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Land use Valuation Method

Natural areas, rich with biodiversity, provide essential services to society which regulate our environment, provide goods and services that support livelihoods, offer opportunities for recreation, and provide cultural and spiritual enrichment. The flow of ecosystem services from natural areas accrues to society every year and, as the extent of natural areas decreases as a result of land conversion, so the annual flow of public ecosystem services is reduced.

This analysis values the environmental externality represented by the loss of biodiversity and ecosystem services associated with the conversion of natural ecosystems to provide land for buildings and agriculture in PUMA's operations and supply chain for a product.

The greatest land use change in PUMA's supply chain is associated with the farming of cotton, rubber and cattle ranching for leather which occur in Tier 4 of PUMA's supply chain. For these land-intensive activities a detailed analysis of the value of ecosystems converted was carried out. For PUMA's own operations and Tiers 1 to 3 of the supply chain a more simplified methodology was applied.

Because information on the specific land areas used in the production of PUMA's raw materials is not currently known, the analysis for cotton, rubber and cattle ranching considers PUMA's impact as a share of the total industry impact within each state in source countries.

Government statistics were used to identify the area occupied in the production of cattle, cotton and rubber at a state level. The area required for producing PUMA's leather, cotton and rubber is based on its share of this production.

For cotton and rubber the full land use impact is attributed to PUMA. For leather, an adjustment must be made to account for the fact that leather is only one of the economic outputs of cattle production, the principle other output being meat. Some commentators argue that leather is a pure by-product of cattle rearing for meat. PUMA takes the more conservative view that since the value of the hide adds up to 15% to the value of the meat, demand for leather forms part of the economic case for cattle-rearing and therefore part of the case for land conversion. Land is therefore attributed to leather production in proportion to its share of the value of a head of cattle in each country.

To identify the ecosystem types associated with PUMA's production, the ecosystems in each relevant state were identified based on WWF's terrestrial eco-regions analysis.

To assign a per hectare value to these ecosystems the analysis draws on the significant body of existing ecosystem valuation literature including those values compiled in a recent study, The Economics of Ecosystems Biodiversity (TEEB). Studies compiled by TEEB were supplemented with additional research and used to generate values for each relevant eco-region (e.g. tropical forest, grassland, inland wetland) in each country drawing on the approach employed by TEEB.

Most underlying ecosystem valuation studies were performed recently and consider the cost of losing an additional hectare 'today', while PUMA is also interested in the cost of past conversions. To overcome this challenge the values from these studies have been adjusted to take into account the fact that ecosystem value per hectare increases as the extent of remaining natural areas diminish. PUMA makes the conservative assumption that ecosystem value is directly proportional to scarcity of the given ecosystem (rather than increasing more rapidly as scarcity increases which would give a lower average value over time) and an average value over time is developed based on this assumption.

The resultant country level per hectare values for the various ecosystem types range from €62 to €18,560, with an average of €180 across all products in the analysis. These were multiplied by the identified production areas for each product to give the total cost of land use associated with PUMA's products operations and supply chain in 2011.