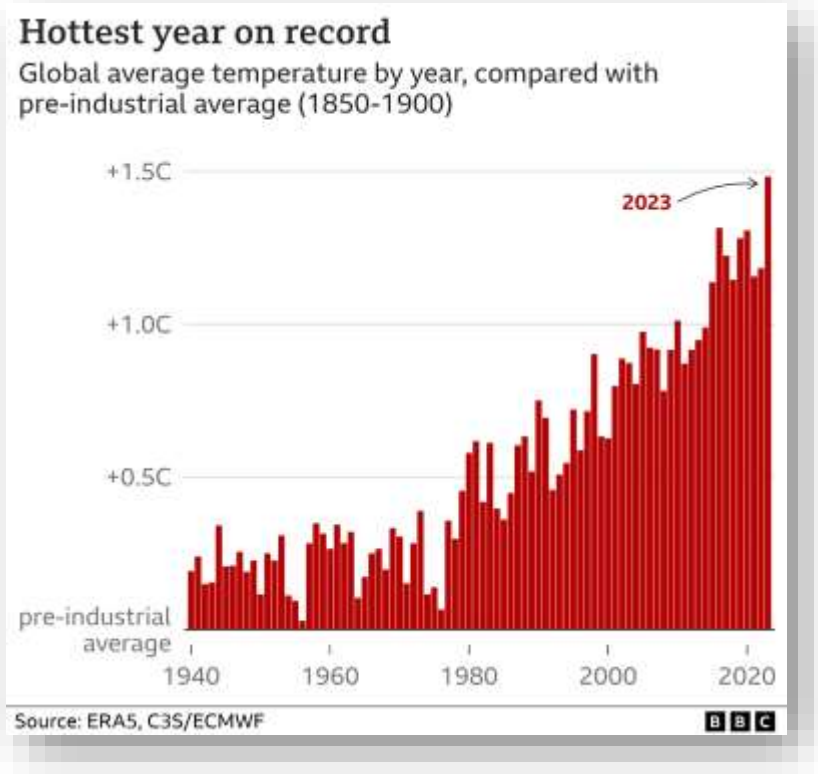
Population Density and Deforestation's Effect on Global Warming

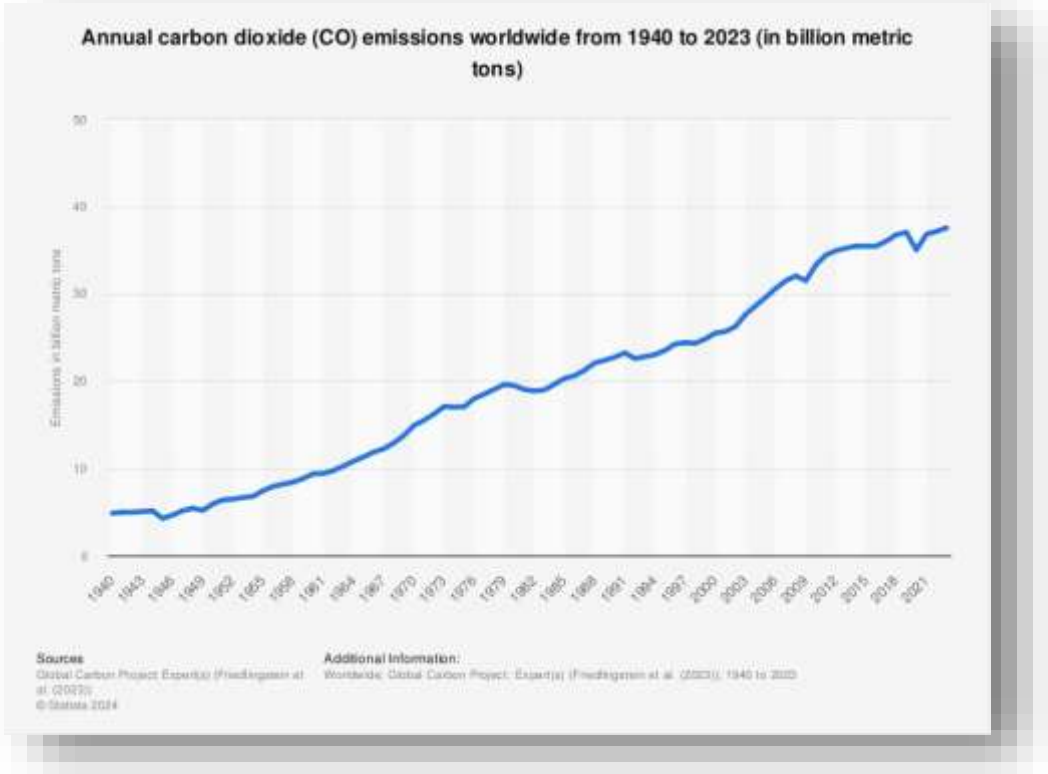
Adel Maddi - B2205.090027
Özlem Nur Duman - B2105.090116
Selin Çabukel - B2105.090119
Rakymzhan Baimurat - B2205.090054
Zayn Zahir - B2205.090002
Sarp Murat Gencer - B1906.090048

Objective

- The objective of this project is to determine if there is a relationship between global warming, deforestation, and population density by analyzing related data.



