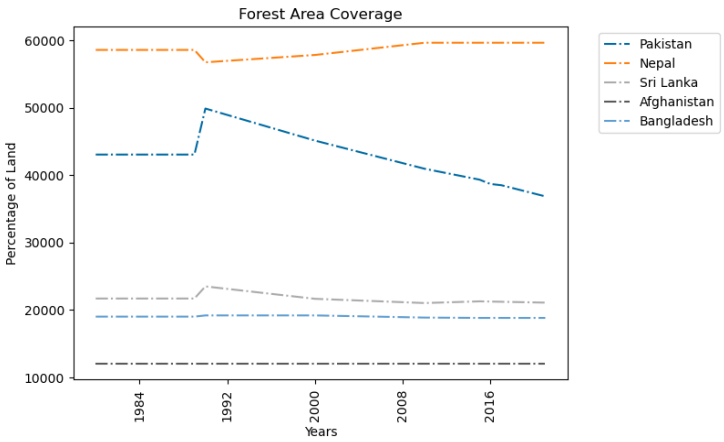
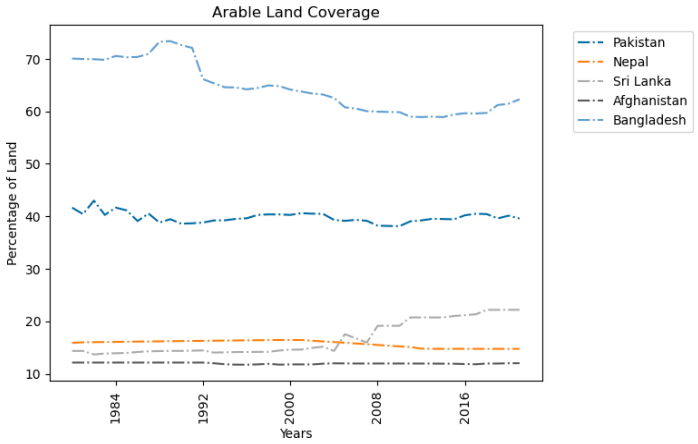
Environmental and Economic Metrics Analysis of South Asian Countries: Trends and Correlations

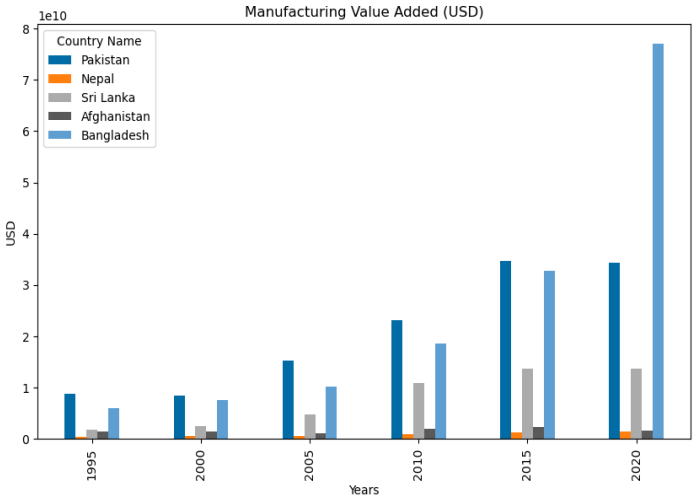
Abstract:

