

Research Proposal: The Role of Biomass in Greenhouse Gas Mitigation in Laos

BounEua Khamphilavanh¹, Toshihiko Masui²

¹Tokyo Institute of Technology, Japan; ²National Institute for Environmental Studies



Background

The concept of low-carbon society scenario (LCS) or low fossil fuel economy is a concept that refers to an economy which has a minimal output of GHG emissions (in particular, carbon dioxide) into the biosphere. In LCS, the society will adopt a lifestyle that makes more use of energy efficient devices and renewable energy technologies. Hence the LCS will be a significant and essential option to support implementing the governmental green growth policies and strategies and making Lao PDR embark on greener economy and development as it is important to avoid the “grow now and clean up later.”

Biomass role in greenhouse gas (GHG) mitigation: Biomass can play a dual role in greenhouse gas mitigation related to the objectives of the UNFCCC, i.e., as an energy source to substitute for fossil fuels and as a carbon store. However, compared to the maintenance and enhancement of carbon sinks and reservoirs, it appears that the use of biomass has so far received less attention as a means of mitigating climate change. Modern biomass options offer significant, cost-effective and perpetual opportunities toward meeting emission reduction targets while providing additional ancillary benefits.

Biomass production and consumption in Laos: The rural population accounted for 67% of the nation's overall total, of which 59% lived in rural areas with road access and 8% without road access and they rely heavily on the forest for fuel wood, medicines, houses and shelter. Wood energy is widely used throughout the country. The forest is already a vital economic resource for Laos, they provide essential contribution to the consumption and income of rural poor people and conserve biodiversity, soil and water values. The total final energy consumption (TFEC) of Laos increased at an average annual growth rate of 5% between 2000-2015. By type of fuel, coal grew the fastest at 28% per year, followed by electricity at 13.4% per year. Petroleum products and biomass consumption, which are the most used types of fuel in the country, grew at a slower rate than coal and electricity. The average annual growth rate of consumption of petroleum products was 8.5% while biomass consumption grew only 1.4% per year over 2000-2015 (Figure.1)