Global Average Temperature by Year



Global CO2 Emission by Year

countries	carbon_emissions	global_warming_handling	gdp	pop_density_growth	pop_density	region
Norway	7,30	High	434,00	0,65	15	Northern Europe
Sweden	4,50	High	576,00	0,69	25	Northern Europe
Finland	8,90	High	283,00	0,21	18	Northern Europe
Denmark	6,60	High	347,00	0,35	137	Northern Europe
New Zealand	7,00	High	207,00	1,37	18	Oceania
India	1,90	Low	3050,00	1,04	450	South Asia
Bangladesh	0,50	Low	399,00	1,02	1265	South Asia
Kenya	0,40	Low	98,00	2,31	95	East Africa
Haiti	0,40	Low	20,00	1,24	426	Caribbean

Countries that are the most and the least affected by global warming

year	forest_cover	ratio_percentage	population	co2_emissions
1880,00	1272,00	40,00	223,00	10,5
1900,00	1209,60	38,00	243,00	115
1920,00	954,00	30,00	268,00	640,2
1940,00	890,40	28,00	324,00	1468,5
1960,00	731,10	23,00	446,00	2832
1980,00	620,57	19,49	696,80	6761
2000,00	684,39	21,51	1060,00	18913,5
2010,00	678,50	21,34	1241,00	31760
2020,00	688,13	21,67	1417,00	54236,8

Collected data for the Deforestation of India

year	forest_cover	ratio_percentage	population	co2_emissions
1880	202,8	52	2,06	0,11
1900	202,8	52	2,656	0,28
1920	204	54	3,22	1,06
1940	204	56	3,63	3,3
1960	214	57	4,37	11,67
1980	220	60	4,72	49,3
2000	234	73	5,12	61,3
2010	235	73	5,363	65,3
2020	237	74	5,53	48,7

Collected data for the Deforestation of Finland

Procedure

- To make it more legible and obvious if there is a correlation between these variables, we will use plot and graph visualizations for the relations.

Analysis: What is Global Warming?

- The term "global warming" describes the steady, long-term rise in Earth's atmosphere's average temperature brought on by the greenhouse effect. Gases from many human activities, but primarily from transportation, are responsible for this effect. We refer to the gasses as CO2 emissions.

countries	carbon_emissions
Qatar	36
Bahrain	26.7
Kuwait	25
Trinidad & Tobago	24
Palau	59

countries	carbon_emissions
Togo	0.39
Kiribati	0.48
Burundi	0.31

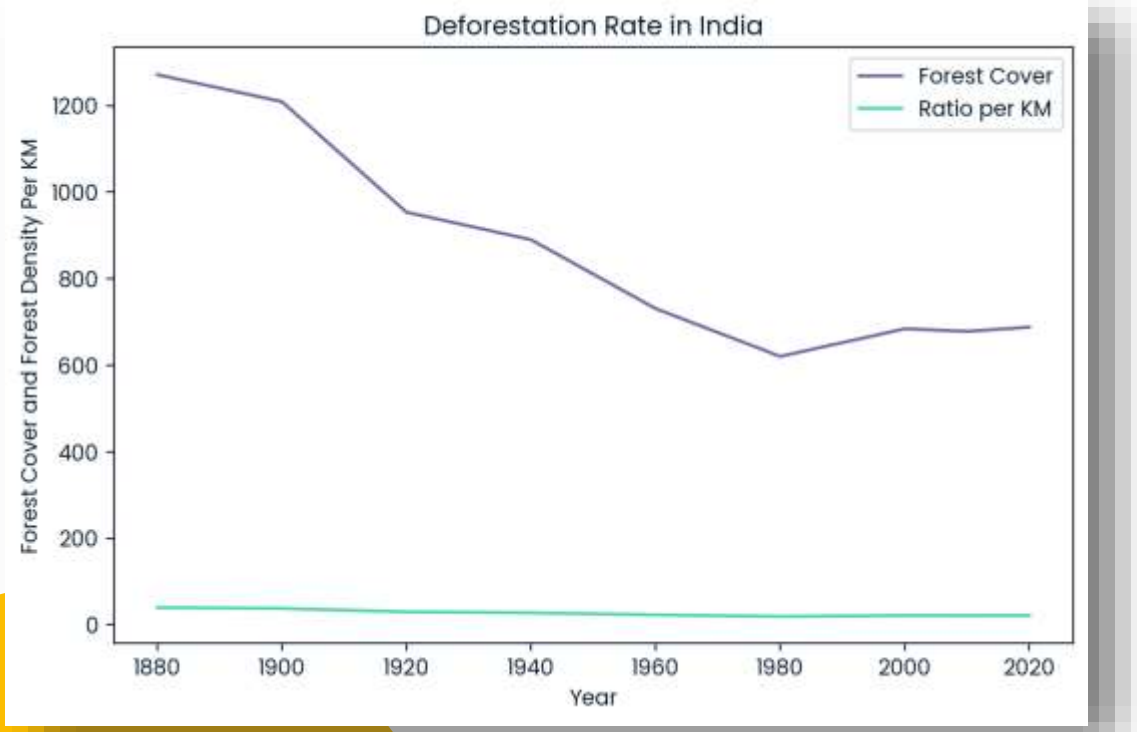
Highest and Lowest CO2 emissions countries (in tons)

- Based on the data, it is clear that carbon dioxide emissions are not the only metric affecting a country's ability to handle global warming.

