

**Measuring Progress Towards the UN Sustainable Development Goal 8: Decent
work and economic growth**

INTRODUCTION TO DATA SCIENCE
GROUP C9

1.0 Introduction

The UN's Sustainable Development Goal 8 (SDG 8), set in 2015, aims to "promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all." We aim to assess how 6 continents in the world (all continents except Antarctica) are faring with respect to the following specific targets set out by the UN:

1. *Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries.*
2. *By 2020, substantially reduce the proportion of youth not in employment, education or training. (NEET)*

This report will therefore focus on two main metrics: GDP per capita, which measures economic performance and provides insight into growth trajectories; and youth NEET which represents the extent of the proportion of young people actively engaged in education or employment.

Since countries differ significantly in development levels, population magnitudes and structural characteristics, this report has aimed to mitigate biases as a result of these heterogeneous economic factors by means of weighting and aggregating.

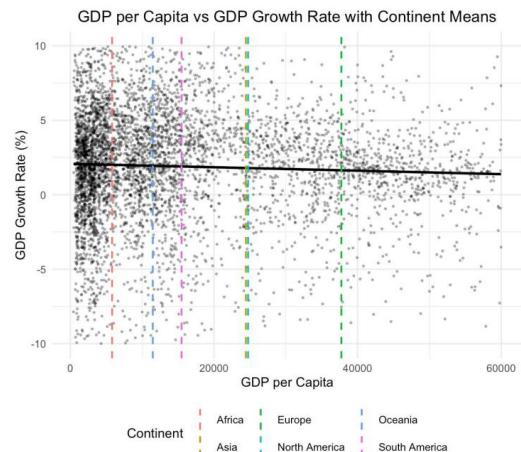
2.0: Methodology

2.1: Definitions of Key Concepts

2.1.1: Least-Developed Countries: Any country that was defined by the UN as a "Least-Developed Country".

2.1.2 National Circumstances:

Defining "national circumstances" was key to the relevance of our report when scrutinising each country's performance towards SDG 8. From initial analysis, we hypothesised that countries with higher GDP per capita broadly exhibit slower GDP growth rates. We then deployed a linear regression model to confirm this, using GDP per capita to estimate a country's expected growth for a given year. We constrained the data range to $-10 < \text{growth rate} < 10$, and $0 < \text{GDP per capita} < 60000$, to avoid anomalies. Our analysis confirmed that countries with higher GDP per capita typically exhibit slower GDP growth rates. We also ran separate regressions for each continent and each year to better find regional variations.



2.1.3: Average GDP: Average GDP is calculated by taking the GDP of each country in that year and finding the mean, giving equal weight to every country regardless of its size across the continent.

2.1.4: Predicted Growth: Using our regression model, we estimate each continent's expected growth rate at its average level of GDP per capita. The results show a mild convergence pattern, but with small differences.

Continent	mean_gdp_pc	predicted_growth_at_mean
1 Europe	37736.86	1.639
2 Asia	24446.81	1.793
3 Africa	5812.06	2.009
4 North America	24754.48	1.790
5 South America	15483.99	1.897
6 Oceania	11482.53	1.943

2.1.5: Weighted Average GDP Growth: Weighted average GDP growth adjusts for the fact that countries differ significantly in population. It is calculated by taking the GDP per capita growth of each country and weighting it by the size of its population or economy, so that larger countries contribute more to the average while smaller countries contribute less.

2.1.6: Mean NEET: Mean NEET for each continent and year was calculated by taking the mean average of each country's NEET percentages. We used this to give equal representation to all countries, regardless of the size of their population. A population weighted measure would reflect the larger economies more which would mask certain patterns in smaller countries. Since the SDG target concerns the proportion of youth NEET, not the absolute number, using mean NEET allows continent trends to show broader progress instead of demographic scale.

2.2 Data treatment

The analysis combined the three provided datasets within the assignment instructions – GDP per capita, youth NEET rates and continent classification. We also utilised extra data sources: the UN's list of LDC countries, and a global population dataset containing population data by country from 1964-2023.

