

**MA-UY 1024/1324****SUSTAINABILITY PROJECT 1**

Direction: Complete each question clearly and neatly. Indicate your final answer clearly. All your work must be done directly on this paper. Show all your work/explanation/arguments. Include units for all your work.

**Greenhouse gases** are gases that trap heat in the atmosphere. The main greenhouse gases are: Carbon dioxide,  $\text{CO}_2$ , enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., cement production); Methane,  $\text{CH}_4$  is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use, and by the decay of organic waste in municipal solid waste landfills; Nitrous oxide,  $\text{N}_2\text{O}$  is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater; fluorinated gases have no significant natural sources and come almost entirely from human-related activities (they are synthetic and are emitted from a variety of household, commercial, and industrial applications and processes).

**Mauna loa** is one of five volcanoes that form the Island of Hawaii in the U.S. The carbon dioxide data on Mauna Loa constitute the longest record of direct measurements of  $\text{CO}_2$  in the atmosphere.



(A) Active Mauna Loa



(B) Non-active Mauna Loa

FIGURE 1. Mauna Loa

- (1) The data in a Microsoft Excel sheet gives you the yearly average of CO<sub>2</sub> emitted by Mauna Loa since 1950. Click on **Data of Mauna Loa**. Use Excel to draw a scatter plot of the data. You may click this link to watch this short **video** on how to create a scatter plot. After you draw the scatter plot, add a trendline on the graph with a polynomial function of degree 2. This is a **mathematical model**. Here is a **Trendline video**. Once you are done, insert the graph with the equation.

(2) What does the expression  $f(20.5)$  represent?

(3) In what year will Mauna Loa emit twice as much as it produced in 1950?

- (4) Use your model to complete the table below. What do you notice between the actual data and the data given by your model?

Year	CO <sub>2</sub> parts per million
1951	
1960	
2000	
2021	
2022	

- (5) We know that there is no way ( or do we have one?) to prevent the eruption of a volcano. But we can still reduce some of its risks. List 2 or 3 ways to reduce its risks since a volcano is unpredictable natural hazards. Elaborate

- (6) What do you think?: do we (humans) produce more CO<sub>2</sub> than **all** Earth's volcanos?

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<sup>1</sup>**Data of Mauna Loa**

<sup>2</sup>Global Monitoring Laboratory

<sup>3</sup>Monthly Average Mauna Loa CO<sub>2</sub>