

京都大学	博士（工 学）	氏名	Nguyen Thai Hoa
論文題目	Development of Middle-term Low Carbon Society Scenario of Vietnam (ベトナムの中期低炭素社会シナリオの開発)		
<p>(論文内容の要旨)</p> <p>Chapter 1 is a part for introduction, and describes research background and research objectives; “What is Low Carbon Society (LCS)?” and “Why does a developing country like Vietnam need to develop LCS?” Vietnam is on an increasing growth trajectory and has priorities to meet development needs. Greenhouse gases (GHG) emissions of the country are expected to dramatically increase due to its large population and fast economic growth. For the question that how to reduce GHG emissions effectively while striving for economic growth and better quality life, an answer is to develop LCS. A goal of the research is to develop a LCS scenario in Vietnam. Thus, this research conducts a projection of GHG emissions and mitigations in energy sectors (residential, commercial, industrial, transport and power sectors) and agriculture, forestry and other land use sector (AFOLU), and proposes necessary Actions towards LCS in Vietnam in 2030.</p> <p>Chapter 2 is a part for Literature review on current climate change-related policies and low carbon studies in Vietnam. The government of Vietnam has formulated several policies and strategies to respond to climate change such as National Target Program to Respond to Climate Change (2008) and National Climate Change Strategy (2011). However, they are mainly focusing on effects and adaption to climate change. Low carbon studies in Vietnam are carried out at different levels and in various forms, and analyzed only specific aspects of low carbon development. Some of them were using outdated data that served for projections of GHG emissions and mitigation with the latest information coming from the year 2000. The review shows that an integrated and comprehensive study is still lacking on low carbon development for entire of Vietnam.</p> <p>Chapter 3 describes a methodological framework and two models, namely Extended Snapshot Tool (ExSS) and Agriculture, Forestry and Other Land Use Bottom-up Model (AFOLUB) which aim to develop a LCS scenario in Vietnam. ExSS is a comprehensive estimation tool for illustrating a quantitatively future snapshot of the target areas. This tool is multi-sectorial static model formulated as a set of simultaneous equations and calculations: 1) Socio-economic activity level of the sectors in the future, 2) Input-output tables, 3) Energy balance tables, 4) CO₂ emissions and 5) Low carbon countermeasures. AFOLUB is a bottom-up type model to estimate GHG emissions and mitigation in Agriculture, Forestry and Other Land Use sector (AFOLU), dealing with quantified low carbon countermeasures. This model estimates mitigation potential based on detailed information of specific technologies, and analyzes effect of policies such as carbon tax and energy tax <i>etc.</i></p> <p>Chapter 4 is a part for development of socio-economic background of Vietnam towards LCS. Socio-economic information and data are collected and estimated in energy and AFOLU sector in the base year. A future scenario in this research is developed, in which its forecasts and assumptions are based on the base-year image of the country and reflection of national development plans and strategies. This research develops a data base of low carbon</p>			

京都大学	博士 (工 学)	氏名	Nguyen Thai Hoa
------	----------	----	-----------------

countermeasures that include all its detailed information. About sixty low carbon countermeasures are collected from domestic and international sources for both energy and AFOLU sector in this research.

Chapter 5 shows a projection of CO₂ emissions and mitigation in energy sectors, which includes sub-sectors such as residential, commercial, industry, transport and power using quantitative tool (ExSS). The findings show that energy demand increases 3.5 times from 2005 to 2030BaU (Business as Usual) scenario. Industry becomes the largest share of 46% in 2030BaU. CO₂ emissions increase 6.4 times from 2005 to 2030BaU scenario. In the 2030CM (Counter Measure) scenario, the CO₂ emissions decrease 34% from that of the 2030BaU scenario, which counts with 180 MtCO₂eq in total mitigation. Among low carbon countermeasures, energy efficiency improvement has the highest mitigation in all sectors. Industrial sector contributes the largest mitigation in energy sectors, accounting for 28% of total mitigation or 50 MtCO₂eq.