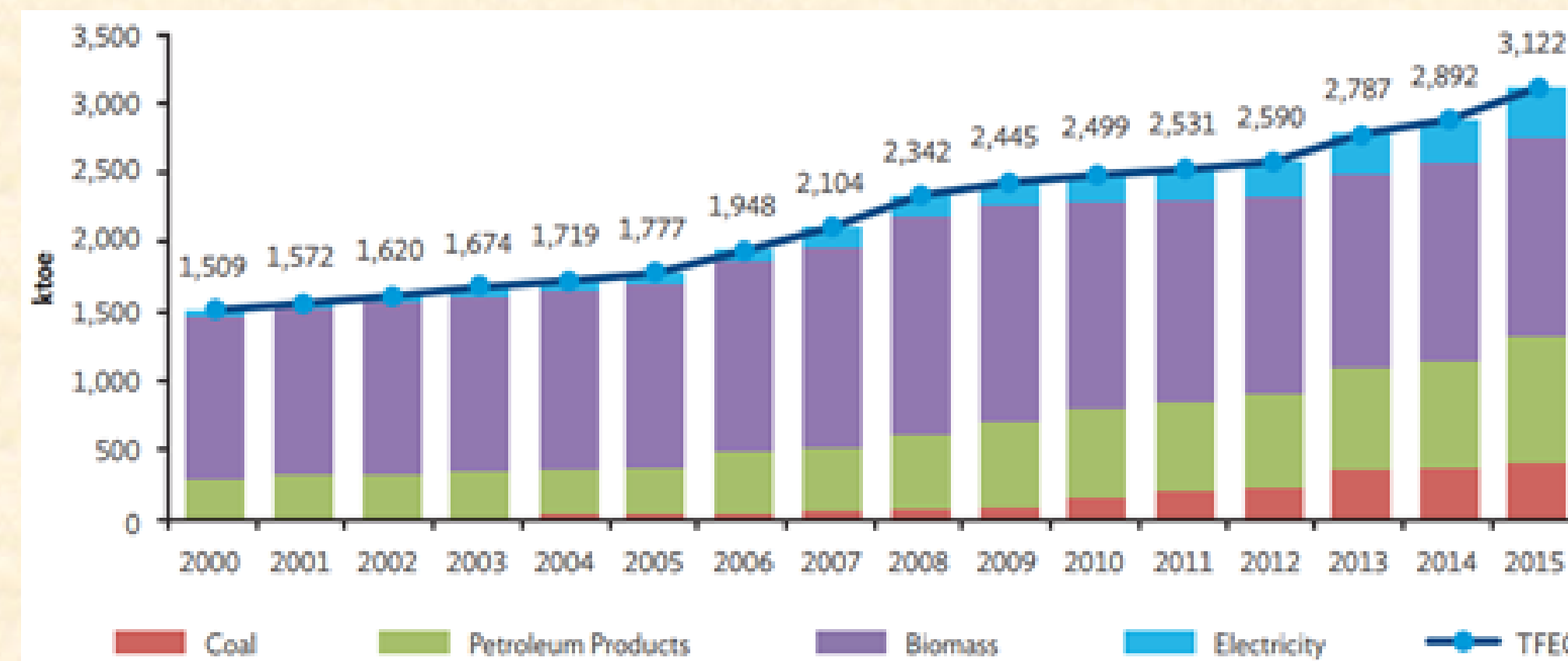


Figure 1. Final energy consumption, 2000-2015
Source: Economics research institute for ASEAN and East Asia, Lao PDR EBT

