Chapter 4

Conclusion as Policy Recommendations

As we have stated, we have summarised policy recommendations through this study. In response to these recommendations, three policy dialogues were held, where we exchanged views with policymakers from the Indian, Indonesian, and Thai governments and representatives from relevant industries. In this discussion, in addition to evaluating our recommendations, we received valuable opinions on reducing energy consumption and reducing greenhouse gases in the transport sector. We would like to recap these and summarise the main points for future policymaking.

We have shown through simulation results that it is difficult to reduce energy consumption and greenhouse gas emissions only by electrifying automobiles, and it is effective to use biofuels, which is a renewable energy resource, together. Therefore, it is essential that future policies in the transport sector be promoted with the dual structure of electrification of automobiles and the introduction of biofuels. Therefore, the policies to be adopted in the future are roughly divided into the automobile policy and the biofuel introduction policy.

Electrified vehicles (xEV), which are currently being introduced, are mainly intended for passenger cars. As is clear from the results of the simulation and the opinions received, measures for passenger cars alone are not sufficient to reduce energy consumption and global warming gas emissions in the transport sector as a whole. Therefore, it is necessary to take measures for each genre of passenger cars, heavy commercial vehicles, and motorcycles. For passenger cars, introducing xEV is effective in reducing the environmental load. Therefore, the introduction should continue. However, in countries where the demand for diesel and coal is high in the energy composition of power generation, the introduction of xEV will have a very small effect on reducing the environmental impact unless it is changed to an energy composition with a lower environmental impact. Especially in the case of battery electric vehicles (BEV), which are 100% dependent on electricity, the effect is large. As a roadmap for introducing xEV, it would be effective to introduce hybrid electric vehicles (HEV) that do not rely on electricity in the short term and have a great effect of using biofuel together. If it is expected that the number of charging stations will increase or the electric power situation will improve over time, the introduction of plug-in hybrid electric vehicles (PHEVs) should be considered in the medium to long term. PHEVs will also have some benefits of using biofuels. In India and Indonesia, where coal-fired power generation is large, the amount of global warming gas emissions from power generation is high, and the advantage of introducing BEVs is small.

Next, we would like to mention the electrification vehicle introduction promotion policy. As shown in the cost estimation of the simulation, the introduction cost of electric vehicles is still high, and consumers have not yet actively supported it. In addition, old cars are

often used in ASEAN member countries and India, and the proportion of new cars introduced is not high. Even if a country tries to promote the introduction of fuel-efficient cars to reduce the environmental load, it cannot be realised unless consumers can be motivated.

In order to promote the introduction of fuel-efficient cars, both ‘candy and whip’ policies should be implemented. The hurdle for introducing xEVs is the high introduction cost. In order for consumers to accept electrified vehicles, it is effective to give incentives such as a reduction of vehicle acquisition tax and eco-car subsidies. By giving incentives for each vehicle type according to fuel consumption and global warming gas emissions, it is possible to reduce costs at the time of introduction and increase consumers' willingness to purchase. If the number of registered vehicles is low, the incentive will be greatly promoted if it is raised to a level that does not differ from the cost of introducing existing internal combustion engine vehicles. When setting incentives, numerical standards for energy consumption and environmental load reduction are clearly indicated, and based on this, evaluation is made for each vehicle type. Automobile manufacturers should provide accurate numerical information to governments so that assessments can be performed accurately.

On the other hand, two points can be considered to promote the introduction of xEVs: environmental taxation and retirement policy for old-model cars. Environmental taxation includes building a carbon taxation system to promote environmentally-friendly efforts. For example, an ‘area taxation’ could be considered such as a taxation on cars entering urban areas where congestion occurs and for vehicles with poor fuel economy, and a seasonal taxation to control the number of vehicles when air pollution becomes serious.

By enacting a vehicle retirement policy and retiring old vehicles with poor fuel efficiency and high emissions of environmental pollutants, the effect of xEV introduction on oil consumption and emissions will be enhanced. In Japan, a tax is levied every 2 years through a vehicle inspection system, and it is obligatory to maintain the necessary parts. Also, the vehicle tax added every year will increase for vehicles that have passed a certain number of years since registration. This tax is disliked, and there is a demand for switching to new cars. Even if it is difficult to manage each individual vehicle, it will be possible to establish a vehicle retirement policy by methods such as regulations and strengthening taxation, by classifying vehicles by year.