Chapter 6 shows a projection of GHG emissions and mitigation in AFOLU sector using an optimization model (AFOLUB). In baseline case, GHG emissions in AFOLU sector increases by 9 MtCO₂eq in 2030 compared to the base year 2005. For Agricultural sector, negative or zero cost countermeasures (also call “no-regret countermeasure”) such as midseason drainage; dome digester, cooking fuel and light; and replacement of roughage with concentration can reduce 11 MtCO₂eq in 2030 at 0 USD/tCO₂eq of Allowable Abatement Cost(AAC). Between 10 and 100 USD/tCO₂eq of AAC, there is only 2 MtCO₂eq difference in mitigation. More expensive countermeasures such as slow-release fertilizer, daily spread of manure and high genetic merit have effect at 100 and 10,000 USD/tCO₂eq. For land use, land use change and forestry sector, mitigation potential can be achieved at the maximum level at 10 USD/tCO₂eq because costs of all countermeasures are lower than 10 USD/tCO₂eq.

Chapter 7 illustrates an analysis of total GHG emissions and mitigations in Vietnam. The study proposes a low carbon policy package towards LCS in Vietnam. The suggested policy package is a menu of recommendation countermeasures that are grouped in to eleven actions. These set of actions are translated into policy actions, focusing on specific sectors. The proposal of five actions from AFOLU sector and six actions from energy sectors contribute to about 19% and 81% of the total GHG emission mitigation in Vietnam.

Chapter 8 gives the conclusion that summary of the main results in the research. A LCS scenario by 2030 in Vietnam is developed in the research. In 2030BaU scenario, GHG emissions are four folds from 2005, from 151 MtCO₂eq to 601 MtCO₂eq. In 2030CM scenario, GHG emissions are reduced 36% from 2030BaU. A policy package and eleven Actions are proposed towards a development of LCS in Vietnam. Among required Actions, “Rice Cultivation Management” and “Forest and Land Use Management” from AFOLU sector, and “Energy Efficiency Improvement” and “Smart Power Plants” from energy sector are the most effective in mitigating GHG emissions in Vietnam in 2030.

氏名

Nguyen Thai Hoa

(論文審査の結果の要旨)

本論文は、これまで日本などの先進国において開発されてきた低炭素社会計画策定手法を開発途上国や新興国に適用可能な手法として発展的に改良し、近年の成長著しいベトナム共和国に適用することによってその実用性を検証し、同国における低炭素社会像を提唱したものであり、得られた主な成果は次のとおりである。

1. 本論文は、急速な社会・経済成長の下にあり、エネルギー消費量の増加が見込まれると同時に、農業・森林・土地利用部門からの温室効果ガス排出の割合が高い開発途上国や新興国において温室効果ガス排出量を抑制する低炭素社会計画の策定手法である「低炭素社会シナリオアプローチ」手法を考案したものである。本論文で提案・工夫された手法は、社会・経済的な合理性及び社会・経済的变化に対し頑健性に富み、開発途上国や新興国における低炭素社会計画の策定手法として有効であると判定できる。

2. 本論文では、上記のような状況にある開発途上国や新興国を対象に、本手法の適用性を高めるために、社会・経済的指標、及び、エネルギー利用技術・エネルギー需要に加え、農畜産物需要・農畜産業技術、及び、土地利用計画を組み合わせ、将来の社会・経済的發展を考慮しつつ、主要な温室効果ガスの排出部門を網羅した定量的な低炭素社会シナリオの構築手法を提案した。

3. さらに、本論文では提案手法を近年の経済成長の著しいベトナム共和国に適用し、現在、この国が計画している経済成長想定下にて 2030 年での温室効果ガス排出量は、対策を行わない場合には現状に比べ 4 倍程度の増加が見込まれるが、その一方、適切な対策を行うことによって、これを 2.5 倍程度に抑制することが可能であることを示した。また、その場合におけるエネルギー部門および農業・森林・土地利用部門の対策とその貢献度を、定量的かつ詳細に提示した。

以上のように、本論文は、開発途上国や新興国における低炭素社会計画を策定するにあたり、社会・経済的な合理性と社会・経済的变化に対する頑健性及び社会的受容性に富む手法を提案・検証したものであり、社会的重要性が高い研究である。また、本研究の成果は、低炭素社会構築を目指すアジア他地域の低炭素社会実現にも大きく貢献するものであり、学術上、實際上寄与するところが少なくない。よって、本論文は博士（工学）の学位論文として価値あるものと認める。また、平成 24 年 8 月 10 日、論文内容とそれに関連した事項について試問を行って、申請者が博士後期課程学位取得基準を満たしていることを確認し、合格と認めた。