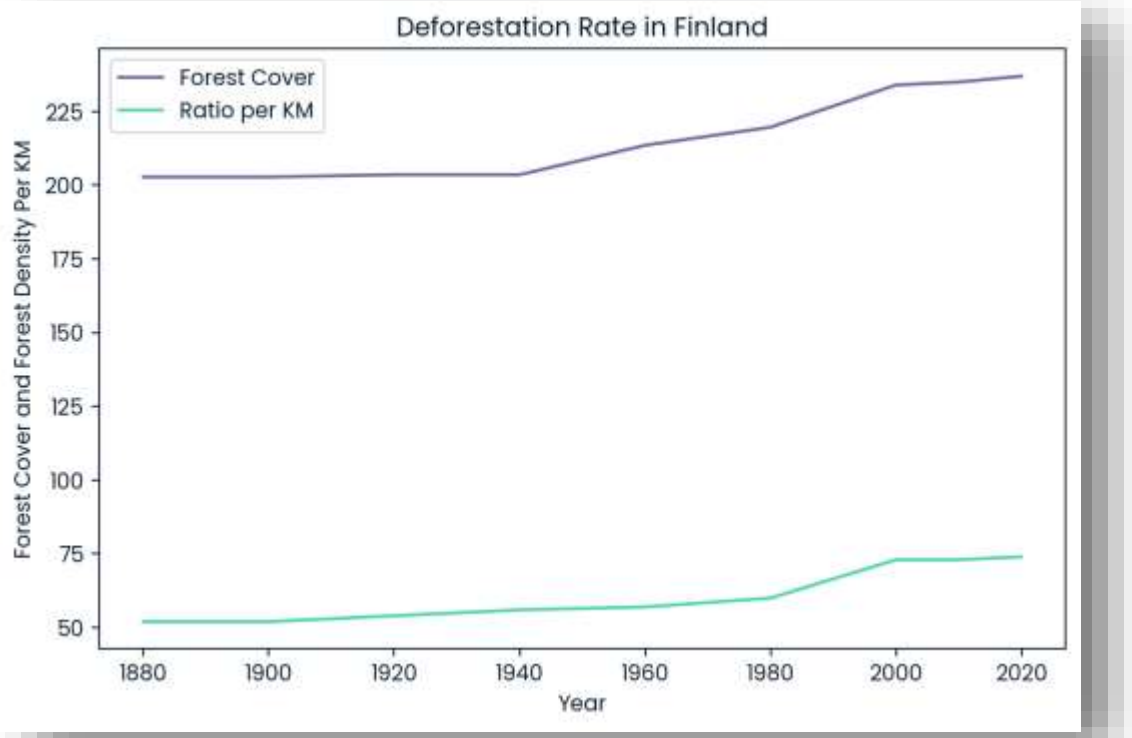
- Therefore, we will examine other factors influencing a country's ability to handle global warming, specifically focusing on deforestation and population density data from India and Finland.

Factor 1 : Deforestation

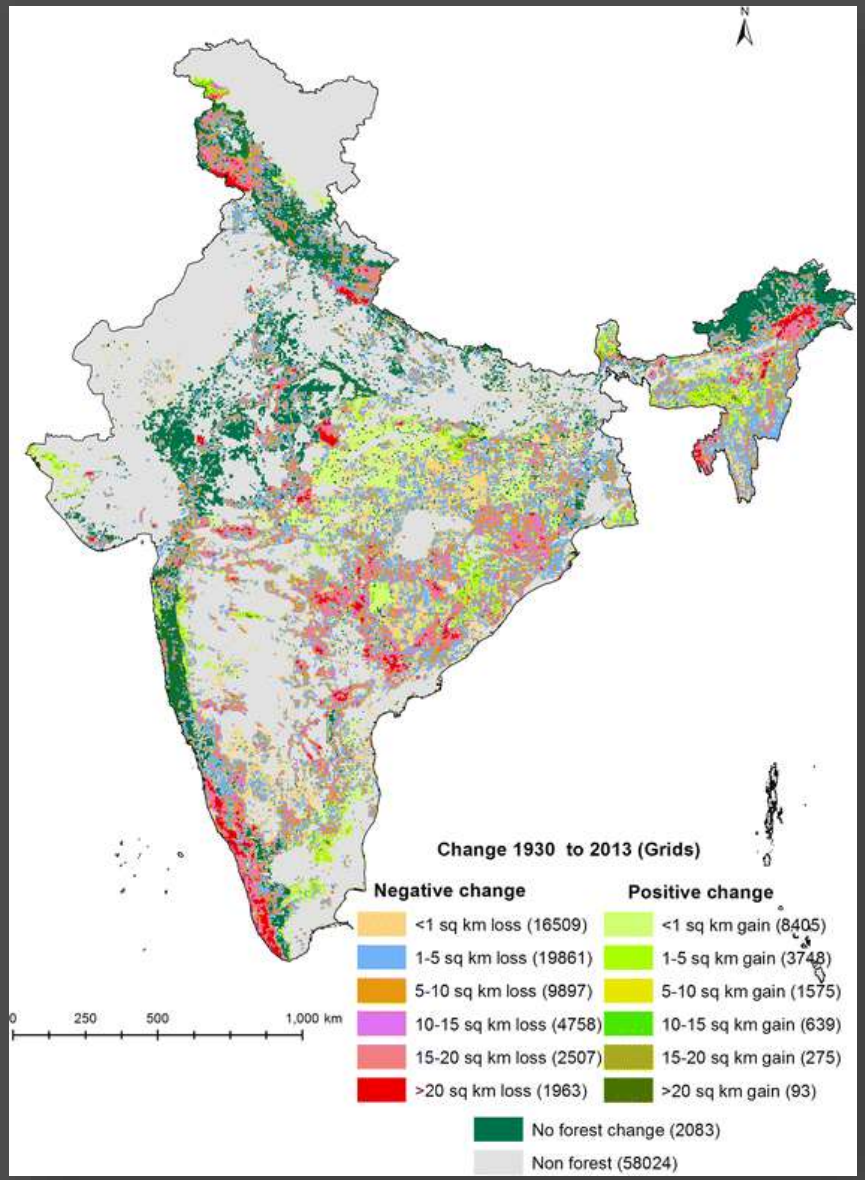
- Deforestation significantly contributes to global warming by reducing the Earth's capacity to absorb greenhouse gases and releasing stored carbon into the atmosphere. Countries with high deforestation rates are likely to experience greater impacts from global warming.