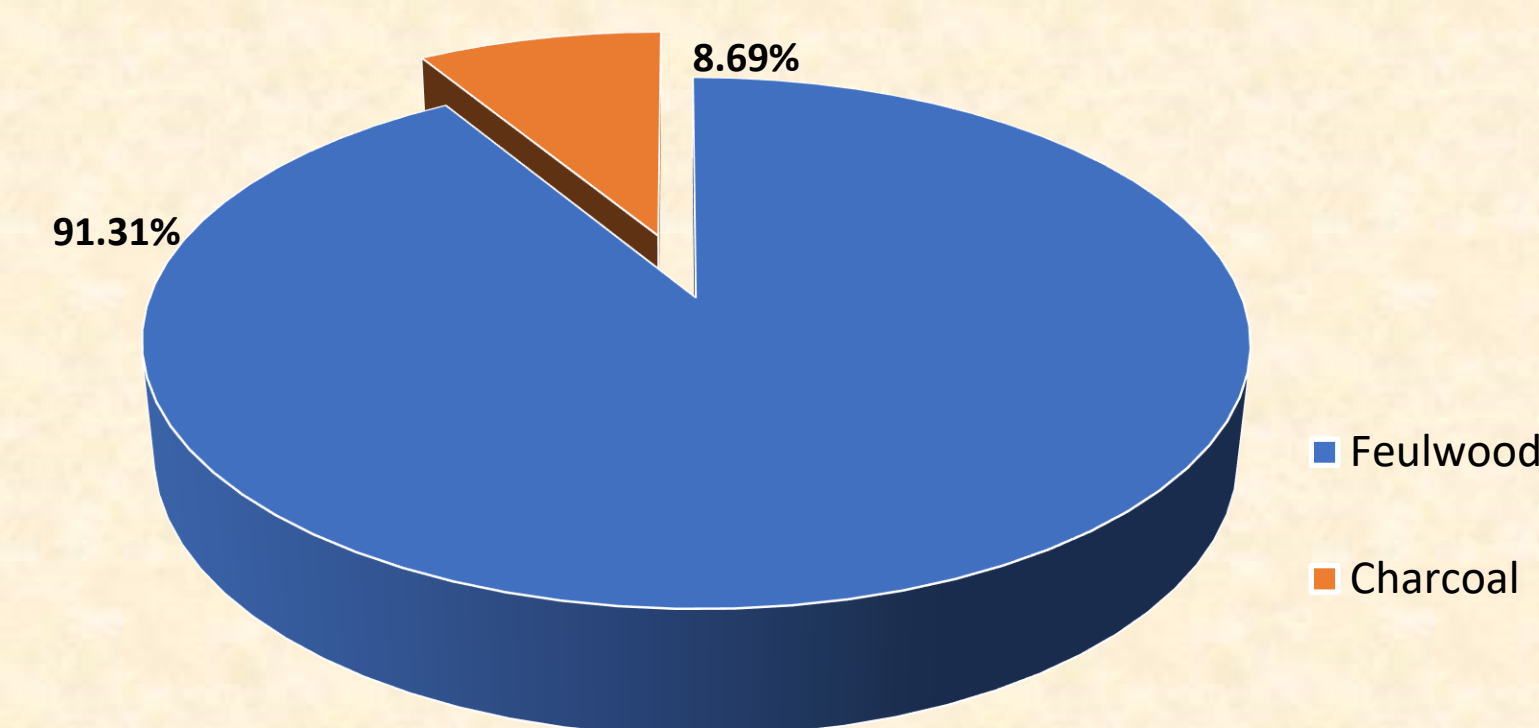


Figure 2. Biomass production in Laos, 2014
Source: Energy statistic 2018, MEM, Laos

There are two types of biomass in Laos (firewood and charcoal), which the firewood is main biomass being used in Laos accounting for 91% (figure 2). Firewood production and consumption has been steadily increased during 1990 and 2008. However, they straightly decreased after 2008. The reason, because households prefer to consume charcoal, as the production and consumption of charcoal rapidly went up since 2008 (figure 3 and 4).

