

CHAPTER I

INTRODUCTION

1.1 Background and significance

Global climate change is nowadays what every country around the world cannot avoid. The issue was caused by the increasing amount of atmospheric greenhouse gases (GHG) including carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). The earth was enveloped by the thick layer of these gases. The solar heat over the earth, which should be reflected back to the space cannot penetrate through the atmosphere leading to global warming. Among these gases, CO₂ is the most abundant and becomes are the major cause of the climate change [1]. Since the industrial revolution when fossil fuels combustion, cement production and land use change became wide spreading, the amount of atmospheric CO₂ has been rising steadily from 280 ppm (in 1750) to over 380 ppm (in 2010) [2].

The urban area, as the center of prosperity, both in business and trade, transportation, industrial activity and service of government, is the major contributor in CO₂ emissions (carbon source). Increasing population leads to higher resource consumption. It can also affect urban air quality. Covering only 3 percent of the whole land area, more than 70 percent of global CO₂ emission is from urban areas [3]. The urban area was defined with the population of up to 3.5 billion people, representing 50 percent of the global population. It was forecast reach 70 percent by the year 2050 [4]. Bangkok, the capital of Thailand, is considered as the country's first and the world' fifth highest of CO₂ emission (42 million tonnes per year) [5]. These CO₂ causes the global warming and affects the urban environment seriously.

According to Kyoto Protocol signed in United Nations Framework Convention on Climate Change, Thailand was categorized in non-annex I country or a group of developing countries that have no obligation to reduce the CO₂ emission in the atmosphere. However, both Thailand and Bangkok have awareness of the issue. The policy to reduce atmospheric CO₂ was initiated. "Bangkok Green City" and

“Change Bangkok to Low Carbon City” projects were established to make Bangkok a livable city by improving the quality of life of Bangkok citizen and reducing the amount of atmospheric CO₂. It is noteworthy that all policies aim to increase the green space. Planting more trees in urban areas has to be proceeded because trees are living organisms that can absorb CO₂ directly from the atmosphere via the process of photosynthesis. The atmospheric CO₂ was transformed and stored in plant tissues or is called “biomass” which is parts of the plant falling off to the ground or the dead plants. It is decomposed by soil microbial activity and became found accumulated in the soil [6].

Urban park is a green space providing a vital service to the city lives. Not only being an umbrageous atmosphere, it is also a place for recreation, exercise and other leisure activities or even a nature-learning source. From the environmental aspect, urban park absorbs and reduces the severity of air pollution [5]. In addition, the park also plays an important role as a carbon pool (carbon sink) of the city via plants and soils with the process of photosynthesis as mentioned previously. Considering the limited area to be developed as an urban green space, especially for inner Bangkok [7], the guidance for the proper management to enhance the carbon capability in the original green area is the possible approach to solve such problems [8].

This study was carried out to study the carbon sequestration in the urban park in order to obtain the empirical data that can be used to suggestion as the management guideline of the urban park and the response to urban management policy.

1.2 Objective of the study

1.2.1 To study the amount of carbon storage in above-ground biomass, litter and soil in the public parks

1.2.2 To analyze the factors that affect on carbon sequestration of the public parks

1.2.3 To suggest the management guideline of the public parks for that support the carbon sequestration

1.3 Scope of the study

1.3.1 Study area

The study was carried out in two main parks under the responsibility of the Office of Public Park, Environment Agency, Bangkok Metropolitan Administration: Lumpini park and Vachirabenjatas park. Two types of land cover, tree-planting area and turf, were studied.

1.3.2 Scope of the study

1.3.2.1 Estimate the amount of carbon storage in three parts, which consists of

1) Above-ground biomass, measured from biomass of stems, branches and leaves of tree. This section was studied in tree-planting area only.

2) Litter, measured from litter fall in tree-planting area and grass litter in turf

3) Soil, measured from total organic carbon and also analyze the soil properties.

1.3.2.2 Estimate the total carbon storage in both tree-planting area and turf

1.3.2.3 Analyze the relationship between vegetation, soil properties and total carbon storage in both tree-planting area and turf

1.4 Expected results

1.4.1 The amount of carbon storage in above-ground biomass, litter and soil of the public parks

1.4.2 The factors that effect on carbon sequestration of the public parks

1.4.3 The management guideline of the public parks for support the carbon sequestration

1.5 Conceptual framework

This study was carried out in two types of land cover, tree-planting area and turf, in two public parks: Lumpini park and Vachirabenjatas park. The carbon storage in above-ground biomass, litter, soil and total carbon storage were studied. The physical and chemical properties of soil were analyzed. The relationship between vegetation, soil properties and total carbon storage were also described in order to the management guideline to support carbon sequestration.