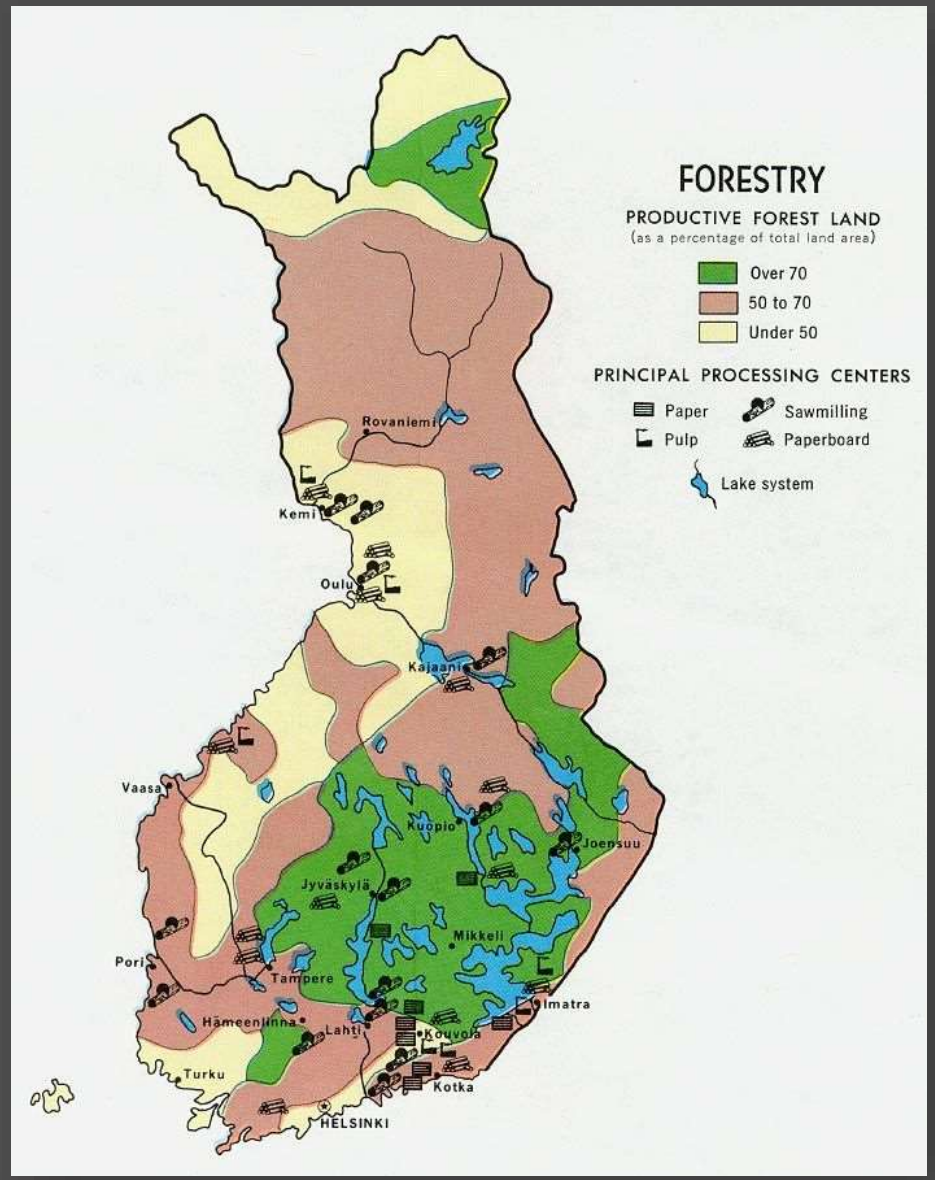
Deforestation Graph of India



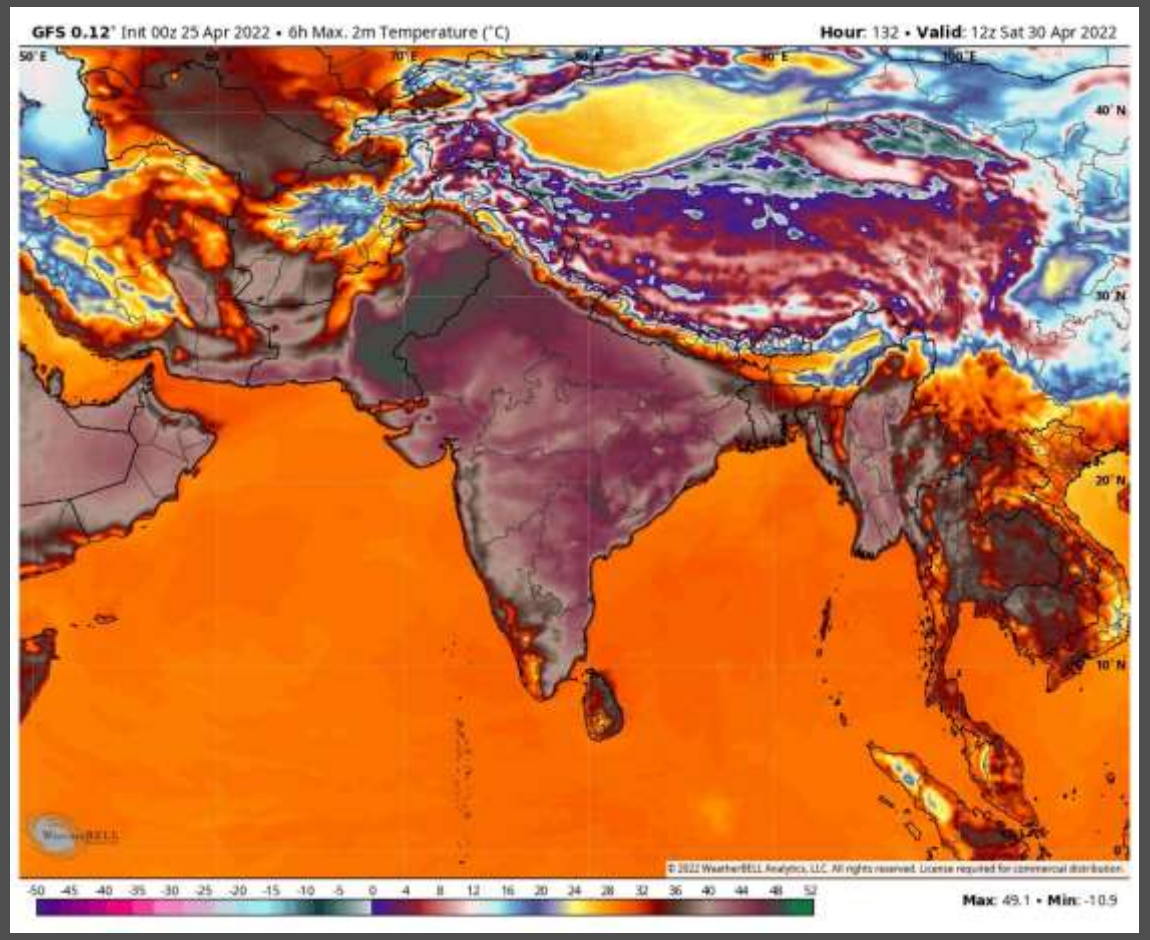
Deforestation Graph of Finland



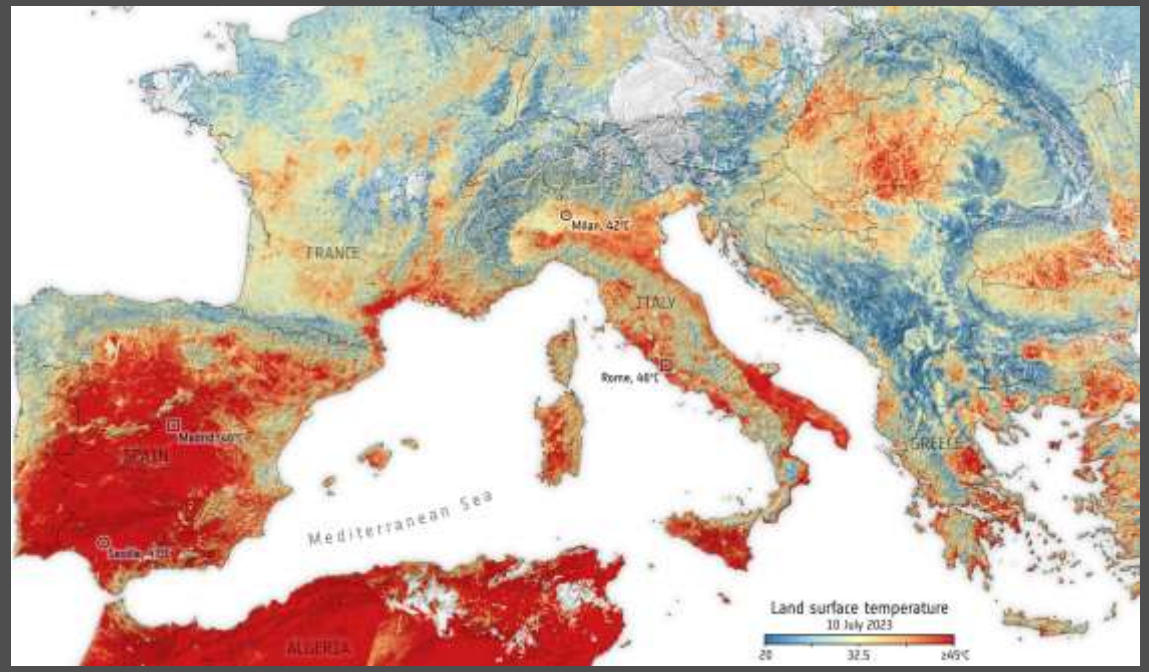
Deforestation Map of India



Deforestation Map of Finland



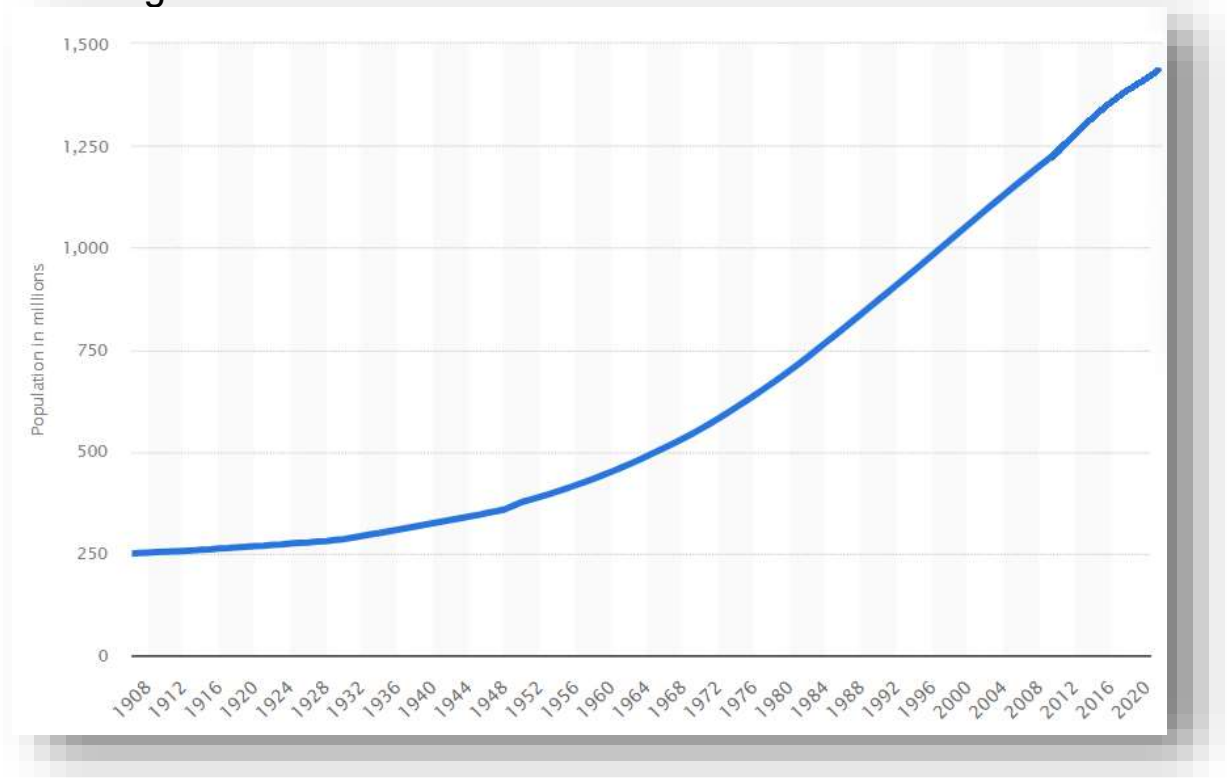