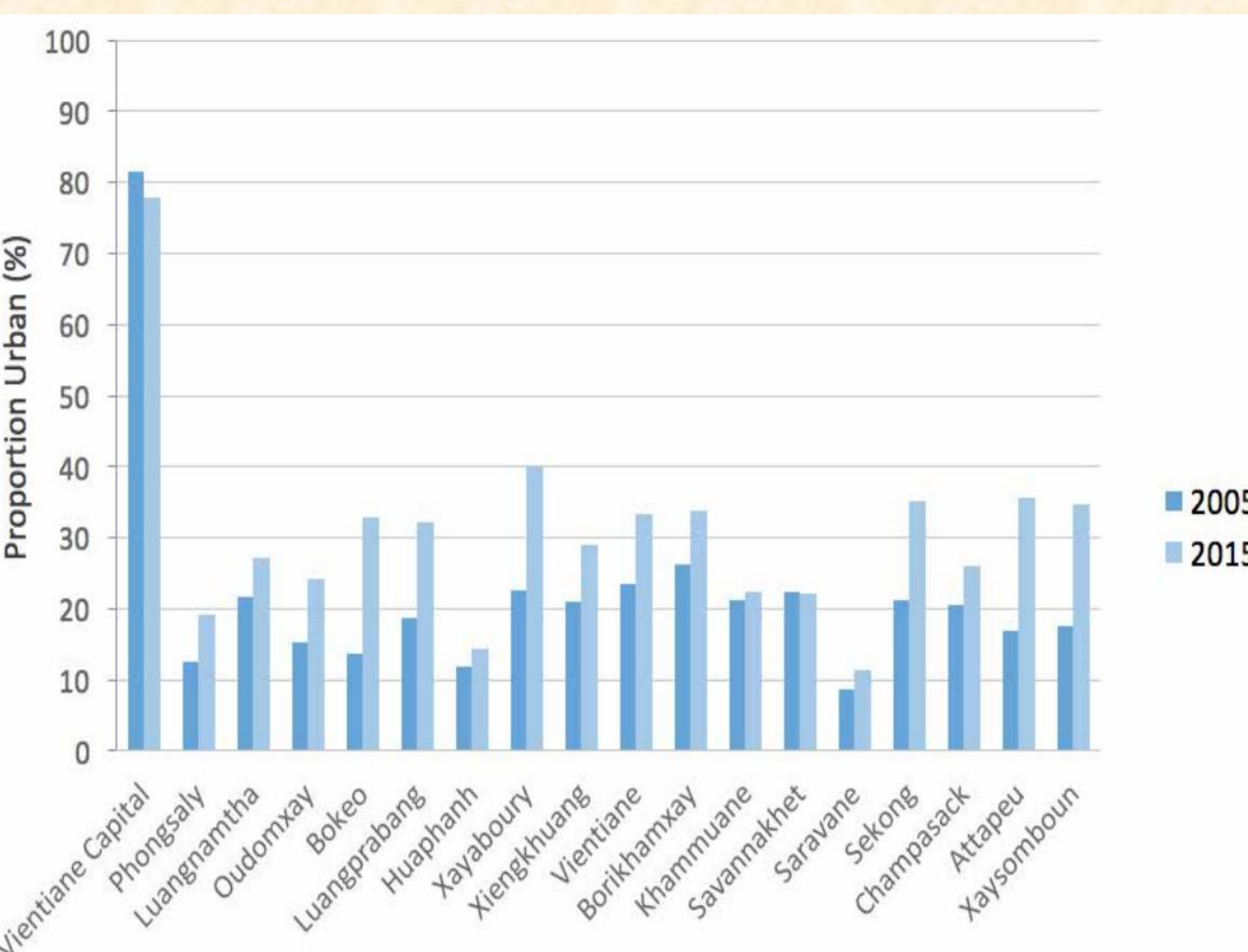


Figure 5. Proportion of urbanization growth in 2005 and 2015
Source: Population and housing census 2015, MPI, Laos

