The efficient use of Renewable Energy Sources (RES) is one of the major issues in the modern energy sector. The objective of this work was to examine the potential of wind energy, solar energy (e.g. photovoltaics), biomass energy sources to meet the current energy use in the island of Lemnos in Greece. An optimisation methodology was applied to the energy system of the island, where various Renewable Energy Sources are abundant and could be exploited to satisfy part of the island's energy needs. An optimization model has been developed having as an objective the satisfaction of Lemnos Island energy needs from Renewable Energy Sources taking into consideration a multiplicity of criteria such as environmental impacts, energy demand, energy cost, and resources availability. A series of solutions have resulted, based on deterministic model runs, providing decision makers the flexibility to choose the appropriate solution based on the given situation.