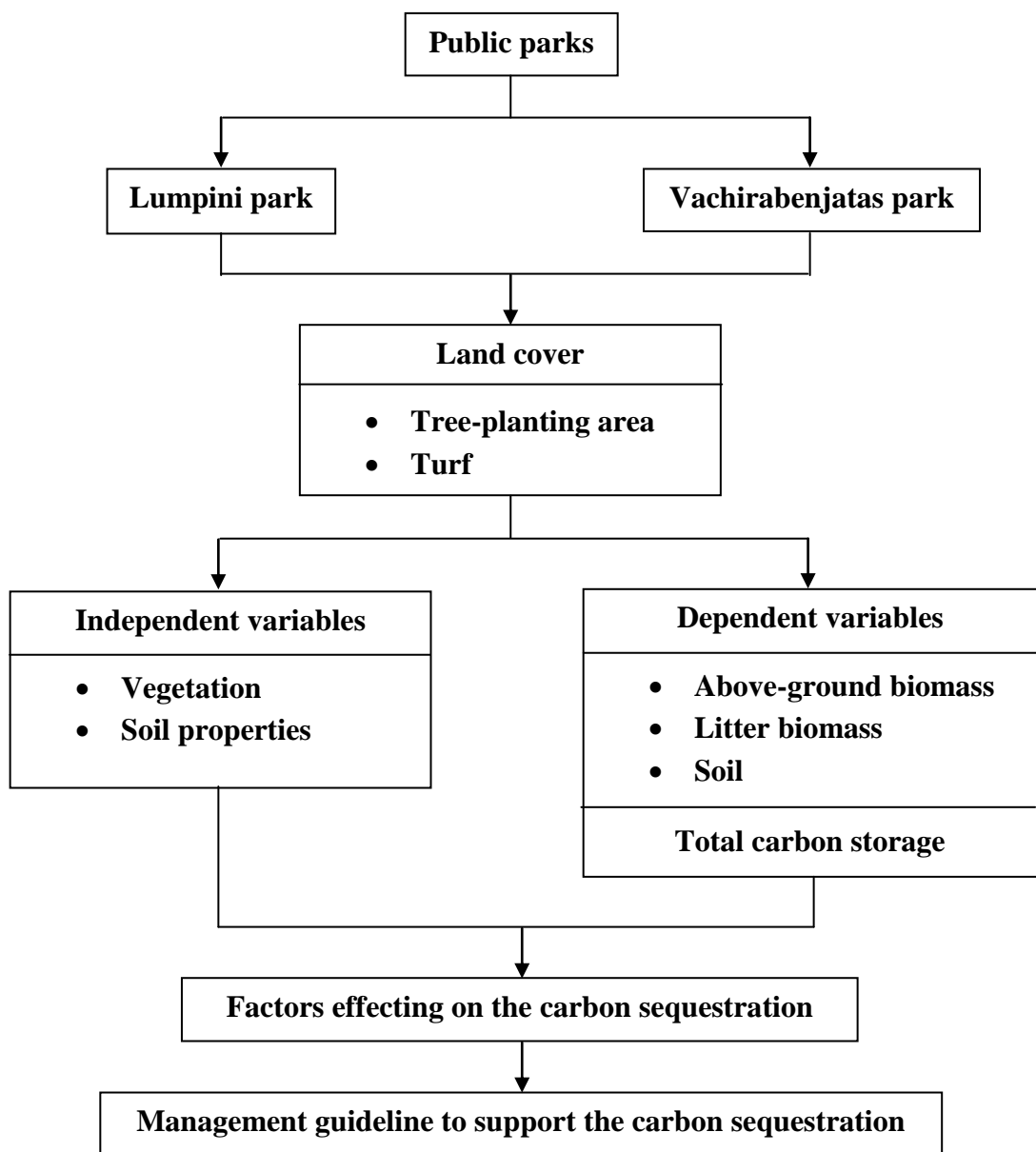


Figure 1.1 Conceptual framework for the study