2.2.1 Renaming and Converting Variables: In order to combine datasets faultlessly, the column names across the datasets were standardised to include 4 columns: 'country', 'code', 'year' and their respective indicator (GDP per capita, continent or population). Before combining the datasets, each dataset was cleaned to ensure consistency in variable types. For example, the 'year' variable was converted to integer format. This prevented join failures and ensured that numerical calculations, such as weighted averages – could be performed.

2.2.2 Addressing Missing Data: For Section 1, there was minimal missing data to address from 1990-2021, allowing for complete usage of the provided datasets. However, most GDP growth rates, both average and weighted, were calculated from 2010 onwards in order to keep the focus on the period surrounding the formalisation of SDG 8 in 2015, while also representing the trajectory of growth leading up to it.

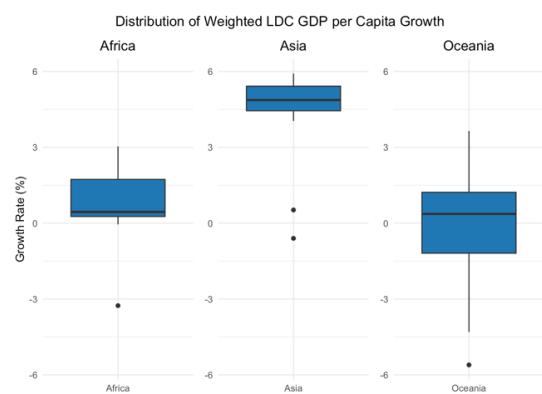
Since section 2 relied primarily on the given NEET and GDP dataset, most data was available for comparison. This allowed the dataset to be used with only minor cleaning. To ensure comparability across continents, only countries with complete NEET records within this period were retained through inner joins with the continent classification dataset. Mean NEET values were calculated by grouping the data into years to construct a line graph. For the proportional comparison, stacked bar graphs were used to explicitly show changes between 2010 and 2020. In-EET proportions were calculated through the formula 100 – NEET.

2.2.3 Time Period of Analysis: To allow for a meaningful analysis, we restricted our visualisations to the years 2010-2022 (the most up to date data from the provided files). Including data in the period before the UN goal came into effect in 2015 provided a baseline for which progress could be evaluated, while extending the graphs to the most recent available data facilitated visualisations throughout the full timeframe of the assignment, including the significant shock of the Covid-19 pandemic.

3.0: Analysis

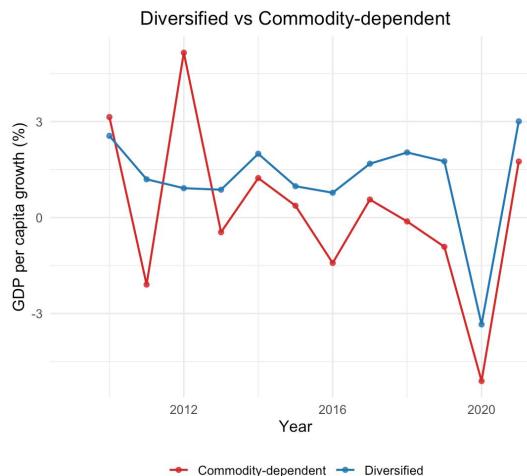
3.1 Section 1:

Asia emerged as the strongest continent relative to its ‘national circumstances’ target of 2%. Both the simple average and weighted average growth measures regularly exceeded the growth benchmark, with the weighted data performing particularly well, reflecting the influence of large, rapidly expanding economies in the region such as China and India. However, despite the contribution of these economies to overall performance, Asian LDC’s ambition towards the UN’s 7% target proved difficult to meet. LDCs instead displayed shorter and considerably more volatile growth rates, as identified by our correlation analysis. Nonetheless, Asian LDCs can be awarded some credit for outperforming those in other continents, as they benefit from their proximity to major global supply chains.