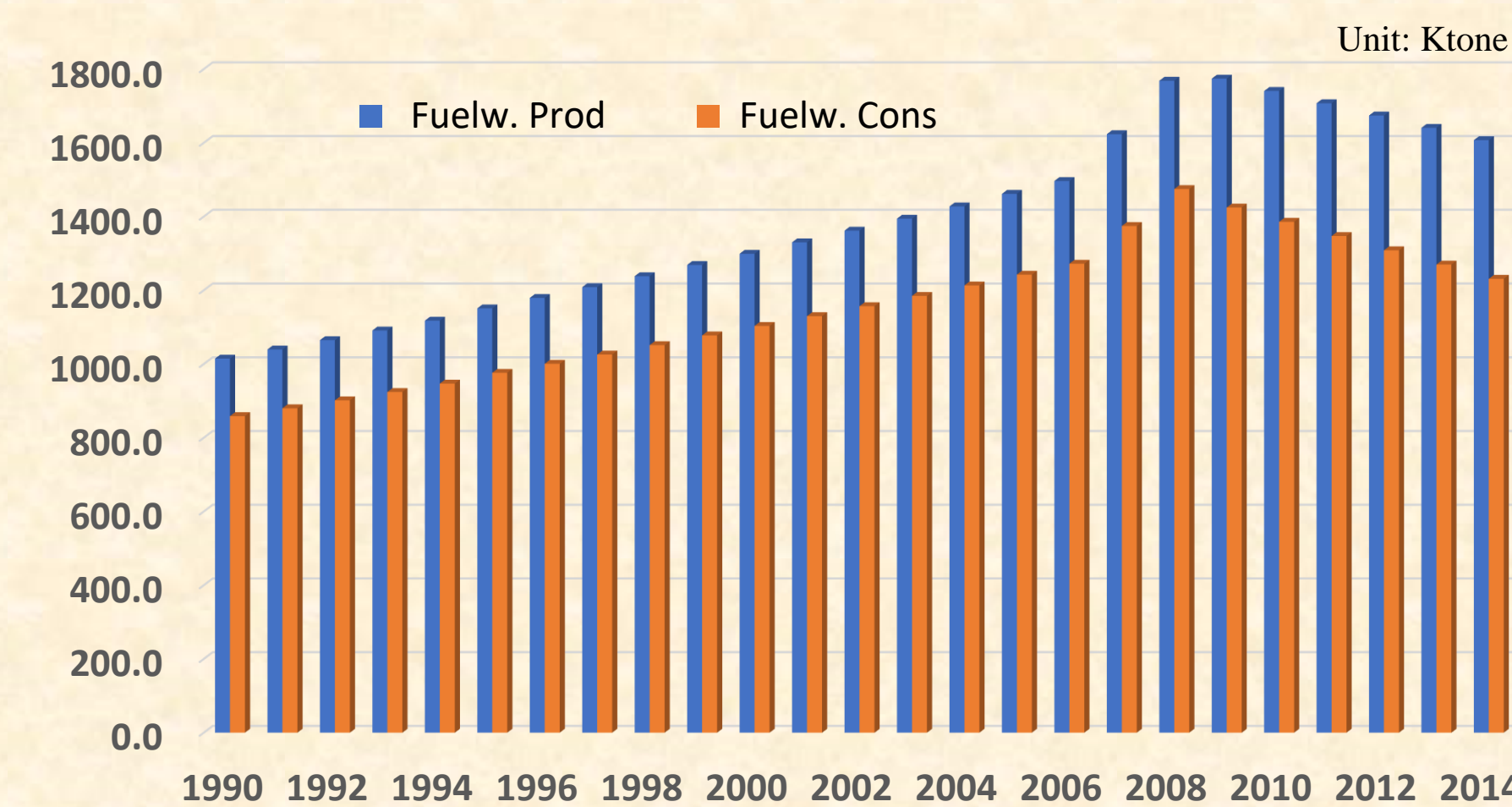


Figure 3. Fuelwood Production and consumption, 1990-2014
Source: Energy statistic 2018, MEM, Laos

