Chapter 2

Methodology of Analysis

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Chapter 2

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2.1 Definition of Self-sufficiency

In this section, self-sufficiency, through analysis, will be defined. This research defines self-sufficiency as the increase as a result of a decrease in TPES or an increase in indigenous production.

Indigenous production represents the following energies.

Table 2.1 Component of Indigenous Production

Fossil fuel
Coal, lignite
Crude oil including unconventional oil
Natural gas including unconventional natural gas (tight or shale, CBM, methane hydrate)
Nuclear power generation*
Renewable power generation
Wind (onshore, offshore)
Geothermal
Hydro (large, medium, small)
Biomass, biogas, wastes, other biofuel
Solar (rooftop PV, utility scale PV, solar thermal)
Biofuel (other than power generation)
Biomass
Biogas
Bioethanol
Biodiesel
Bio jet fuel

* Nuclear energy is regarded as quasi-indigenous production in this study.

CBM = coalbed methane, rooftop PV = rooftop photovoltaics.

Source: Study team.

On the other hand, energy efficiency improvement is a method for reducing TPES.

2.2 Definition of Energy Resource Potential

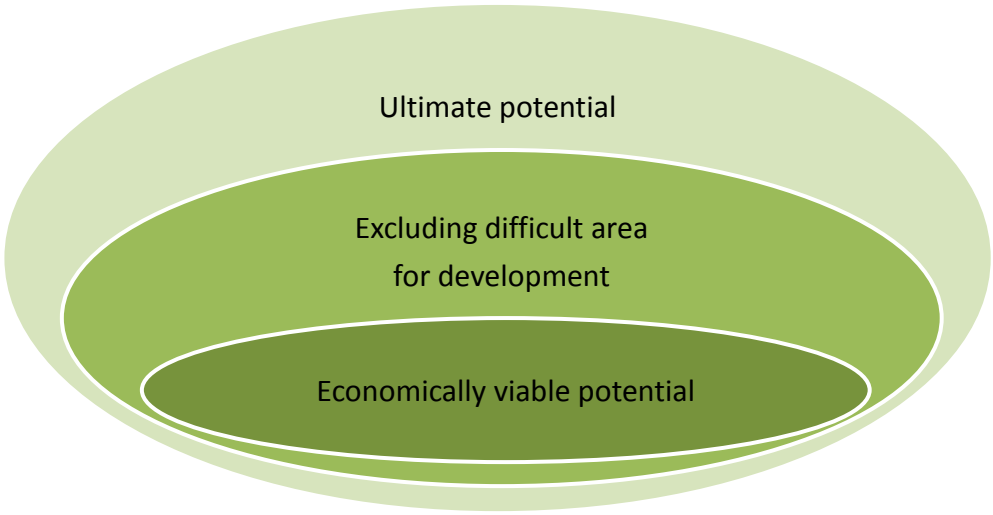
In conducting a study, the potential of energy resources must be defined.

Potential can be largely separated into three forms per the figure below: (1) 'Ultimate potential' is a form of potential calculated based on a country's land area, discharge of rivers, wind speed, sunlight, and among other factors; (2) 'Excluding difficult areas' is a form of potential excluding areas difficult for development from ultimate potential due to natural impediments, such as steep slopes, laws, policy, and environmental issues; and (3) 'Economically viable potential' is a form of potential for which economic viability is expected up to 2030 from among those excluding difficult areas.

Cost is an important element for increasing energy security. This is because even if a certain method can greatly increase energy security, if the cost is too high then increasing energy security is not realistic. The purpose of this study is to examine choices for increasing self-sufficiency based on both potential and cost. In this aspect, cost cannot be disregarded.

In the case of ultimate potential and excluding difficult areas, it is difficult to assess cost or they are expected to lack economic rationalities. Therefore, this study focuses on economically viable potential for which cost assessment is possible and for which there is a high probability that cost is within a reasonable range.

Figure 2.1 Definition of Potential in the Study



Source: Study team.

2.3 Case Study

The method used to increase self-sufficiency will vary by country depending on accessibility to natural resources, the presence of usable land, and the cost burden capacity of its people. Therefore, the relationship between cost and quantitative potential of the method for increasing self-sufficiency will differ by country. The following elements were considered in the selection of the target country for the case study.

(A) Data availability

In order to carry out this study, data on the cost and quantitative potential of each energy resource are necessary.

(B) Fossil fuel resources

Fossil fuel resources are heavily influenced by a country's energy mix. They also have an effect on the priority ranking for increasing self-sufficiency. For the case study, selecting a country

where the development of fossil fuel resources is active and one where it is not will make comparison easier.

(C) National plan

The energy outlook or natural resources development plan formulated by a national government is an important source of information for conducting this study.

Considering the above elements, Japan was selected as a case study. It has huge publicly available data. The Government of Japan draws up its Long-term Energy Supply and Demand Outlook every 3 years, the most recent of which was published in July 2015. Also, it publishes detailed power generation cost analysis through the Procurement Price Calculation Committee and Power Generation Cost Verification Working Group. Although Japan has limited fossil fuel resources, it has an active development of fossil fuel resources, available data, and a national plan.

2.4 Data Source

Important data sources for conducting this study are presented below.

2.4.1 Potential

Self-sufficiency Improving Measures	Data Source
Fossil fuel production	- Hearing from experts
Nuclear power generation	- Long-term Energy Supply and Demand Outlook, METI - Asia and World Energy Outlook, IEEJ - Estimation by study team
Renewable power generation	- Study by the Ministry of the Environment
Biofuel production	- Hearing from experts - Biomass utilisation promotion Committee, MAFF
Energy saving	- Long-term Energy Supply and Demand Outlook, METI

IEEJ = The Institute of Energy Economics, Japan; MAFF = Ministry of Agriculture, Forestry and Fisheries, Government of Japan; METI = Ministry of Economy, Trade and Industry, Government of Japan.

2.4.2 Cost

Self-sufficiency Improving Measures	Data Source
Fossil fuel production	-
Power generation	- Report of power generation cost Verification Working Group
Biofuel production	-
Energy saving	- Long-term Energy Supply and Demand Outlook, METI

METI = Ministry of Economy, Trade and Industry, Government of Japan.

2.5 Base Year and Target Year

The base year of the assessment is set as 2013 and the assessment period up to 2030.