Africa illustrated high volatility in GDP growth rates and struggled more than any other continent in terms of achieving sustained performance over the time period. While some nations, such as Ethiopia and Guinea experienced strong episodes of short growth, even occasionally hitting 7%, overall ability to reach this targeted growth rate was limited. From our analysis of individual economies, we deduced that more diversified African economies, for example Kenya, were able to maintain a positive growth correlation. Comparatively,

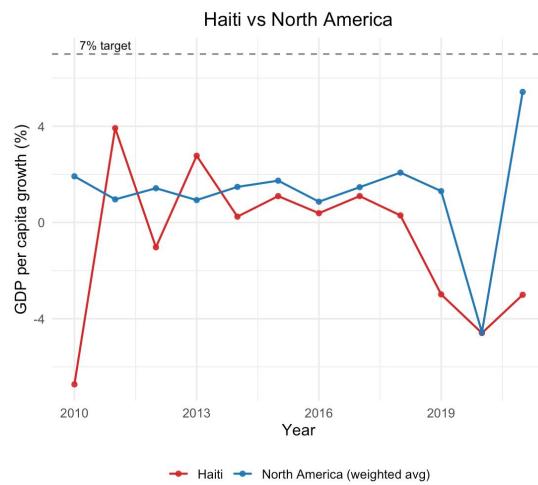
many of the continent’s LDCs struggled as they rely heavily on commodity exports (UNCTAD, n.d.) – the contributing factor resulting in volatile growth rates and main inhibiting factor to achieving 7% sustained growth.



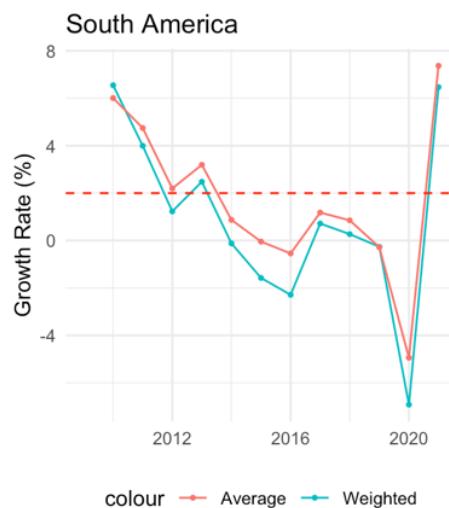
Europe displayed somewhat stability, with both the average and weighted GDP per capita growth rates consistently exceeding the continent’s 1.6% national-circumstances target from 2015 until the Covid-19 pandemic in 2020. The steady performance can be attributed to the diversified economies (similarly to in Africa), where during the 2015-2019 period, the average growth exceeded the national circumstances target by 52%. Furthermore, since Europe’s population is more evenly spread across countries, the weighted and average growth trends were relatively similar, indicating minimal population distortions. The Western and Northern Europe regions particularly experienced consistent growth, while Eastern and Southern Europe indicated greater variability.

North America sustained approximately 1.5% weighted growth between 2015 and the Covid-19 shock, although fell slightly short of the national circumstance target growth rate of 1.8%. The only LDC across the continent,

Haiti, had a volatile growth rate during the time period, similar to the surrounding area of the Caribbean, and remained far off from achieving the 7% target. Although North America's growth rate was not as remarkable as Asia or Europe, it still demonstrated an overall stable and marginally positive growth pattern.