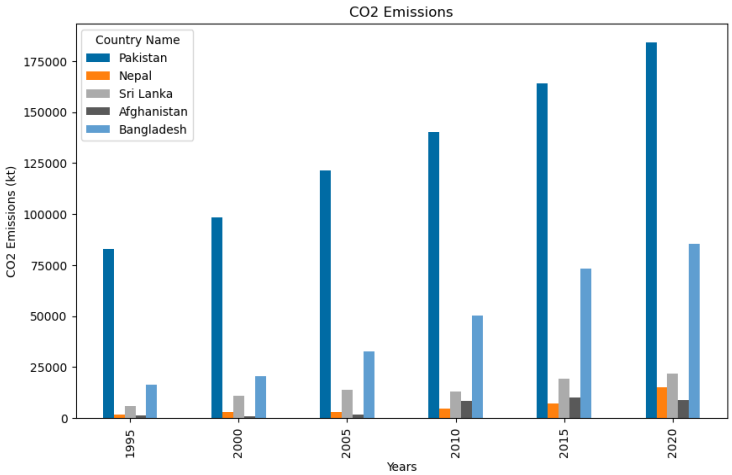
This research provides a thorough examination of many environmental and economic indicators in South Asian nations from 1995 to 2020. The main emphasis is on the extent of forest area, cultivable land, the value added in manufacturing in terms of USD, and the amount of CO2 emissions for nations such as Pakistan, Nepal, Sri Lanka, Afghanistan, and Bangladesh. The study aims to uncover significant patterns and insights by using various data visualizations, such as bar charts to show temporal economic trends and line graphs to illustrate land use changes. Additionally, correlation heatmaps will be used to reveal interdependencies among variables like urban population growth, energy use, and manufacturing output. These assessments not only emphasize the patterns of growth and environmental effects in these countries, but also investigate the relationship between economic advancements and environmental management and regulations. The results aim to aid policymakers, academics, and stakeholders in making well-informed choices to advance sustainable development in the area.





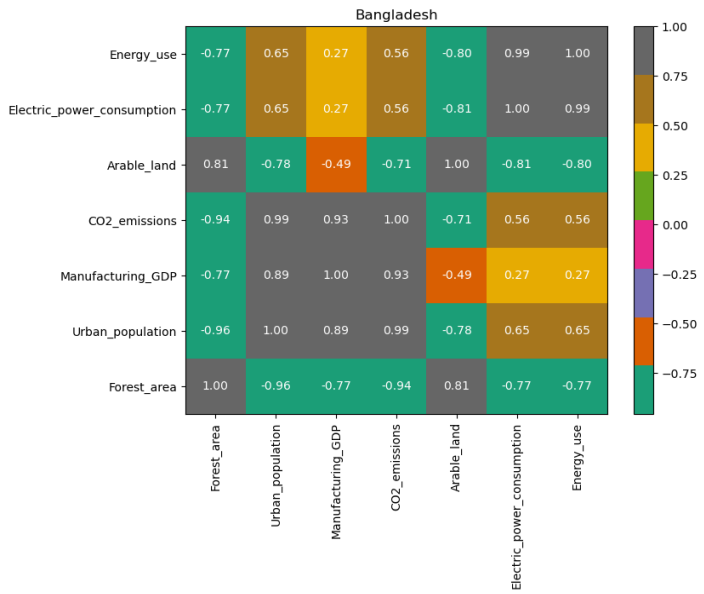
The line graphs depicting the proportion of forest area and arable land in South Asian nations as a fraction of the total land from 1984 to 2016 demonstrate intriguing links. In nations such as Sri Lanka, there is a notable decline in the extent of forested areas, while the proportion of arable land remains relatively constant. This implies that deforestation may not be directly associated with an expansion of agricultural land, but rather might be influenced by other factors such as urbanization or industrialization. On the other hand, Bangladesh has had a little rise in both arable land and forest area, which suggests effective land management approaches that effectively combine agricultural requirements with forest preservation. This research emphasizes the intricate correlation between alterations in land use and strategies for managing the environment in the area.