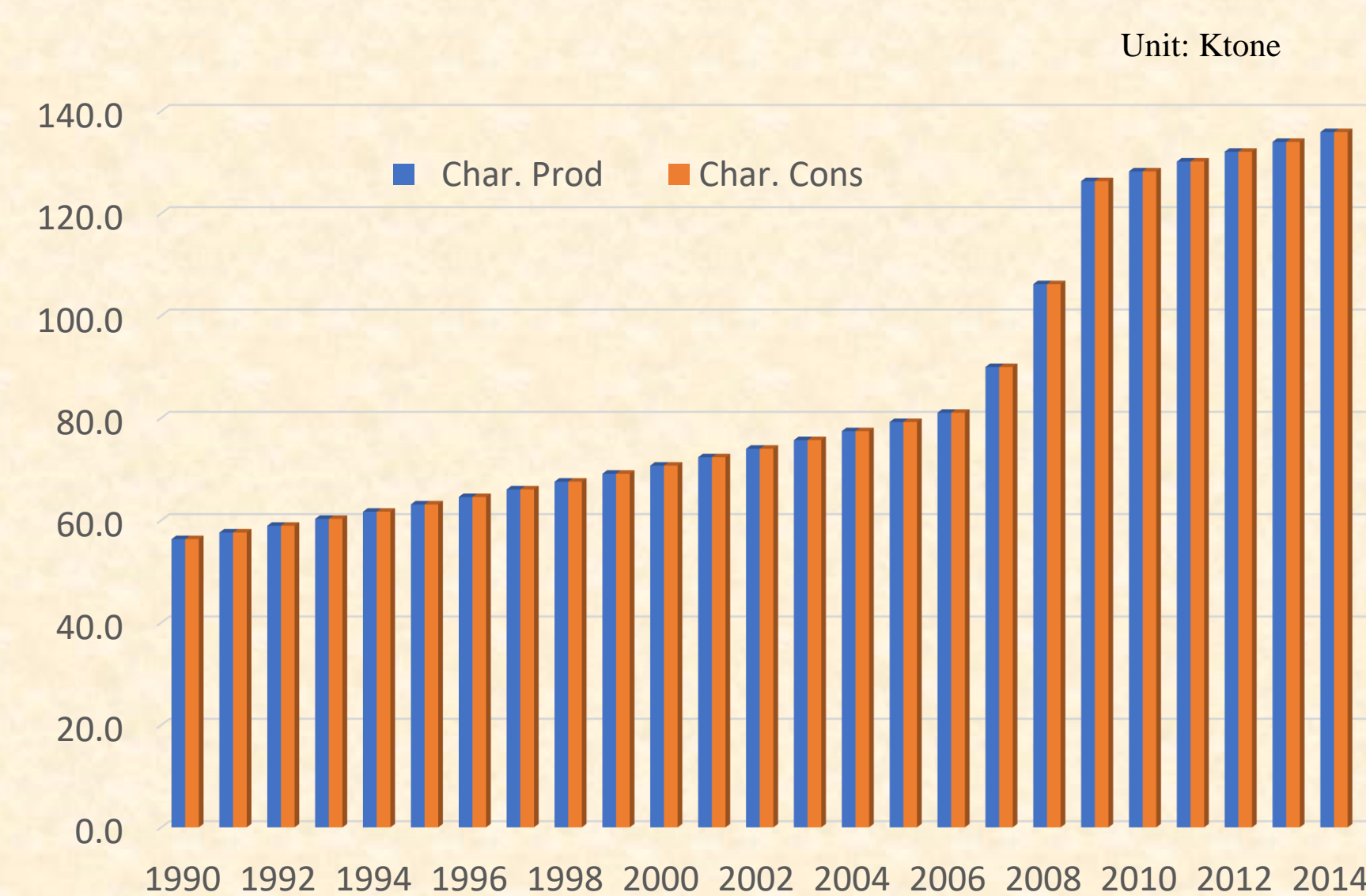


Figure 4. Charcoal production and consumption, 1990-2014
Source: Energy statistic 2018, MEM, Laos

Urbanization growth was a reason that households using less firewood. Households in urban areas they demand more charcoal that it is more clean energy and easier to use (figure 5). They have been also afforded for LPG.

Figure 6. illustrates the firewood demand until 2050 which will be slightly increased, and amount of the firewood consumption will be around 2,100 ktce in 2050. while the demand of charcoal will be more than firewood in the long-term and it will be increased one time comparing between consumption 2014 and 2050 (figure 7).

Research Objectives:

Based on the above information, Laos is facing the increasing trend of charcoal demand and other energy sources (LPG) in the residential sector. This trend would strongly impact on the reliability of future energy supply in the sector, along with energy-related CO2 emissions. Therefore, the objectives of this study are to (1) examine energy savings and CO2 mitigation potential of policies; (2) estimate biomass energy demand of households and other substitution energy. The CGE model is proposed as a methodology to forecast biomass demand until 2050.

