

Renewable Energy Supply

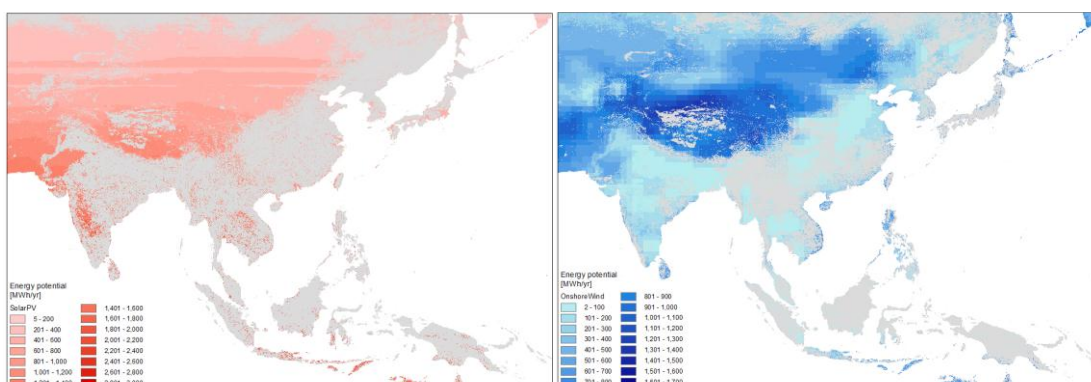
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The purpose of this study is to assess the feasibility and the design of a low carbon energy supply system with renewables in Asia. The study is composed of two parts: (1) Assessment of the technical potential of renewable energy using geo-referenced data and (2) Designing local energy supply system with renewables based on simulation analysis of hourly demand-supply balance of energy.

1. Assessment of technical potentials of renewables by a renewable energy potential model

The model estimates the technical potential at global scale of solar and wind energy for electricity generation using photovoltaic (PV) and wind turbines onshore, respectively. Currently, a module for estimating the potential of biomass for energy purposes is being developed.

The definition of technical potential considered for the construction of the model refers to the amount of a given resource that can be harnessed for energy purposes considering technical constraints. In particular, these constraints refer to a maximum slope and altitude where the renewable resource can be harnessed, to restrictions in land use which vary according to the type of land cover, to the occurrence of areas protected for nature conservation reasons or areas difficult to access (referred to as wilderness areas in the model). In addition, restrictions that are specific to each type of resource are considered; for example, shadowing between solar panels, and resource collection and production rates for the case of biomass. Other restrictions, such as those related to economic, social and political aspects, are out of the scope of the assessment. Figure 1 shows examples of outputs of the model.



(a) Solar PV

(b) Wind onshore

Fig.1 Renewable Energy Potentials in Asian region

2. Designing energy system with renewables by an AIM/ESM [Local]

Low-Carbon energy supply system is one of key measures for achieving Low Carbon Society (LCS). Renewables expect to play a central role for Low-Carbon electricity supply system, and photovoltaic systems (PVs) and wind power generators are now widely adopted across the world as an option for reducing CO₂ emissions.

Electricity from renewables, especially solar and wind, has large variability in time. Renewable energy supply varies according to natural conditions, such as solar insolation, and thus the electricity supply rarely matches electricity demand. Therefore in designing electricity supply system with renewables it is important to simulate and test feasibility for supply-and-demand balance.

The AIM/Local Energy System Model (AIM/ESM [Local]) designs regional energy supply system with renewables based on simulation analysis of hourly demand-supply balance of energy. The AIM/ESM [Local] covers photovoltaic (PV), wind turbine, biomass and mini-hydro as renewables. Energy supply from renewables is determined based on meteorological conditions and maximum potentials as well as capacity of the system. The model allows for installation of storage system such as zinc battery, NaS battery and Li-ion battery. Figure 2 shows schemes of the AIM/ESM[Local] for Iskandar Malaysia study.

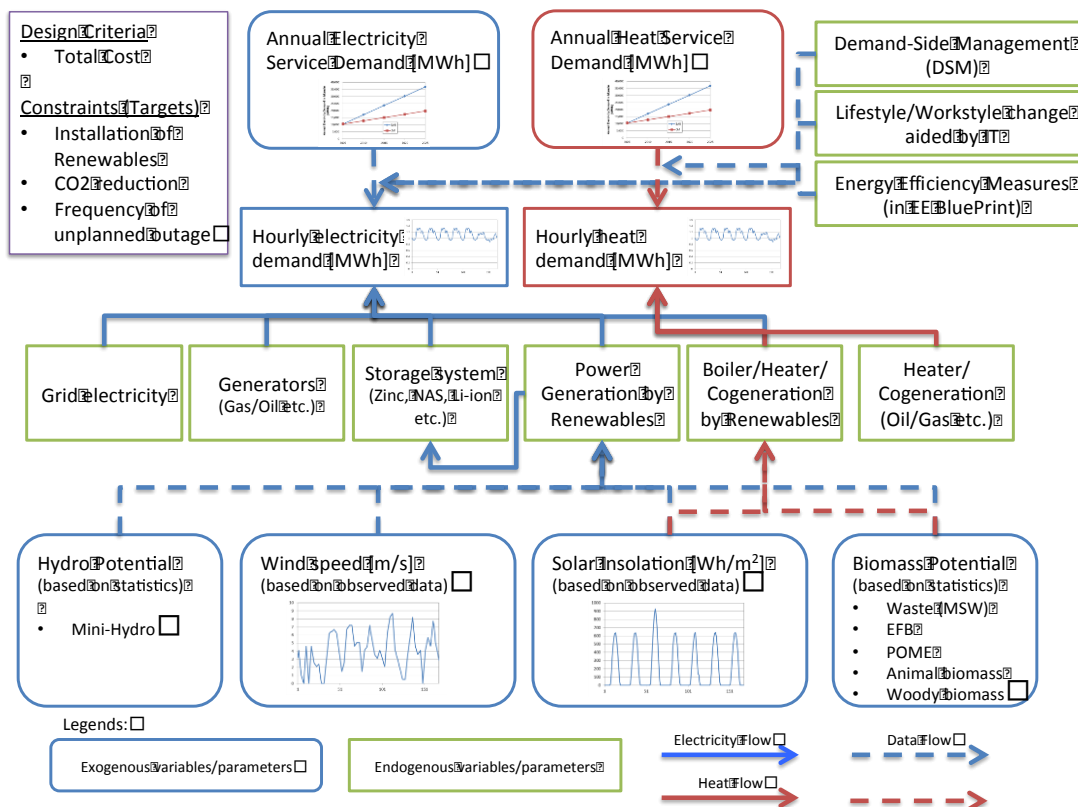


Fig.2 Schemes of the AIM/ESM[Local] for Iskandar Malaysia