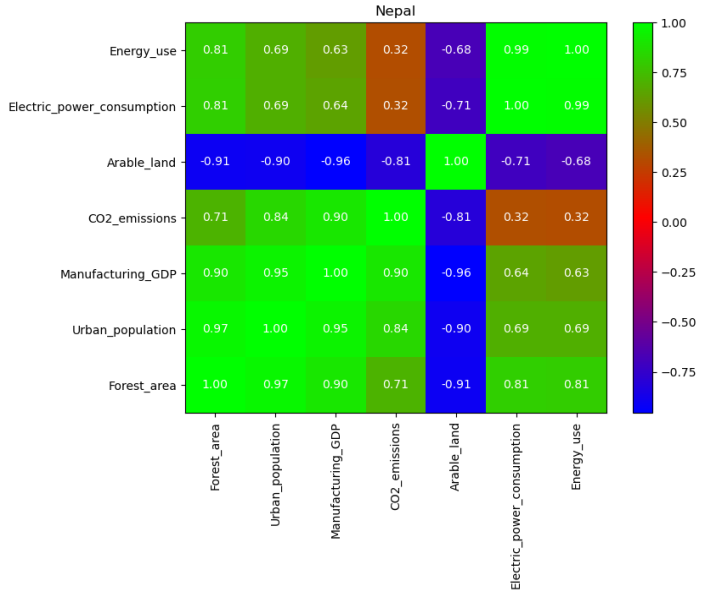




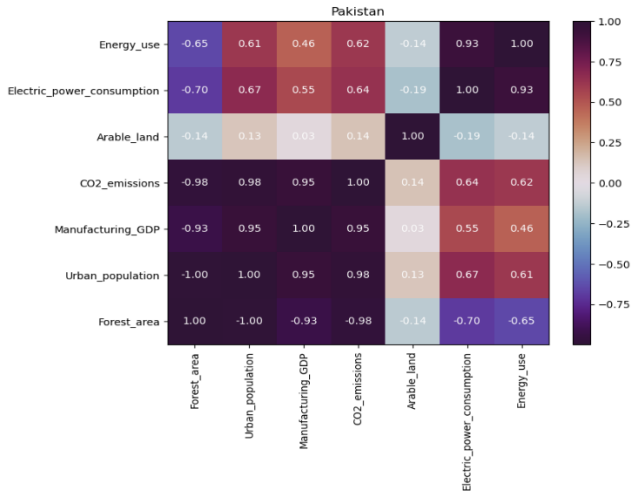
The bar graphs illustrating the manufacturing value added in USD and CO2 emissions from 1995 to 2020 for nations like Pakistan, Nepal, Sri Lanka, Afghanistan, and Bangladesh demonstrate a distinct correlation between industrial activity and their environmental consequences. Pakistan and Bangladesh have had a noteworthy rise in both industrial

production and CO2 emissions, particularly in recent years. This suggests that economic expansion in both nations is strongly associated with an increase in environmental degradation. This tendency highlights the difficulty of achieving a balance between economic growth and environmental sustainability in emerging nations. The graphs indicate that these countries should embrace cleaner technology and implement more efficient industrial techniques to separate economic progress from environmental damage.





The correlation heatmap in Bangladesh reveals robust negative associations between urban population growth and forest area, as well as a substantial positive correlation between manufacturing GDP and CO2 emissions. These findings indicate noteworthy environmental consequences resulting from urbanization and industrial operations. The Nepal heatmap reveals strong correlations between urbanization, growth in the industrial sector, and CO2 emissions, resulting in detrimental impacts on arable land. This highlights the challenges related to sustainability that arise during periods of economic and urban growth.



Country Name	Forest_area	Urban_population	Manufacturing_GDP	CO2_emissions	Arable_land	Electric_power_consumption	Energy_use
count	31.000000	3.100000e+01	3.100000e+01	31.000000	31.000000	31.000000	31.000000
mean	43245.354839	5.938154e+07	1.944894e+10	123183.987097	39.532114	358.460859	416.931534
std	3789.599362	1.509175e+07	1.208375e+10	40754.298937	0.742789	44.350301	21.129684
min	37259.000000	3.528901e+07	6.185621e+09	59026.000000	38.125259	258.763947	369.030989
25%	40131.650000	4.656045e+07	8.671465e+09	89776.400000	39.143576	330.072268	407.567682
50%	43024.950000	5.925513e+07	1.524243e+10	121608.700000	39.487339	358.460859	416.931534
75%	46301.425000	7.236196e+07	3.141060e+10	145903.500000	40.265670	397.804668	431.929105
max	49867.900000	8.443767e+07	4.132063e+10	198738.800000	40.602947	429.449132	461.601072

Pakistan's data summary and correlation heatmap show a complicated economic-environmental relationship. Increased CO2 emissions and urban population are highly correlated with high GDP growth, demonstrating economic expansion comes at environmental cost. The association of these variables with diminishing forest acreage shows the difficulty of preserving ecological balance despite rising urbanization and industrialization.