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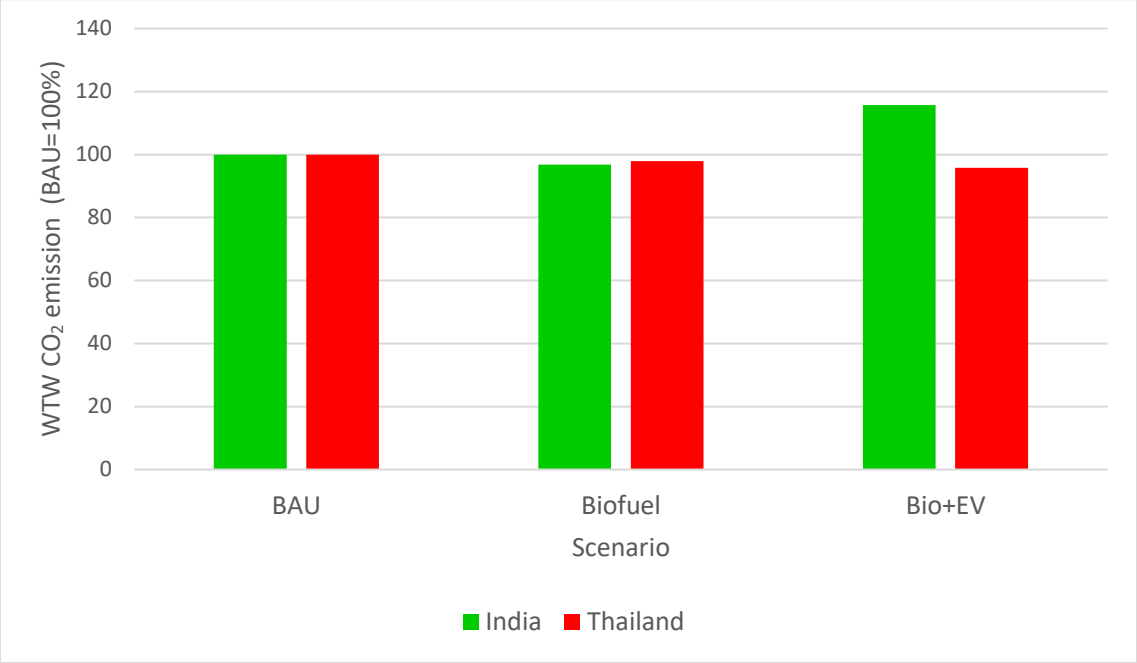
The electrification of heavy commercial vehicles such as buses and trucks is currently difficult. In particular, heavy-duty trucks used for physical distribution transportation have a feature that they travel long distances, so that when they are electrified, it is inevitable they will need to be charged midway in the trip. It takes time to maintain charging stations, and the long charging times affect the transportation schedule.

As an environmental measure for heavy-duty vehicles, the use of fuel, which has a lower environmental load than petroleum diesel fuel, is considered. Liquefied natural gas (LNG) and compressed natural gas (CNG) are two options. Since the technology has already matured, the problem of developing infrastructure must be solved. Since natural gas can also be used as a fuel for civil use in the city, it is desirable that the supply stations be planned together with the infrastructure development of the city.

A problem closely related to the electrification of automobiles is the problem of energy composition of power generation. In this research, it is not correct to simply compare the simulation results because the values used for scenario setting and calculation differ from country to country. Based on this, the comparison of the well-to-wheel-based global warming gas emissions forecasts for 2030 in India and Thailand are shown in Figure 4.1. As bio scenarios, the results of the alternative fuels scenario in India (Fig.2.13) and those of the alternative energy scenario in Thailand (Fig.2.31) were compared. As a Bio+EV scenario, comparisons were made with the results of the moderate electrification scenario in India and the combination scenario in Thailand.

Figure 4.1. Well-to-Wheel CO_2 Emissions from Road Transport Sector (2030) Based on Simulation