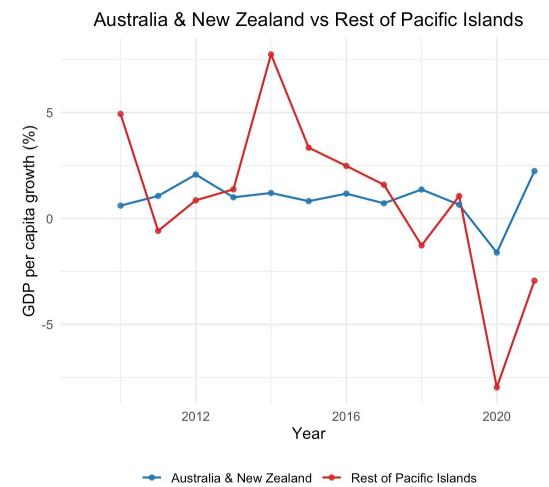


South America's primary feature was its fluctuating growth rates, with substantial variation in both the average and weighted growth patterns, reflecting the continent's difficulties in sustaining per capita GDP growth and long-term macroeconomic instability. Highly populated countries, such as Argentina and Brazil experienced multiple downturns driving weighted growth downward. Despite these challenges, South America's growth persists closer to its target and exceeds it more frequently than Africa reaches its 3% growth target.



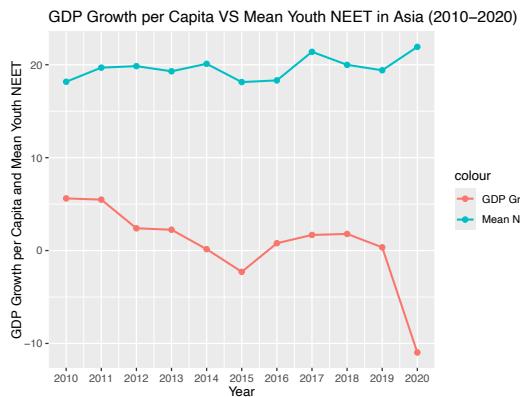
Oceania showed a relatively steady growth rate across the

time period. This is most likely due to the developed economies in the region, Australia and New Zealand, who both experienced stable growth patterns. Despite their weight the continent fails to meet its national circumstance growth target of 2%. The LDCs in the region consist of small pacific islands whose economies have rarely, if ever, reached the 7% target, likely due to their structural constraints. As a result of their unique constraints, it may be more realistic to deploy a growth strategy that accounts for these vulnerabilities.

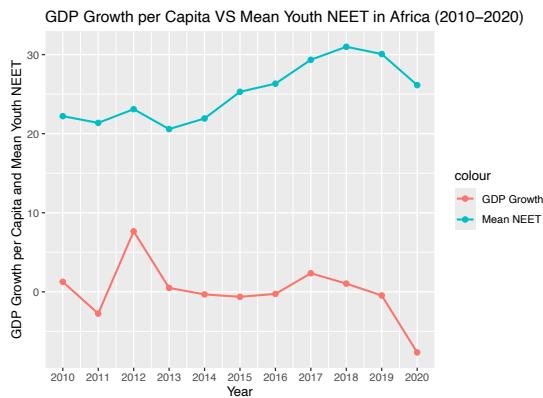


3.2 Section 2:

Across the 2010–2020 period, **Asia's** NEET rate remained relatively stable in the first half of the decade at around 19%, followed by a gradual upward trend towards 22% in 2020. The continent does not exhibit a sustained reduction toward the SDG target. When NEET is viewed alongside GDP growth, despite some years of positive and relatively stable GDP growth leading up to Covid-19, this economic expansion did not translate into consistent improvements in youth labour-market inclusion, suggesting that broader economic gains were not sufficient to reduce NEET rates in Asia.

