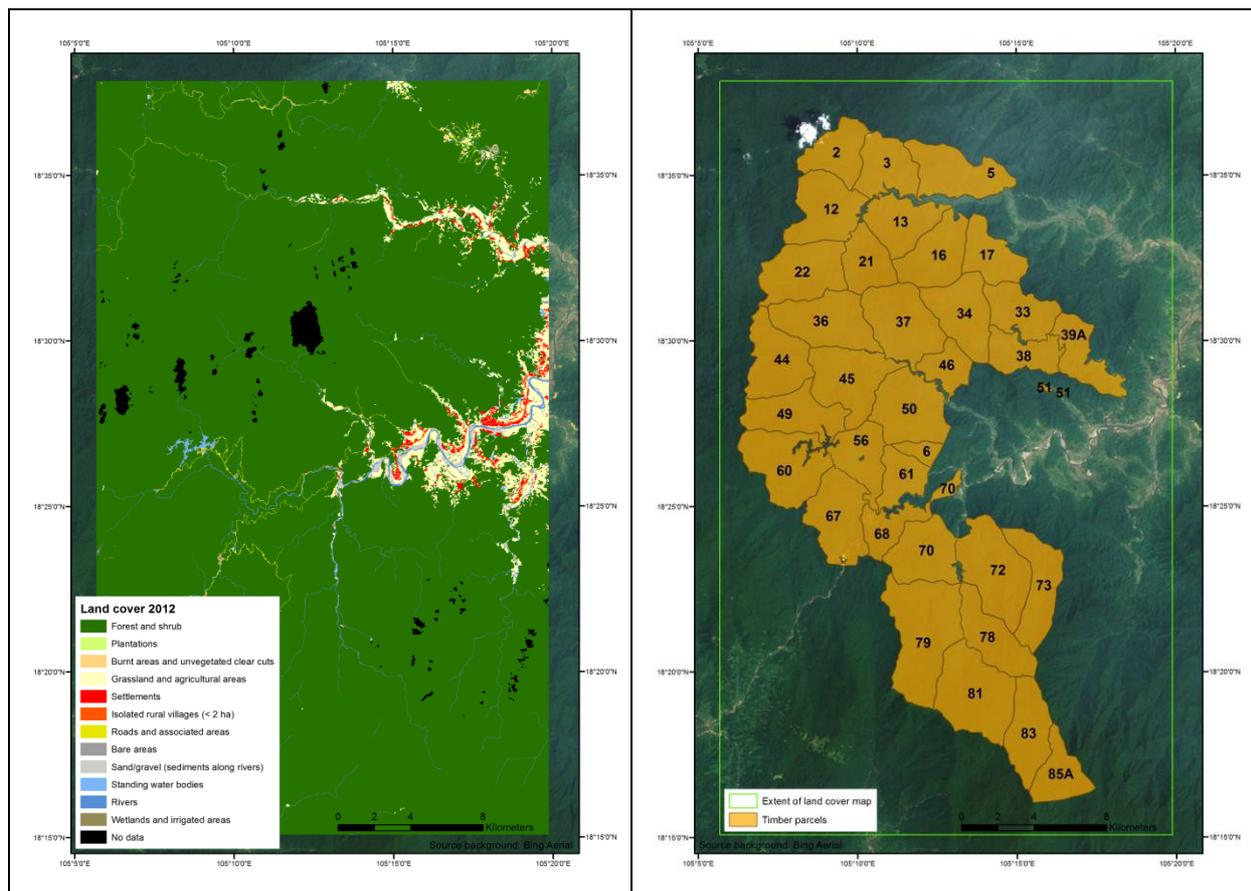


Provision of timber

The spatial basis for the valuation of timber production as a major provisioning ecosystem service is an up-to-date land cover map depicting forested areas and other land uses with high spatial detail. Spatially highly detailed EO products, including detailed forest changes, have been produced by GeoVille for the Huong Son site in Vietnam in the frame of this project. These datasets can also be used as basis for developing potential future land use scenarios.

In addition to land cover, there is a need for integration of ancillary information like statistics providing local data for the use in the InVEST model. In particular, information about timber extraction cost and management cost (including cost for maintenance, harvesting and sales) are required per individual parcel.



Comparison of the extent of land cover map and the concession for managed timber production in Huong Son. Left: Land cover map 2012. Right: Timber parcels derived from SNV map.