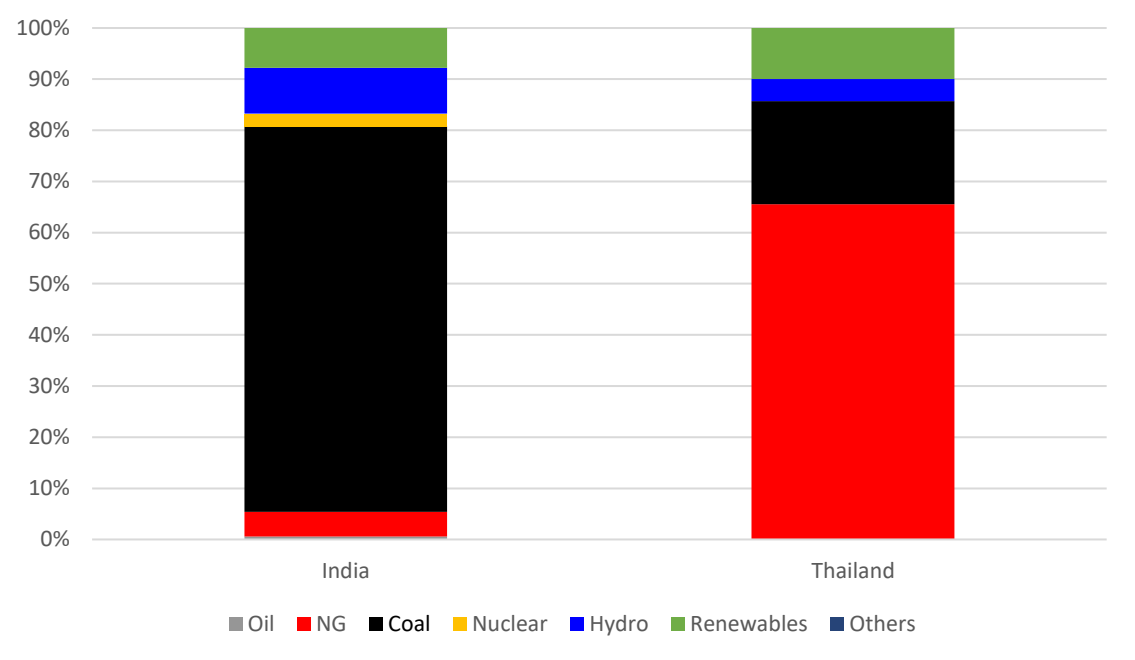


BAU = business as usual, EV = electric vehicle, WTW = wheel-to-well.
Source: Authors.

In the biofuel scenario, CO_2 emissions are decreasing in both countries, indicating that they are effective in reducing greenhouse gas emissions. The magnitude of the effect is different because the policy target of the introduction amount is different in each country. On the other hand, when biofuel and electrification of automobiles are carried out in parallel, the synergistic effect appears in Thailand and the reduction effect is large,

whereas it is increasing in India. Since the reduction effect of electrification appears in TtW (Fig. 2.14), it can be seen that the increase in electrification is due to WtT, that is, power supply. Figure 4.2 compares the energy composition of power generation in both countries. India has a large proportion of coal-fired power plants that emit a large amount of CO_2. This is considered to be the main reason why emissions of global warming gas cannot be reduced even by electrification, and it is pointed out that the reduction of environmental load by electrification of vehicles is meaningless unless they are combined with power generation improvement.

Figure 4.2. Energy Composition in Power Generation



Source: BP (2019).

The introduction of biofuels is effective in reducing greenhouse gas emissions and oil consumption, as was mentioned above. Based on the fact that biofuels are already widely distributed in the ASEAN market, we will summarise the points to be noted in the electrification of automobiles in the future.

As is clear from the results of this simulation, the introduction of biofuels can reduce oil consumption and greenhouse gas emissions. On the other hand, the big problem of introducing biofuel is its price. As the fuel for transportation is ridiculed as 'cheaper than water,' it is necessary to considerably reduce the selling cost from the standpoint of consumers. On the producer's side, it is desirable to maintain a price that can secure an adequate income to maintain production. To satisfy this conflicting position, government incentives for producers and reduced fuel taxes on consumers are essential.

Electrified vehicles are mainly passenger cars, and they are being introduced mostly as an alternative to gasoline vehicles. The proportion of gasoline vehicles in passenger cars varies from country to country. In particular, when diesel vehicles will be replaced by

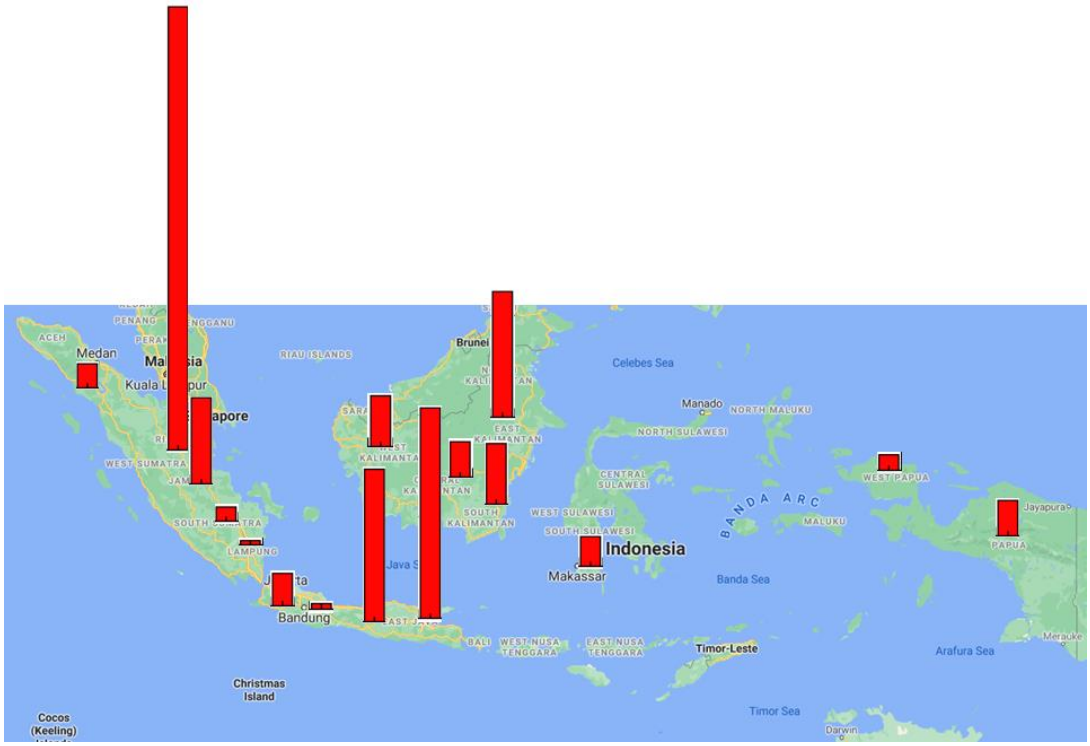
electrified vehicles, it is expected that a shift in demand from biodiesel fuel to bioethanol will occur. As can be seen from Thailand's simulation results, the introduction of HEVs offsets the improvement in fuel consumption and growth in fuel demand, and the demand for bioethanol is almost flat. On the other hand, the conversion of diesel vehicles to electrified vehicles has reduced the consumption of biodiesel fuel compared to the BAU case. It is expected that the demand for biofuels will change in conjunction with the spread of electric vehicles in the future, so it is necessary to modify the supply plan flexibly according to the situation when carrying out a biofuel policy.