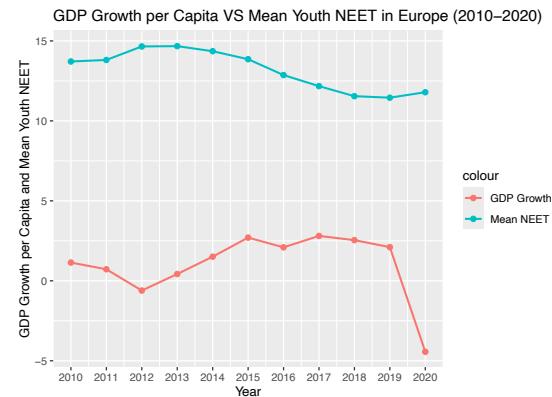


Africa consistently exhibits a clear upward trajectory in NEET rates from 2010–2020 and often showed the highest NEET rates of any continent. The graph shows rates climbing from roughly 22% in 2010 to 31% by 2018, before a slight decline to 26% in 2020, indicating movement away from the SDG target. When plotted against GDP growth, the data show that modest or fluctuating economic expansion did not correspond with sustained reductions in youth disengagement. The rise in youth NEET despite some periods of positive growth suggests there may be significant structural constraints such as limited job creation, rapid population growth and large informal labour markets that prevent young people from benefiting equally from economic activity.

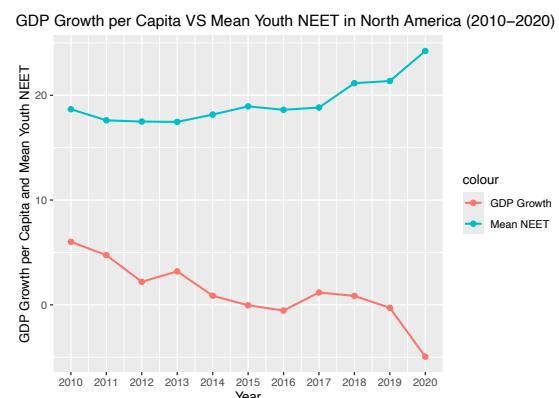


Europe demonstrates the lowest NEET levels globally and is the only continent to show a consistent decline over 2010–2020. The mean NEET graph shows a smooth downward trend from approximately 14% in 2010 to 11.8% in 2020. This indicates that Europe moved steadily toward the SDG target, even though progress slowed slightly in the later years due to Covid-19. When compared against

GDP growth, Europe shows a pattern of gradually improving NEET outcomes during consistent economic expansion. Unlike all of the other continents, the alignment between declining NEET rates and stable macroeconomic conditions suggests that Europe achieved the clearest and most sustained improvements toward SDG 8.



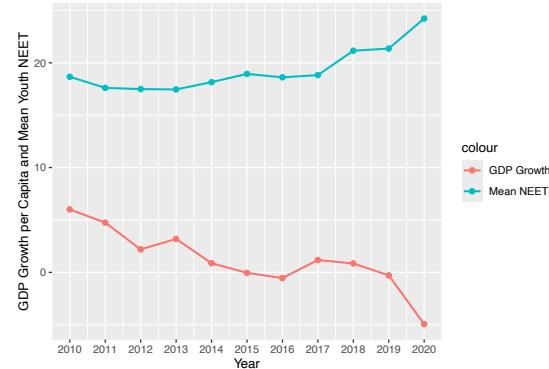
North America shows moderate NEET rates throughout the decade. The graph indicates mild fluctuations between the 21–23% range, with no sustained reduction by 2020. Comparing NEET and GDP reveals a weak relationship; despite periods of steady GDP growth prior to Covid-19, youth NEET did not consistently decline, suggesting that economic gains were not evenly distributed. North America does not demonstrate a substantial reduction in youth disengagement by the 2020 target year.



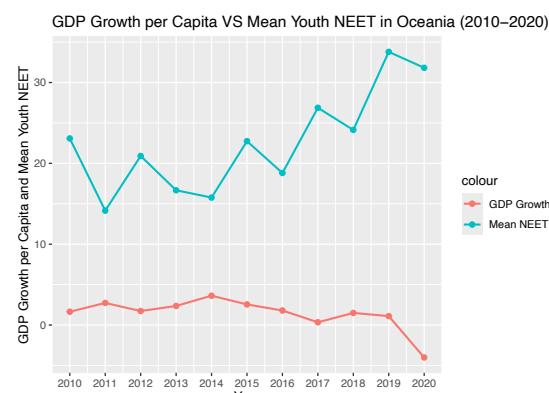
South America shows persistent and rising NEET levels over the decade. The mean NEET graph depicts an increase from roughly 18% in 2010 to over 24% by 2020, with noticeable spikes during periods of economic downturn. The GDP and NEET comparison illustrates a

partial relationship; during years of weaker GDP growth, NEET rates tend to rise, especially in countries facing recessions such as Brazil and Argentina. However, even in periods of recovery, NEET levels did not fall substantially. Overall, South America made little progress toward reducing youth NEET.

