Optimasi Jaringan Logistik Terbalik Limbah Elektronik dengan Keberlanjutan Menggunakan Metode Algoritma Genetika NSGA-II = Electronic Waste Reverse Logistics Network Optimization by Sustainability Aspects using Non-Dominated Sorting Genetic Algorithm (NSGA-II)

Alivanza Firdaus Rhufyano, author

Abstrak

Penelitian skripsi ini akan berupaya mengoptimalkan logistik terbalik limbah elektronik di Indonesia terhadap aspek-aspek keberlanjutan yaitu lingkungan, sosial, dan ekonomi. Model yang digunakan dalam penelitian ini meliputi fasilitas pengolahan limbah elektronik beserta lokasi timbulan limbah dan pasar sekunder material pulihan limbah elektronik. Adapun pencapaian keberlanjutan akan diukur dari tiga aspek, yaitu lingkungan, sosial, dan ekonomi. Ditinjau dari karakteristiknya, model yang disusun merupakan model penentuan lokasi fasilitas dan diselesaikan dengan metode metaheuristika yaitu NSGA-II. Hasil optimasi yang dilakukan menunjukkan beberapa temuan. Pertama, provinsi dengan kapasitas fasilitas pengolah limbah elektronik yang tinggi masih terpusat di Jawa. Kedua, di kawasan Indonesia Tengah, provinsi yang menjadi pusat (hub) pengolahan limbah elektronik adalah Bali, Sulawesi Selatan, dan Kalimantan Timur. Kemudian, kawasan Indonesia Timur masih cenderung mendirikan fasilitas hanya untuk memenuhi kapasitas sendiri, dikarenakan jarak dan biaya pengiriman yang mahal. Dalam mengimplementasikan temuan ini di Indonesia, terdapat beberapa hal yang perlu diperhatikan. Pemerintah perlu mendukung berkembangnya ekosistem pengelolaan limbah elektronik yang optimal di Indonesia dengan cara memperbaiki regulasi dan memberikan subsidi bagi perusahaan pengolah limbah elektronik. Selama proses transisi berlangsung, sektor informal perlu dilibatkan untuk membantu memperoleh limbah elektronik. Sektor ini juga perlu diberdayakan dengan mempekerjakan pengumpul limbah elektronik sebagai pekerja di fasilitas pengolahan limbah elektronik. Hal ini diperlukan demi mewujudkan sistem pengelolaan limbah elektronik di Indonesia yang efektif dan efisien demi dunia yang lebih baik.

.....This research will attempt to optimize the reverse logistics of electronic waste in Indonesia regarding sustainability aspects, namely environmental, social and economic. Indonesia is now facing a fairly serious electronic waste problem. This problem is then exacerbated by Indonesia's ability to process electronic waste which is still very inadequate. Therefore, a more formal electronic waste management system model will be developed and optimized. The model used in this research includes electronic waste processing facilities along with waste generation locations and secondary markets for electronic waste recovered materials. The achievement of sustainability will be measured from three aspects, namely environmental, social and economic. Judging from its characteristics, the model prepared is a facility location determination model and is completed using the metaheuristic method, namely NSGA-II. The results of the optimization carried out show several findings. First, provinces with high electronic waste processing facility capacity are still concentrated in Java. Second, in the Central Indonesia, the provinces that are the centers (hubs) for electronic waste processing are Bali, South Sulawesi and East Kalimantan. Then, the Eastern Indonesia still tends to set up facilities only to meet its own capacity, due to distance and expensive shipping costs. In implementing these findings in Indonesia, there are several things that need to be considered. The

government needs to support the development of an optimal electronic waste management ecosystem in Indonesia by improving regulations and providing subsidies for electronic waste processing companies. During the transition process, the informal sector needs to be involved to help obtain electronic waste. This sector also needs to be empowered by employing e-waste collectors as workers in e-waste processing facilities. This is necessary to create an electronic waste management system in Indonesia that is effective and efficient for a better world.