

INTISARI

Peningkatan kebutuhan energi berbanding lurus dengan peningkatan emisi karbon jika sumber energi fosil terus dijadikan pilihan utama. Proses pembakaran batubara memiliki efek eksternal tertinggi dan paling merugikan sehingga penggunaan batubara harus ditekan. Biomassa berperan penting sebagai salah satu sumber utama Energi Baru Terbarukan (EBT). Visi misi jangka panjang perusahaan untuk mencapai karbon netral dapat diciptakan dengan transisi bahan bakar fosil ke biomassa. Kebutuhan biomassa yang tinggi, ketersediaan yang rendah, dan performansi yang umumnya di bawah bahan bakar fosil menyebabkan bagian terbesar dari biaya energi biomassa berasal dari operasi logistik. Hal ini menunjukkan betapa pentingnya pengelolaan rantai pasok biomassa pada perusahaan yang akan melakukan transisi energi.

Penelitian dilakukan untuk memberi rekomendasi jenis biomassa bagi perusahaan sebagai keputusan rantai pasokan pada level strategik. Berdasarkan literatur terkait karakteristik biomassa, potensi di Jawa Barat, kriteria pemilihan biomassa, serta kebutuhan perusahaan, maka terpilihlah *sawdust* produk Hutan Tanaman Energi (HTE) dan pelet sekam padi sebagai rekomendasi bahan baku kebutuhan energi perusahaan. 5 kriteria pemilihan biomassa yang dipakai adalah ketersediaan bahan baku, kondisi geografis dan lokasi, biaya bahan baku, kandungan energi, dan penciptaan lapangan kerja serta dukungan terhadap komunitas lokal.

Skenario rancangan pengelolaan rantai pasok biomassa disusun dengan metode *Distribution Resource Planning* (DRP) yang akan menghasilkan perhitungan biaya logistik biomassa serta biaya pajak karbon dari sisi operasional dan logistik. Aturan *DRP* yang digunakan meliputi penentuan *jam order*, penentuan level inventori, *safety stock*, *reorder point*, penyewaan gudang sewa, perubahan armada angkut, *lead time*, dan atau penentuan *safety stock* gudang sewa. Total biaya logistik terdiri dari biaya inventori, transportasi, pembelian biomassa, dan biaya *over capacity* baik di gudang perusahaan maupun di gudang sewa. Total pajak karbon terdiri dari pajak karbon operasional dan logistik baik di gudang perusahaan maupun di gudang sewa. Hasil perhitungan menunjukkan bahwa Skenario Pelet Sekam Padi 6 memiliki biaya logistik yang paling rendah yakni Rp916.481.727,15 dan biaya total pajak karbon yakni Rp28.663.810,76 untuk setiap siklusnya. Hal ini membuktikan bahwa biaya rantai pasokan sangat dipengaruhi oleh *lead time* transportasi yang dibutuhkan dari pemasok ke perusahaan.

Kata Kunci: Biomassa, Energi Baru Terbarukan, Rantai Pasok, Level Keputusan Rantai Pasok, Rantai Pasok Biomassa, Emisi Karbon, Pajak Karbon

ABSTRACT

The increase in energy demand is directly proportional to the rise in carbon emissions if fossil energy sources continue to be the primary choice. The coal combustion process has the highest and most detrimental external effects so coal use must be suppressed. Biomass plays a crucial role as one of Renewable Energy (RE). The company's long-term vision and mission to achieve carbon neutrality can be created through transitioning fossil fuels to biomass. The largest part of biomass energy costs comes from logistics operations due to the high demand of biomass and its low availability and performance. This underscores the significance of biomass supply chain management for companies aiming to transition their energy sources. Research was conducted to provide recommendations for types of biomasses for companies as supply chain decisions at a strategic level. Sawdust and rice husk pellets were chosen as the recommendation based on literature on biomass characteristics, potential in West Java, biomass selection criteria, and the company needs. The five criteria for biomass selection used are raw material availability, geographical aspect, raw material costs, energy content, and job creation as well as support for the local community.

The biomass supply chain management design scenario is developed with Distribution Resource Planning (DRP) method which includes calculations of biomass logistics costs as well as carbon tax costs from the operational and logistics perspectives. The DRP rules applied encompass order timing, inventory level, safety stock, reorder point, rental of warehouses, transport fleet, and/or lead time. Total logistics costs consist of inventory costs, transportation, biomass procurement, and over capacity costs. The total carbon tax consists of operational and logistics carbon taxes both at company warehouse and in rented warehouse. The calculation results indicate that Scenario Rice Husk Pellet 6 has the lowest logistics cost at Rp916,481,727.15, and lowest carbon tax cost at Rp28,663,810.76 for each cycle. This proves that supply chain costs are significantly influenced by the required transportation lead time from the supplier to the company.

Keywords: Biomass, Renewable Energy, Supply Chain, Supply Chain Decision Levels, Biomass Supply Chain, Carbon Emissions, Carbon Tax