Heat Waves Map in India, Bangladesh, Sri Lanka



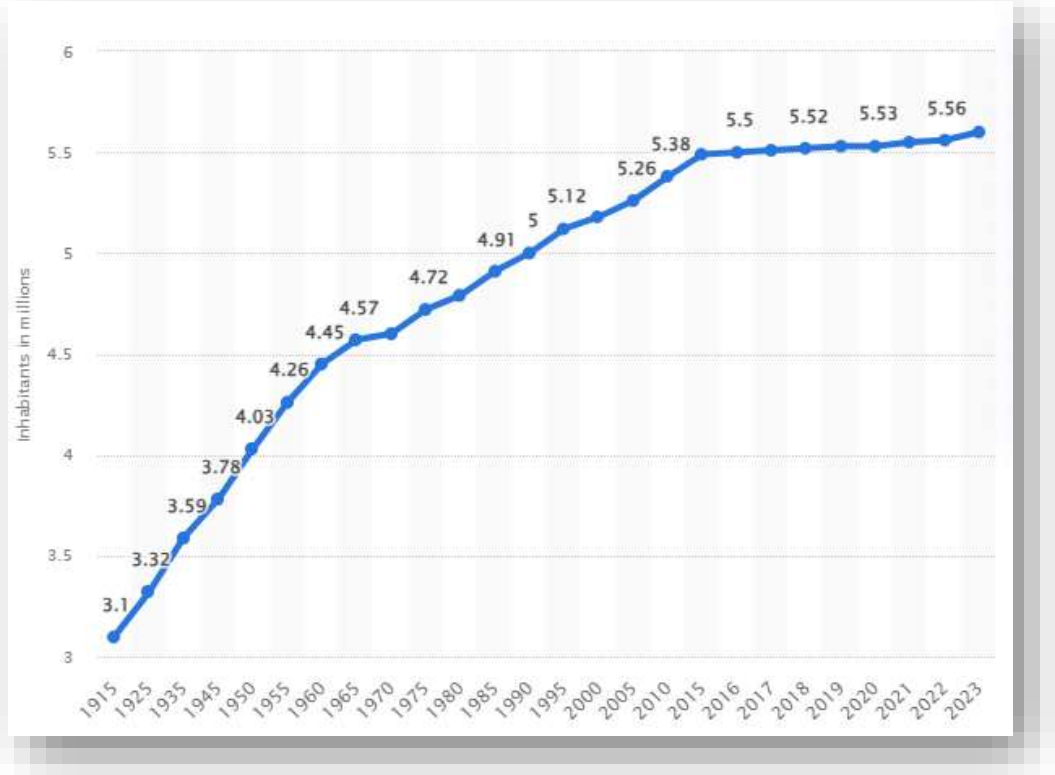
Heat Waves Map for Europe

Factor 2 : Population Density

- Population density measures the number of people per square kilometer in an area. It's vital for urban planning, resource management, and understanding environmental effects. The global average population density in 2024 is around 60.31 people per square kilometer.
- According to our hypothesis nations with higher population density than the average should be the most affected by Global Warming



