



## Assessment of the carbon footprint mass balance in the context of global climate change; a case study for Isparta Province

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**Abstract:** After the industrial revolution in the world, especially in the last 20 years, due to the increase in population and technology, energy consumption has also increased in very serious quantities. The industrial revolution has started with the intense use of fossil fuels, which is a process of millions of years of human creation. As a result of the use of fossil fuels in energy consumption, the atmospheric carbon emissions have increased and the concept of global climate change has formed. The concept of carbon footprint has been established in the United Kingdom to create awareness of global carbon emissions and the adverse effects of global climate change. In this study, the emissions of the main carbon sources in Isparta Province were calculated. A calculation was also made from the carbon respiration of forest areas in the Isparta Province and the results were compared. In this context, four main sources were taken into account in the carbon footprint calculation for Isparta Province. These were electricity consumption, heating, number of cars and socioeconomic preferences. The calculation tool used at the carbon footprint calculation is located at [www.carbonfootprint.com](http://www.carbonfootprint.com), which is based in the United Kingdom and aims to raise awareness about global warming and centers in different countries. Within this scope, it was accepted that 4 people living in 1 household in order to calculate the carbon emissions per household. The population of Isparta Province was 427 324 people in 2016 according to Turkish Statistical Institute and about 106 800 households were found (1 household with 4 people accepted). The consumption for heating purposes of Isparta Province was accepted about 40% natural gas and 60% coal. The average annual natural gas and coal consumption per household was accepted as 360 m<sup>3</sup> and 1 ton, respectively for Isparta Province. The annual average total energy consumption for Isparta Province was assumed to be 1000 kWh per household. According to Turkish Statistical Institute, 160 000 vehicles have been determined in Isparta Province as of 2016. However, some assumptions were made from the socioeconomic situation of the people living in Isparta Province such as the preference for food (meat consumption), the recycling rate of the formed garbage (some being recycled) and the furniture and electronic goods preferences (generally taking new products and using them for at least 5 years). The amount of carbon footprint per capita for Isparta Province was calculated to be about 5.2 tons by the carbon footprint calculation. It was seen that the average value of Turkey is about 4 tons per capita and slightly above the average for Isparta Province. The total carbon footprint of Isparta Province was calculated approximately as 2 220 000 tons (427 324 people \* 5.2 tons). The forest area of Isparta Province was 386 048 hectares according to taken data from Isparta Regional Directorate of Forestry for 2016. The amount of carbon sequestration per hectare by forests is 3-5 tons per year in literature. This value was chosen as 4 tons in order to stay safe in this study. The amount of carbon sequestration per year was calculated to be approximately 1 544 000 tons for Isparta Province (386 048 ha \* 4 tons). It was found that 676 000 tons of carbon to be released in atmospheres from Isparta Province when carbon mass balance was made in the light of the abovementioned acceptances. In this case, it is recommended that decreasing of the use of fossil fuels and increasing of the use of renewable energy resources and the area of productive forests for reducing the adverse effects of climate change.

**Keywords:** Carbon emissions, Carbon footprint, Climate change, Forest areas, Fossil fuels