In order to meet the demand change of biofuels due to the spread of electrified vehicles, it is necessary to balance the supply and demand by domestic fuel inventory management in the region and import/export in the ASEAN region. It is hoped that a coordinated policy will be discussed at the energy conference held by the government officials of each country.

Industrial ethanol is in great demand not only as an automobile fuel, but also as a chemical raw material and a pharmaceutical. With the recent prevalence of COVID-19, the demand for disinfection has increased significantly and the price has also risen. In production from the current crops, it is expected that high-priced food (alcohol) and pharmaceuticals will be given priority, and low-priced fuel alcohol will be in short supply. The production of ethanol from unconventional raw materials will help solve this supply shortage. The production of ethanol from lignocellulose, which is an unconventional raw material, is currently low in productivity and the production process is not optimised. Only laboratory tests at the research stage, a life cycle assessment based on those values, or bench-scale manufacturing tests are performed. In order to commercialise the production of ethanol from lignocellulose, some technical hurdles must be cleared. These include (i) search for biomass resources that bring about high productivity, (ii) establishment of highly efficient and energy-saving production processes, (iii) energy consumption in production processes by using by-products (lignin) reduction, (iv) location selection of production areas to ensure economic efficiency, and (v) economic efficiency improvement by productivity improvement by using first-generation raw materials together. By deriving highly accurate numerical values through research and development, it becomes possible to more accurately calculate the environmental load and production cost by a life cycle assessment. Since it is difficult to make a profit as a corporate activity in the research and development stage, it is desirable that governments provide subsidies. Biofuel refineries are often small businesses. In order to improve economic efficiency, the integration of small-scale refineries should be considered.

For first-generation biofuels, fuel production has been carried out by setting up production plantations on newly reclaimed land. This led to environmental damage and became a problem. Traditional slash-and-burn agriculture has also caused haze problems. In order to produce next-generation fuel whilst suppressing environmental damage, it is desirable to use waste that does not require the production of new crops. This survey, which was compiled for Indonesia, shows that there are regional differences in the supply potential of lignocellulosic waste (Figure 4.3). In addition, some of the existing palm oil manufacturing plants are producing waste that can be used, such as EBF, waste at the stage of oil extraction, and old trees whose fruit production capacity has declined. In order to locate a manufacturing plant, it is necessary to conduct a resource survey on the type of biomass, the amount of biomass, and the regional characteristics.

Figure 4.3. Estimated Total Potential Bioenergy from Harvesting and Wood Processing Residue, Indonesia (2013)



Source: Created by the authors based on Simangunsong et al. (2017) and Google Maps.

Finally, we would like to argue that it is essential for policymakers to formulate solid medium- to long-term national energy plans that have carefully evaluated the outlook. Sometimes the policy may change midway due to political conditions, but the basic skeleton does not change, and we plan a policy that can flexibly respond to the 'branches and leaves' with minor modifications due to the spread of automobiles and the production status of biofuels. The policy needs to be multifaceted, as the fusion of technologies for electrifying automobiles and introducing biofuels is effective.

The formulation of such policies should be based on accurate data. In addition to collecting and enriching the statistical data of the current transport sector, which is the basis for trial calculation, reduce energy consumption and global warming in the trial transport sector by incorporating other factors such as travel demand management, mass transportation promotion, and eco-driving. An optimal solution for reducing gas emissions should be sought.

References

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