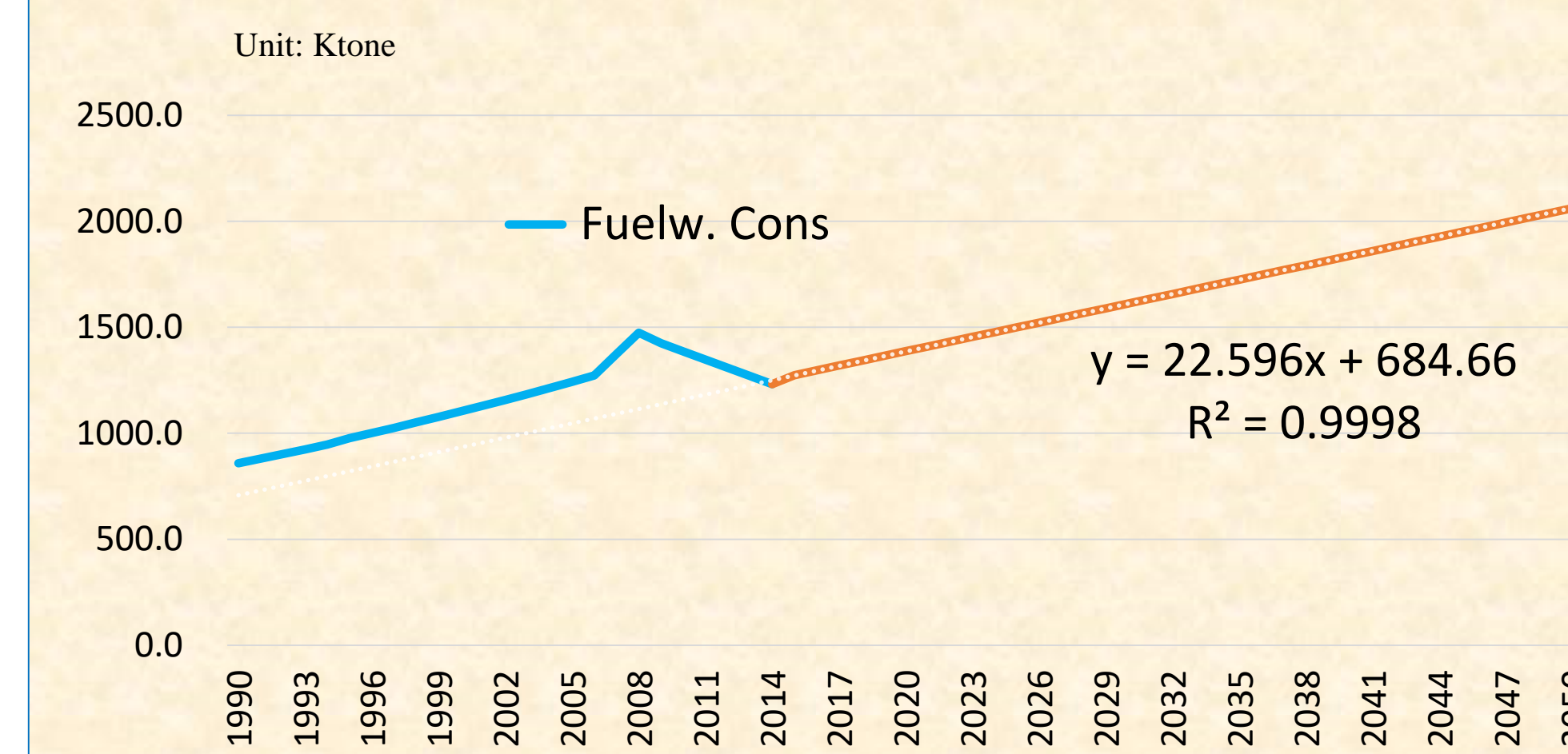


Figure 6. Fuelwood consumption scenario, until 2050
Source: Energy statistic 2018, MEM, Laos