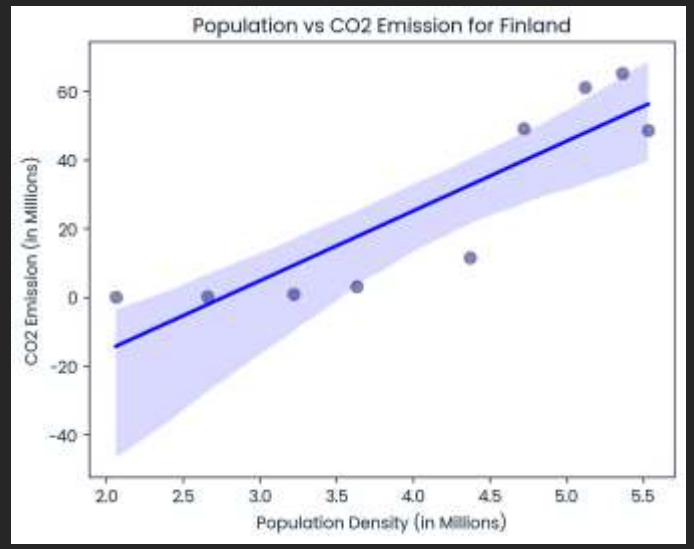
Population Density in India



Population Density in Finland

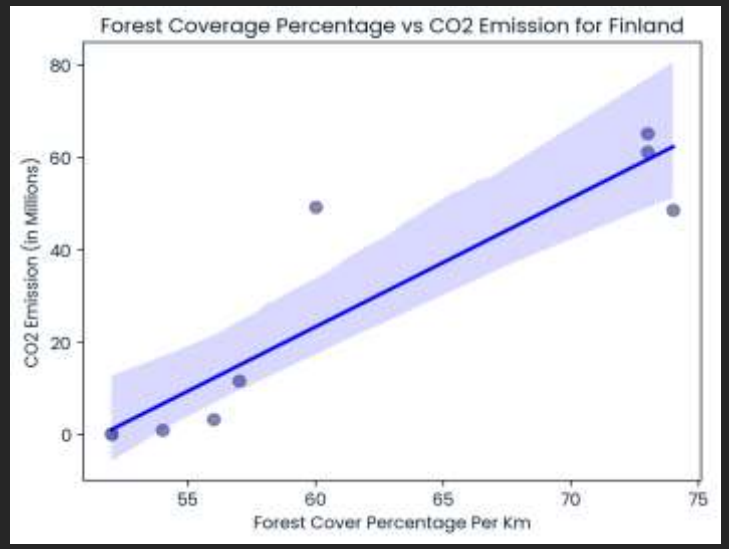
Correlation Coefficient:

0.8853567608920456



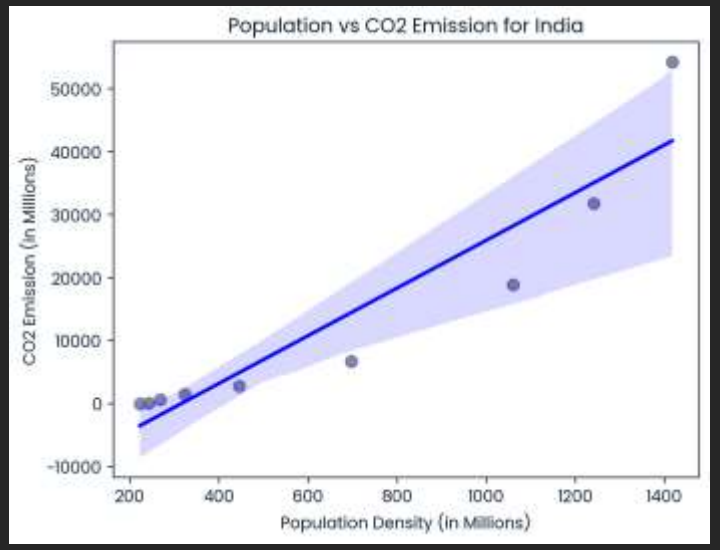
Correlation Coefficient:

0.9185399035064348



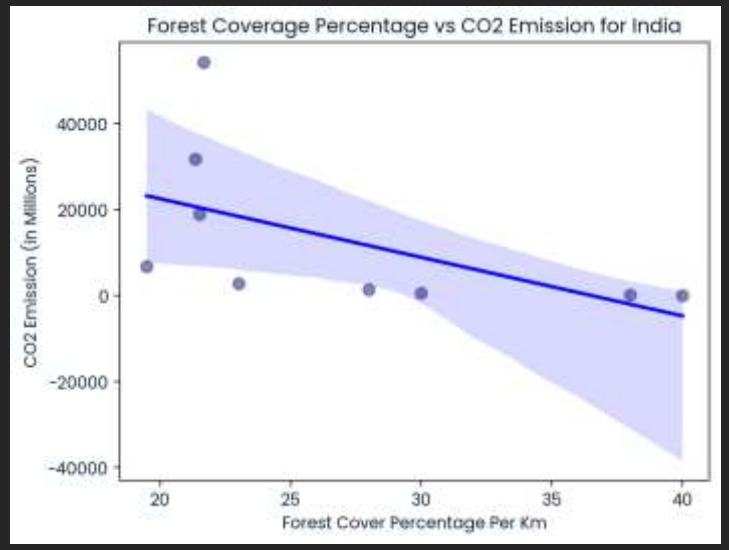
Correlation Coefficient:

0.9375301735948659



Correlation Coefficient:

