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Thesis Outline

The first chapter explains the threat of climate change that urged global awareness and concern towards society, economy and environment. Thailand is among the most vulnerable countries to the adverse impact of climate change as the country faced the extreme weather conditions and loss events such as flooding and drought more frequently in the recent year. This is due to the development of Thai economy during the past decades enhanced GHG emissions which are the main source of climate change. As a result, there is no sign to have the peak GHG emissions soon in Thailand. Since Thailand is a party under the United Nation Framework Convention on Climate Change (UNFCCC), Thailand pledged national determined contribution (NDC) to the global communities that the country will reduce GHG emissions by 20% compared to the business-as-usual (BAU) within 2030. From the current update, it is all known that Thailand NDC is still far behind from the 2-degree Celsius target which is the main goal of the Paris Agreement. Thus, Thailand needs more ambitious measures on the long-term policy to bring back the country on track and achieve 62% GHG reduction new target at the earliest compared to BaU. From the literature review, it clearly shows that Thailand as a developing country is still learning by doing and lacking the experience in doing the climate policy. Due to the existing research gap, this study sets a research goal to assess the economic loss when 62% GHG reduction constraint is introduced in Thailand to achieve 2-degree Celsius target under the Paris Agreement while assessing the economic loss mitigation through introducing the GHG mitigation actions.

The second chapter explains the methodology and data using in this study. By recognizing the importance of market-based mechanisms, this study uses a computable general equilibrium (CGE) model to assess economic indicators in the scenarios setting in advance. Business as Usual (BaU) scenario shows economic situation in Thailand progress as usual. Thailand has initially endorsed the Paris Agreement but the country has not yet considered the 2-degree Celsius target. As next step, this study sets GHG limitation and assumes Thailand to achieve GHG emissions target under 2-degree Celsius pathway (RCP2.6_2degree) by the target year 2050 and assess the potential economic loss compared to BaU. After knowing the potential economic loss, this study then introduces electric freight vehicle mitigation option in freight transport sectors

(M1_Transport), Cryogenic Carbon Capture technology in power sector (M2_CCC), brand-new efficiency improvement machines and devices in main industrial sectors (M3_Efficiency) and introduce all aforesaid mitigation actions together in freight transport, power and industrial sectors (M4_All) on top of RCP2.6_2degree scenario to reduce the potential economic loss from RCP2.6_2degree compared to BaU.

The third chapter shows the result and discussion of this study. According to the result, achieving a 2-degree Celsius target according to the Paris Agreement will cause Thailand economic loss observed highest in the RCP2.6_2degree compared to BaU. The economic loss occurred because this study using GHG price which is equivalent to GHG tax to control GHG emissions. GHG price in general impacts the production and household sectors for the increased price of goods and services in the intensive carbon sectors. The cumulative real GDP loss in RCP2.6_2degree scenario is 1.8% and accounts for 2,900 billion baht compared to BaU. Without mitigation actions, economic loss from limiting GHG emissions will deter the country's development and progress towards achieving the economic target. Introducing mitigation option in transport sectors (M1_Transport) and electricity generation sector (M2_CCC), reduction of cumulative RCP2.6_2degree GDP loss is observed since the result shows cumulative GDP loss by 0.7% in M1_Transport and by 0.8% in M2_CCC compared to BaU. It should be noted that introducing mitigation option in industrial sectors (M3_Efficiency) shows a good outcome since there is no cumulative GDP loss in M3_Efficiency compared to BaU. Lastly, by introducing all mitigation options together (M4_All), the best outcome is possible since it increases cumulative GDP by 1.4 % compared to BaU and GHG price at the target year is only about 7,700 baht/tCO₂eq (245 USD/tCO₂eq). As for freight transport, the output of road freight, air transport and water freight will be dropped by 30%-55% in all mitigation scenarios in 2050 compared to BaU; however, the output of rail transport will be increased by 2% - 5% in 2050 compared to BaU. This must thank the rail mitigation option that introduce electric rail to replace coal and oil rail help propelling the production output. The share of primary energy mix of coal and oil as the high carbon content and dirty energy will be reduced from 85% in BaU to about 67% in mitigation scenarios in 2050 while the share of renewable energy and gas will be increased to replace the decrease of coal and oil share. With this result, economic structure change can be observed since Thailand can

transform from a high carbon society in which GHG intensity level recorded about 14,000 tCO₂eq/billion baht to a low carbon society in which GHG intensity level recorded about 5,600 tCO₂eq/billion baht by 2050.

In the fourth chapter, it concluded this study by using the information from the research goal. This study concludes that realizing 2-degree Celsius target Thailand will suffer GDP loss by 6.1% in 2050 compared to BaU. Introducing mitigation actions through electrification in freight transport service, energy efficiency improvement in industrial sectors and decarbonizing in power sector economic loss mitigations are possible since the result of this study shows the clear outcome that either introducing the mitigation action individually or combining the mitigation actions together. Mitigation actions can help reduce the economic loss, in which the result shows the reduction of GDP loss by 1.2% in M1_Transport, by 0.1% in M2_CCC, by 2.3% in M3_Efficiency and by 2.7% in M4_All in 2050 compared to not introduce any mitigation option (RCP2.6_2degree).