Example findings – InVEST Analysis in the Heart of Borneo

The natural capital assessment directly supports an upcoming publication and website – *Heart of Borneo: The Economics of Ecosystems and Biodiversity (HoB-TEEB).* The short report here simply documents some of the preliminary findings, as of December 2011.

Water Supply

The forests and mountains of the Heart of Borneo are an important source of water supply by replenishing groundwater and surface water bodies. The Kapuas, Kapuas-Barito, and Mahakam river basins represent 70% of Kalimantan's population and area, and 40% of the river basin area located inside the HoB. InVEST analysis reveals that a large proportion of water in these major river basins is produced in the HoB – 55% for the Mahakam, 40% for the Kapuas Barito, and almost 60% for the Kapuas basin. A change in hydrograph of the river and increased demand for water for palm oil or other agricultural sectors could lead to a lack of water in the dry season. Possible water users that may experience negative impact are water companies, water-dependent industries, irrigated agricultural lands, palm oil companies and local communities.
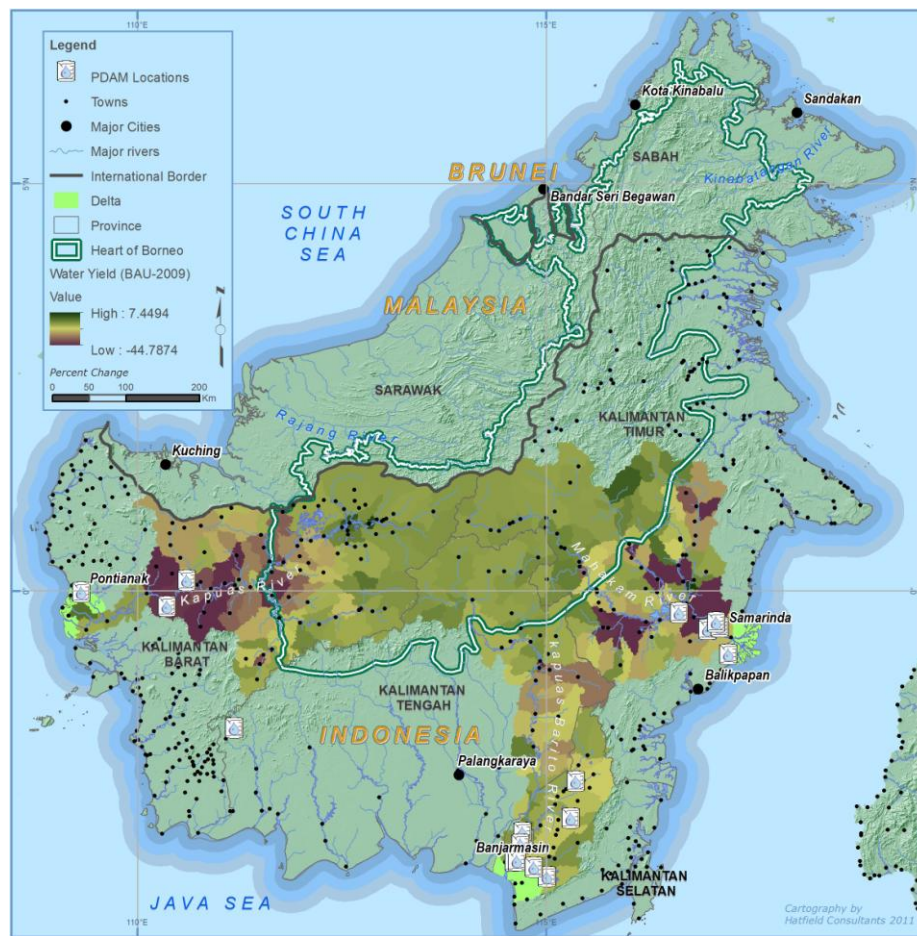
Figure 1: Water Yield

Figure 1 shows the importance of sub-catchments in the Heart of Borneo to the overall water inputs into the Mahakam, Kapuas and Kapuas Barito river systems. The local water companies (PDAM) rely on the freshwater from the rivers for water supply. The water company in Sanggau (West Kalimantan) is an example of a water company experiencing water scarcity.

The InVEST water yield model determines the amount of water running off each pixel as the precipitation less the fraction of the water that undergoes evapotranspiration. Water use by agriculture is determined based on setting different potential evapotranpiration values for each land cover category. The model does not differentiate between surface, subsurface and baseflow, but assumes that water yield from a pixel reaches the river system via one of these pathways. All outputs are summed and/or averaged to the sub-basin scale.

Water Quality and Oil Palm

Based on issued oil palm plantation permits, there are 9.5 million ha of cultivation area approved in Kalimantan. Under business as usual, 2.7 million ha of natural forest could be converted since the land status allows conversion to non-forest. Under a Green Economy, oil palm plantation development is encouraged, but on already degraded land and in a way that generates the maximum benefits to smallholders and limits the impacts on biodiversity, water quality and aquatic ecosystems. In Kalimantan, it is estimated there is more than 15 million ha of degraded land.

In the lowland areas of Kalimantan, the main cities are located along rivers and near the coast. Water quality issues include high pesticide and nutrient levels from palm oil plantations and agriculture.

The InVEST water purification model was used to assess the potential increase in nitrogen export from fertilizers associated with plantation development. To maintain water quality with WHO standards in Kalimantan, it is anticipated that a number of improvements to water supply will be required, and options include construction of a dam in the river, use of a freshwater reservoir or search for an alternative water intake further inland. None of these solutions is cheap and all have other negative impacts.

The InVEST Water Purification Nutrient Retention model calculates the amount of nutrient retained on every pixel then sums and averages nutrient export and retention per sub-catchment. InVEST also calculates the economic value that nutrient retention provides through avoided treatment costs. It integrates data on the magnitude of overland flow, pollutant loading, the capacity of different vegetation types to filter pollutants, the cost of water treatment (for pollutants of interest), and feasibility to meet water quality standards.

Figure 2: Nutrient export