In the area, the Huong Son Company is responsible for the exploitation of timber for a concession of 35 parcels located in the centre of the study area in the Ha Tinh province in Vietnam bordering the Lao People's Democratic Republic. Hence, there is only information about the managed production area of Huong Son.

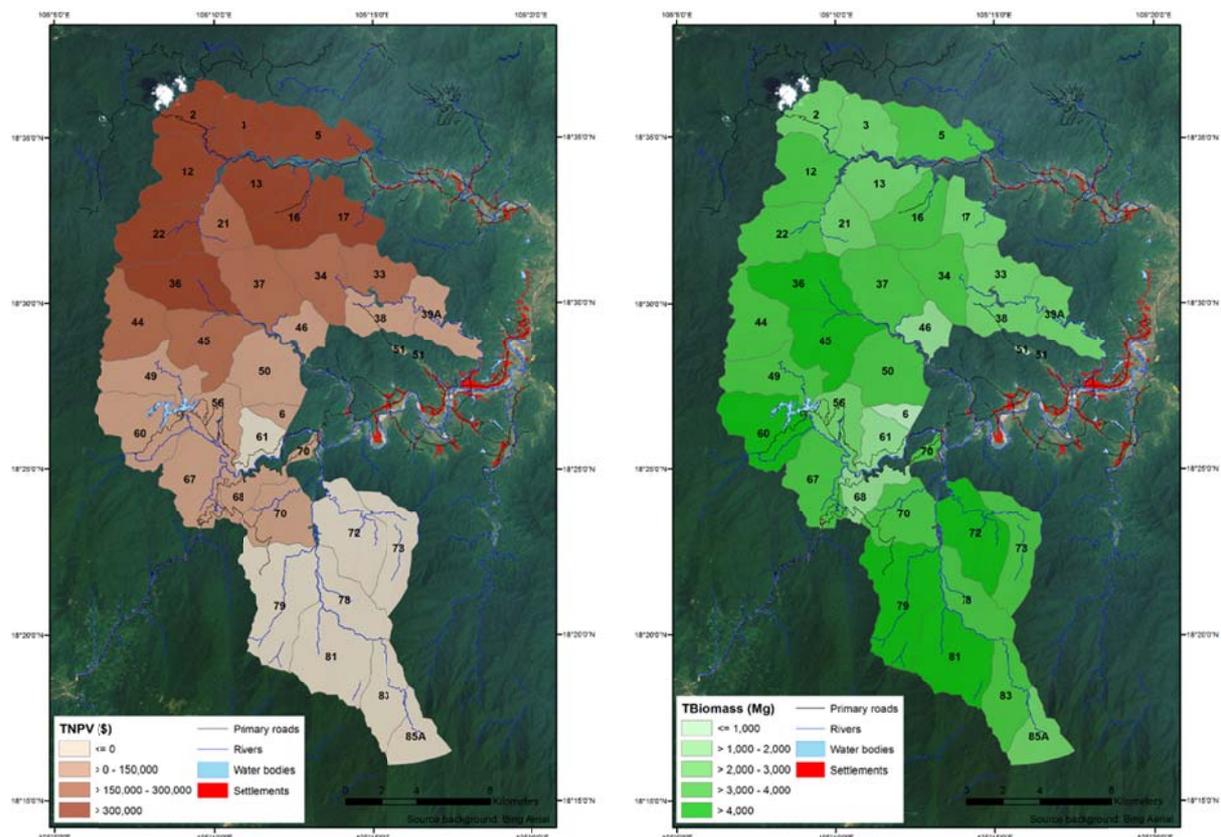
In general, the InVEST Managed Timber Production model estimates the economic value of harvested timber (=produced good) in an area composed of a company-led forest concession based on the wood market prices and related harvest and management costs. The result of the model is a map providing the economic value of timber as well as the total volume and biomass of harvested wood in the different management units. Hence, the model does consider the economic value and the harvested wood removed from the timber parcels and provides no information about the impact of the exploitation to the nature.

The Managed Timber Production model takes into account harvest related information like harvest mass, frequency and costs as well as maintenance cost and considers also a market discount rate for the whole

logging period. Therefore local data, i.e. from the timber production company, is needed for the calculation of the model.