-0.548535555

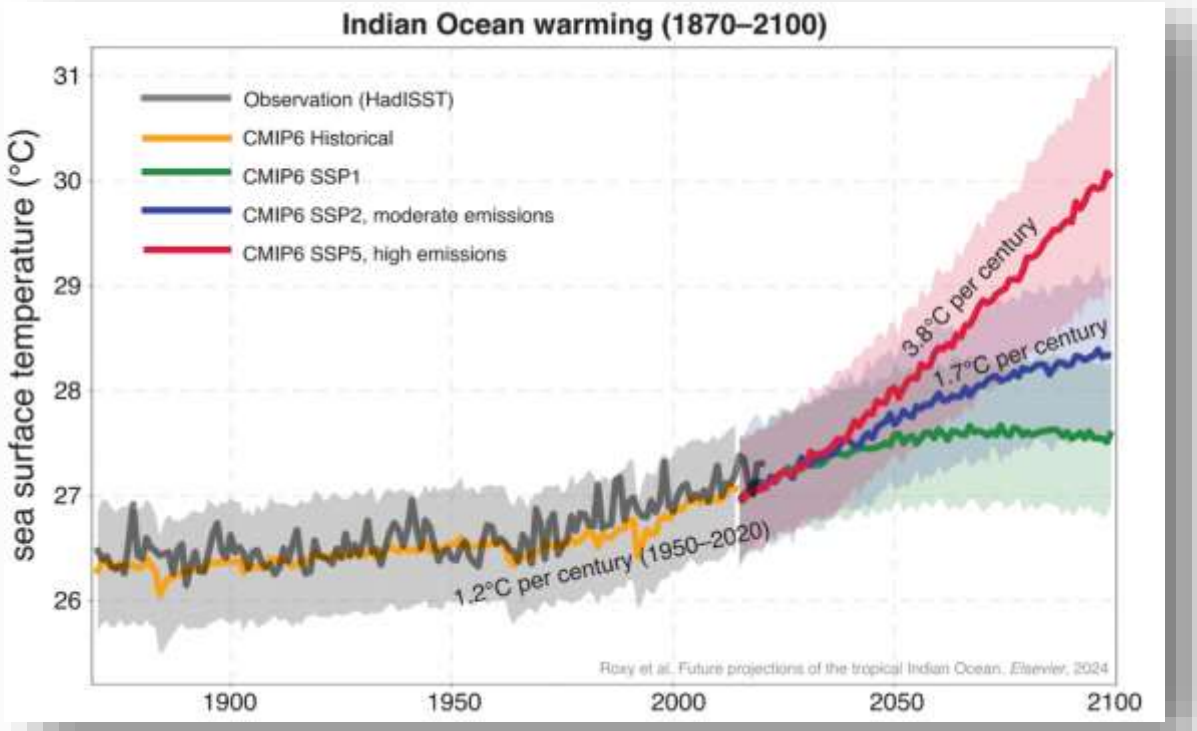


Forest Coverage Ratio vs CO2 Emission for Finland and India

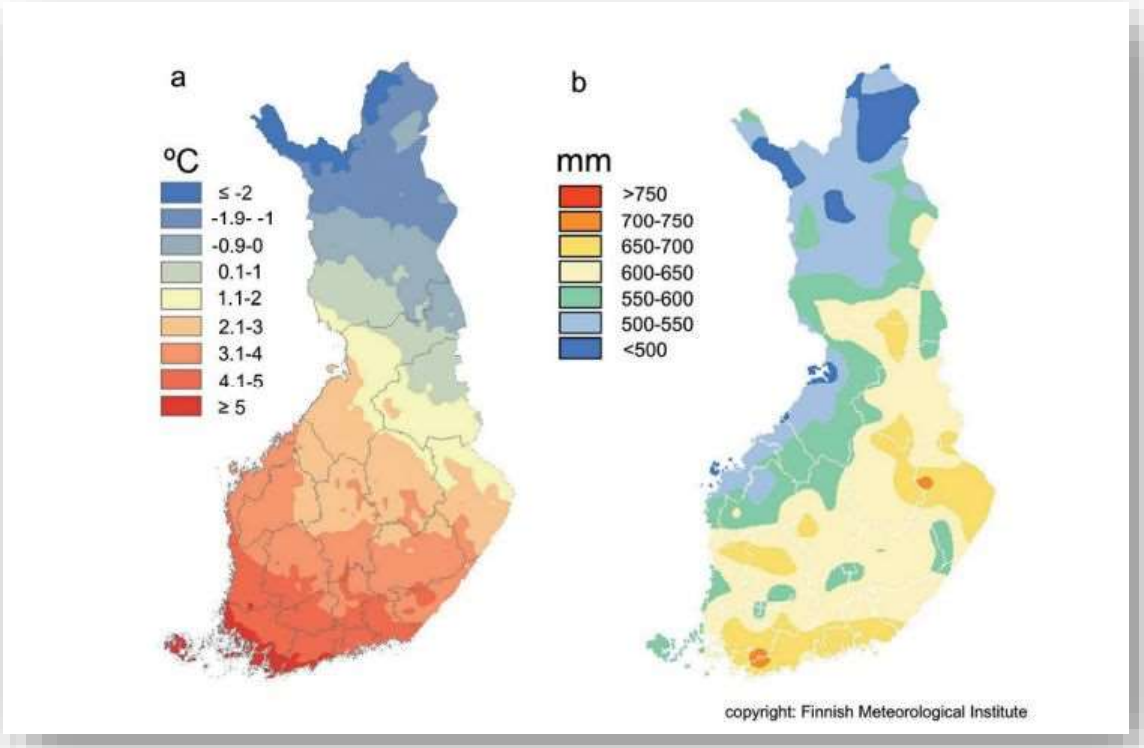
Population vs CO2 Emission for Finland and India

Conclusions

- Population density demonstrates a strong positive correlation with CO2 emissions, highlighting a significant impact on global warming.
- Finland's proactive conservation and reforestation initiatives are reflected in its capacity to mitigate global warming, as evidenced by the favorable trends in regression analysis. In Finland, there is a positive correlation between forest cover rate and CO_2 emissions, suggesting that increased forest cover may be part of a broader strategy to manage and reduce emissions.
- In India, CO_2 emissions are positively correlated with population growth, while forest cover shows a negative correlation with CO_2 emissions. This suggests that rapid industrialization and urbanization are driving emissions up, despite efforts to increase forest cover, resulting in complex environmental interactions.



Ocean Temperature in India



Water Flow Temperature in Finland

Thank you!

References:

REFERENCES .txt