of reservoirs) water storage facilities that regulate water flows over time. The exact character of these functions is locality-specific but for our purposes we can assume a value of **\$200/ha/yr**.

Biodiversity:

This is notoriously one of the hardest values to calculate, partly because it depends on the characteristics of the local ecosystems in terms of their inherent ecological values and in part because it is strongly based on opinions on the values of ecological conservation. One way to do it is to calculate the cost of conservation: especially of moving sensitive and high value species to a new location. Global studies show huge variations in the values assigned to biodiversity (based on the data base of the recent study ‘The Economics of Ecosystems and Biodiversity’ or TEEB, which contains 4,000 references). For our purposes, we can use a figure from a recent study in the Cardamom Mountains in Cambodia, which assigned a value of **\$650/ha/yr** for areas of **high ecological value**, assumed to be **30%** of the total forest

area. The remaining **70%** of forests can be assumed to have a lower value, but still some significant value, assumed to be **\$200/ha/yr**.

Carbon Sequestration:

This is an extremely important but usually neglected value of forests and other land cover types. There is an increasing volume of data on the value of biomass carbon stocks (though much less on soil carbon, which can be extremely important). The table above gives carbon stock values for different land cover types from the Forest Inventory & Planning Institute of Viet Nam, based on national surveys. These are in line with other international assessments and can be used for this exercise.

The value of carbon is increasingly taken as meaning the trading price in international carbon markets. These have been very volatile in recent years, with on average prices falling significantly in recent years from the high values of up to \$40/ton of carbon when the markets first emerged. Recent prices in the Asia region have been much lower and an average price of **\$7/ton carbon** can be used for this exercise.