The forest management plan of the Huong Son Company is based on a 35-year logging period for 35 compartments (derived from a map provided by SNV). The management plan provides information about historic logging for a period of four years (2006-2009) and forecasts for a selection of parcels for a period of 5 years (2011-2015). Information for the remaining logging cycle like envisaged harvest area, volume and costs is only provided for the whole concession and not for each parcel. Therefore, a simple approach was used for calculations, i.e. each parcel should be logged during one year (year 1: T=1, Freq_harv=1, Immed_harv=N → year 35: T=35, Freq_harv=35, Immed_harv=N) for the whole concession period. The cutting intensity, the volume of timber harvested as well as the costs within the period from 2006 to 2009 as well as the envisaged area and volume of timber harvested from 2011 to 2015 varies moderately. Therefore, due to the absence of detailed parcel specific data, it has to be taken into account that only averaged values can be used for the Timber Managed Production model for the logging period 2011-2045.

The marketplace value of the wood harvested from the parcel (“PRICE”) was calculated based on information of the forest management plan and additional data on forest quality for the study area. The price was also counterchecked with timber market prices provided by the “REDD+ Country Report” on “Cost implications for pro-poor REDD+ in Lam Dong Province, Vietnam”. For this scenario the market discount rate remains constant at 7 %.



Results from the Managed Timber Production model applied to the concession of Huong Son Company. TNPV: total net present value of the forecasted timber extraction until 2045 (based on averaged values). TBiomass: total harvested biomass. Numbers correspond to the parcels listed in the forest management plan of the Huong Son Company.

Conclusions

The model calculates the total net present value (TNPV) of the managed timber production for the 35-year concession period as well as the total biomass (TBiomass) harvested. For visualising purposes the TNPV of harvest for the current year is provided in US-\$ but can easily be transformed into Vietnamese dong (VND) (1 US-\$ = 20,700 VND).

The TNPV calculated for the 35 parcels of the Huong Son concession shows a trend of high economic benefit in the first years (northern parcels) towards low benefit respectively economic loss (southern parcels) in the final years of the logging period. It has to be noted that the calculation are based on approximate values assuming that one parcel is harvested per year in numerical order and based on data of a 4-year historic period (2006-2009) and the planning for a 5-year period (2011-2015). Also, the fixed market prices and the application of a 7 % market discount rate for this long period are probably underestimating the future benefits. This seems also to be the reason for the parcels with negative TNPV located in the southern part of the concession area. Furthermore, potential fluctuations of timber market prices along the logging cycle are not considered due to the long period of the logging cycle of 35 years.

Related to the forest management plan, 10 parcels are harvested in the first 5-year period but due to missing further information about the remaining years a simple approach was used for this scenario assuming that one parcel is harvested per year in numerical order. This would be also an explanation for the decreasing economic benefit for the parcels harvested at a later stage of the logging cycle.

The TBiomass map visualizes the volume of harvested timber during the full logging period of 35 years. Due to missing data for each parcel an average value was calculated based on the envisaged volume of timber harvested within the whole logging cycle. Due to this approach the parcels with a high areal percentage of forest also have a high potential of timber biomass.

Despite all limitations due to approximated inputs the model is a powerful tool to get economic values of region with managed timber production. However, **spatial information on forest is one of the main inputs to the Managed Timber Production model** where EO products of high resolution, as they have been produced in this project, are important to generate results of high quality.

Lessons learnt

- A management plan of the full logging cycle with detailed in-situ information about foreseen harvest practices, cost and prices from the managed timber exploitation are crucial to run this kind of models. **With limited data only simplified approaches can be used for the model.**
- The results and the definition of the scenarios would benefit from a deeper analysis of the prices and cost trends.
- The market discount rate is a critical factor in such a long-term analysis and should be adapted to the actual regional conditions.
- More accurate results would be obtained if the mass of timber extracted (instead of the volume) could be available. Alternatively, the volumes should be transformed into mass species by species with specific density data.
- Accuracy (the spatial resolution of model results) is limited to the exploitation parcels' size.
- This InVEST model shows serious limitations to account for the natural provision of ecosystem services. It mostly focuses on the exploitation of natural resources (timber) and their economic returns (the final value of the benefits), without considering other key factors such as sustainable practices, conservation zones, clear-cut vs. selective logging, etc. The application of other (more natural-based) ecosystem service models would provide a more complete picture of the study area.