

# Impacts of land cover change on climate trend in Padang Indonesia

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**Abstract** The purpose of this study was to analyze the trend of climate change through changes in the elements of Green House Gases (GHGs), includes the trend of CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>. The change of the extreme rainfall and temperature indices due to land cover change into developed area in Padang. Identification and analysis trends of climate change and extreme climatic events were analyzed by using RclimDex the Expert Team for Climate Change Detection and Indices (ETCCDMI) technique. Where as the analysis and interpretation of land cover changes into developed area used Landsat TM 5 and Landsat 1985 7 ETM + of 2011 by ERDAS 9.2 GIS with the supervised classification method and GIS Matrix. The results of the study provide informations of land cover changes into developed area at forest land (11,758.9 ha), shrub (3,337.3 ha), rice fields (5,977.1 ha), and garden (5,872.4 ha). It has an implication on increasing of the elements of GHGs concentration such as CO<sub>2</sub> (14,1 ppm), N<sub>2</sub>O (5,4 ppb) and CH<sub>4</sub> (24,8 ppb). This condition lead to an extreme temperature and presipitation indexes trends in Padang.

**Keywords:** Climate Change; Green House Gases; Land Cover Changes

**Abstrak** Tujuan penelitian ini adalah menganalisis trend perubahan iklim melalui perubahan unsur-unsur Gas Rumah kaca (GRK) yang meliputi trend CO<sub>2</sub>, N<sub>2</sub>O, dan CH<sub>4</sub>, serta indeks temperatur dan curah hujan ekstrim akibat perubahan tutupan lahan menjadi lahan terbangun di Kota Padang. Identifikasi dan analisis trend perubahan iklim dan kejadian-kejadian iklim ekstrim di analisis dengan menggunakan metode RclimDex dengan teknik Expert Team for Climate Change Detection and Indices (ETCCDMI), sedangkan analisis perubahan tutupan lahan menjadi lahan terbangun dilakukan dengan interpretasi Citra Landsat TM+5 tahun 1985 dan Citra Landsat ETM+7 tahun 2011 dengan GIS ERDAS 9.2 dengan metode supervised classification dan GIS Matrix. Hasil penelitian memberikan informasi perubahan tutupan lahan menjadi lahan terbangun yang cukup ekstrim terjadi pada lahan hutan (11.758,9 ha), semak (3.337,3 ha), sawah (5.977,1 ha), dan kebun (5.872,4 ha). Kondisi ini mengakibatkan trend yang meningkat dari CO<sub>2</sub> sebesar 14,1 ppm, N<sub>2</sub>O meningkat sebesar 5,4 ppb, dan CH<sub>4</sub> meningkat sebesar 24,8 ppb. Hal ini secara langsung mengakibatkan terjadinya trend indeks temperatur ekstrim dan curah hujan ekstrim di Kota Padang.

**Kata kunci:** Perubahan Iklim, Gas Rumah Kaca, Perubahan Tutupan Lahan

## I. Introduction

Land cover change is an urban development phenomenon that is difficult to solve. This is due to the urban development which directly change natural land functions. In line with the urban development caused the pressure on forest land conversion into developed area. The land cover changes will lead to the increasing of CO<sub>2</sub> concentration in the atmosphere. The changes in agricultural and farm land into developed area will produce an increasing trend of N<sub>2</sub>O and NH<sub>4</sub>. That would affect the changes of climatic conditions in the region directly [Hermon, 2012a]. CO<sub>2</sub>, N<sub>2</sub>O, and NH<sub>4</sub> are included in green house gas (GHG) which naturally can adsorb the heat radiation in the atmosphere. The change in GHGs concentration will impact unstable

climatic conditions both on extreme temperature and rainfall. GHG emissions have been increasing due to the increased of fossil fuels (FF) consumption since the industrial revolution in the mid 1980s. In the last decade, CH<sub>4</sub> emissions have declined by 22 million tons/year from 37 million tons/year in the previous decade and N<sub>2</sub>O emissions also decreased slightly from 3,9 to 3.8 million tons/year. The CO<sub>2</sub> emissions increased by more than double from 1.400 million tons/year to 2.900 million tones/year. It had an implication on temperature rising by 0.50 C° compare to pre industrial. In the long term, earth temperature will tend to be higher than the current temperature [IPCC, 2001; Hermon, 2010].

Padang is the capital city of West Sumatra Province. that has a flat to hilly relief in general, primary forest located on the eastern and southern city. It continues over the time. Land cover change into developed area covered 3,044.20 ha in 1980 and increased to 8,288.28