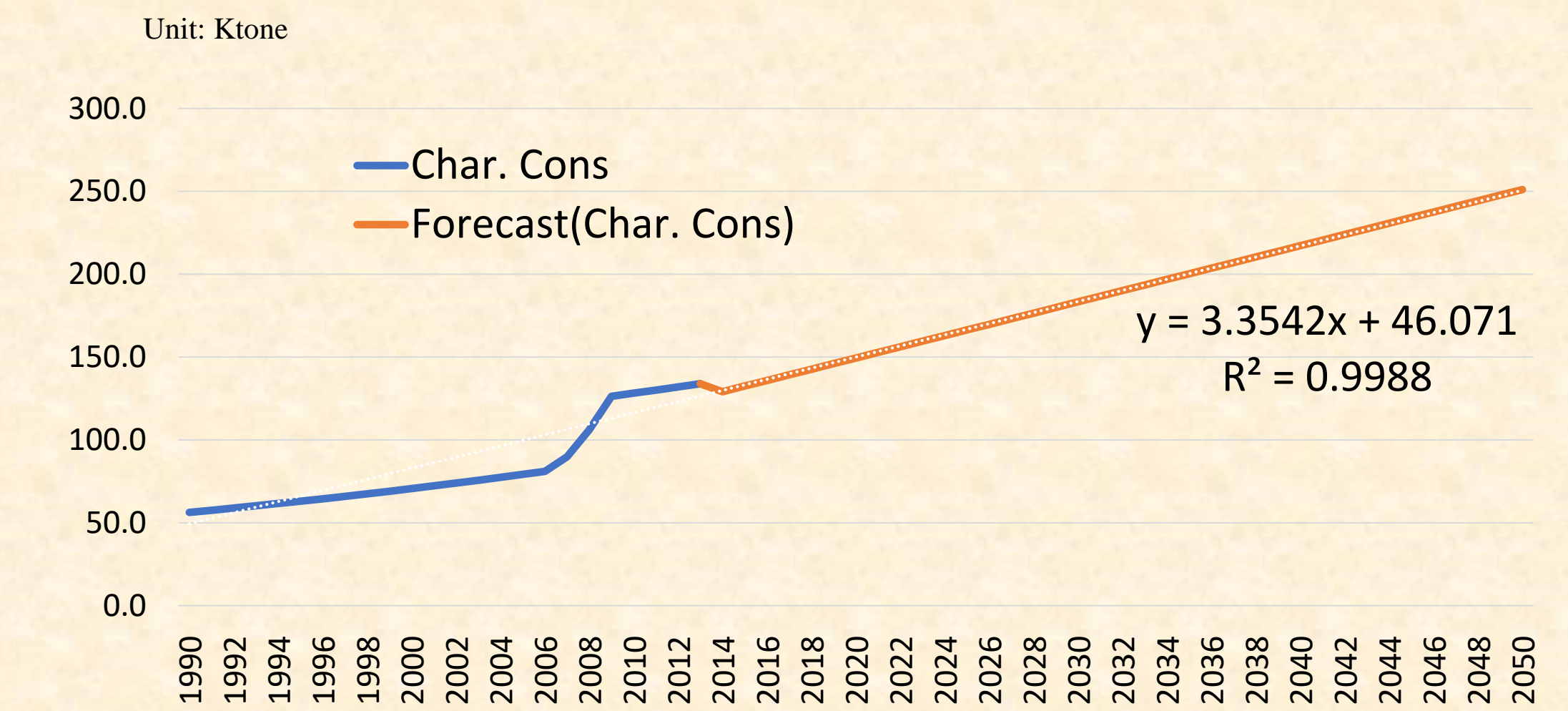


Figure 7. Charcoal consumption scenario, until 2050
Source: Energy statistic 2014, MEM, Laos

Proposed Methodology

Computable General Equilibrium (CGE) model: In general, the Computable General Equilibrium (CGE) model is a simulation that connects the abstract general equilibrium structure with realistic economic data to solve quantitatively for the supply, demand, and price level that support equilibrium across a specified set of markets. CGE model is one of the most useful tools for empirical economic analysis. During the last few decades, the CGE model has been applied to various countries and to the whole world for not only economic analysis but also energy consumption and greenhouse gas emission analysis. The CGE models are known as a tool for analysis of short-term and long-term economic implications of climate change, where price is an important signal that drives agents in an economy. The fundamental of CGE model is optimization of demand and supply curves of goods and factors of production, which are equilibrium in the markets by flexible prices adjustment.

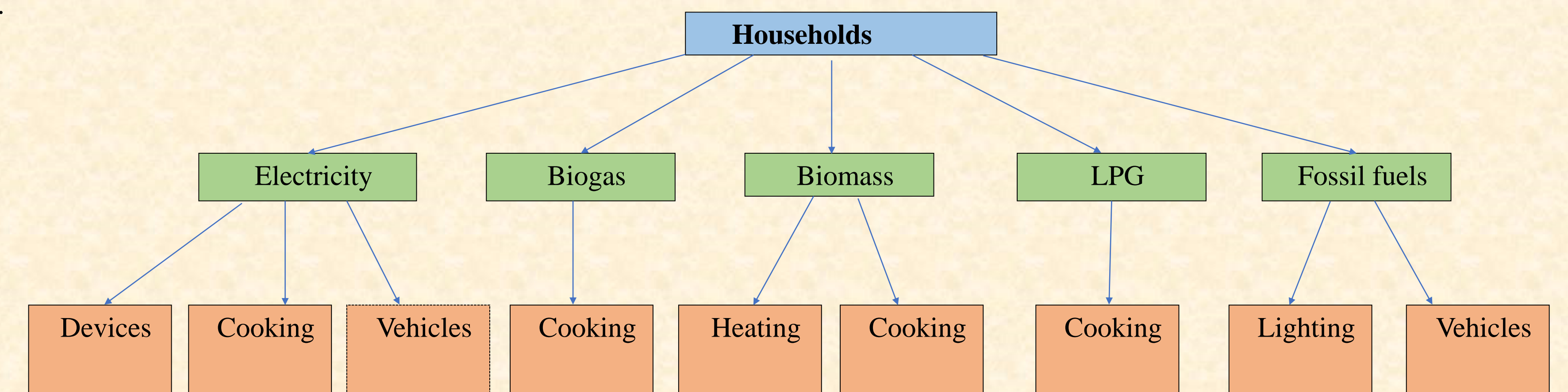


Figure 8. Overview of households' energy demand

Expected Outcomes

The aim of this study is to develop the GHG emission scenario in BaU and more efficient biomass use. In this study, in order to mitigate household's pollution from cooking, we will propose using improved cookstoves as a counter measures. And the other scenario will be proposed for cooking energy demand (LPG), in this case we assumed that households demand on biomass energy is larger than supply so LPG energy will play a role as substitution for cooking. Therefore, the expected outcomes are follows:

1. Scenario on BaU emission and efficient biomass use (applying improved cookstoves)
2. Scenario on household's demand on other energy sources (LPG)