GDP Growth per Capita VS Mean Youth NEET in South America (2010–2020)



Oceania displays one of the most volatile NEET trajectories, due in part to the small number of countries represented and significant size variation between Australia, New Zealand, and Pacific Island nations. The mean NEET plot shows levels fluctuating between 14% and 33%, peaking near the end of the decade. When compared with GDP growth, the graphs show that even relatively strong economic performance in developed economies did not translate into regional improvements in youth engagement, as rising NEET in smaller island nations offsets gains elsewhere. This leads to an overall picture of inconsistent and insufficient progress, preventing reducing NEET in a sustained manner.



4.0 Internal Analysis

4.1 Limitations

4.1.1 Lack of data: Specifically for NEET rate, some countries displayed a small range of data (e.g. the Congo only included data for 2005 and 2009), thus any extrapolation to estimate longer trends is unlikely to be meaningful.

4.1.2 Unrepresented informal labour data:

Unemployment data may undercount informal labour, which is most prevalent in developing nations. As a result, official figures could limit the accuracy of analysis.

4.1.3 Short time frame: 2010 – 2022 can be considered too short of a time period to measure patterns for both growth and NEET rate. Observing from 1990, and then evaluating SDG 8 may have proved more material in terms of gaining insight into the developments of each continent, however this was not the specified timeframe of the assignment.

5.0 Conclusion

Both evaluated aspects of SDG 8 in section 1 (sustained economic growth and progress toward the 7% GDP growth target for LDCs) suggest that no continent fully accomplishes the UN's objectives.

Asia demonstrates the strongest performance in terms of its national circumstances benchmark, consistently exceeding its 2% expected growth rate and benefiting from the highly influential functioning of its largest economies. Regardless, the continent's LDCs struggle to achieve the 7% target, emphasising the divergence between regional averages and the outcomes of its least developed nations. Similarly, Europe maintains stable and consistent growth above its 'national circumstances' target until the disruption of the Covid-19 pandemic. Likewise, North America also experienced steady, marginally positive growth, although it falls slightly short of meeting its 1.8% target.

Africa and South America were both characterised by volatile growth patterns. Overall, Africa's heavy commodity dependence limited its ability to meet both the 3% benchmark and 7% LDC target. Oceania, a continent

prominently driven by the economies of its largest and most stable nations (Australia and New Zealand), maintains moderate growth but its LDCs also remained far from the 7% target due to their structural constraints.

8, backed by strong macroeconomic conditions and youth education. Both Asia and North America showed no meaningful decline in NEET levels.

Africa and South America both experienced marked increases in NEET throughout the decade, furthering their distance from the UN's desired target and emphasising structural challenges and insufficient job creation.

Oceania, influenced by the combination of its largest developed economies and small island states, demonstrated the greatest volatility, with no progress made towards the target.

While certain regions have made partial progress towards SDG 8, the global effort remains inadequate in order to reach the levels of sustained growth and youth employment envisioned by the SDG framework. More targeted and context-specific support is required to enact progress.

Reducing youth NEET rates by 2020 was also largely unmet. Europe demonstrated clear and sustained downward trajectory over the decade, making it the only continent to display consistent progress aligned with SDG

6.0 References

1. DataHub (n.d.) Population figures for countries, regions and the world. <https://datahub.io/core/population> (Assessed 2nd December 2025)

2. UNCTAD (United Nations Conference on Trade and Development). (n.d.). Commodity dependence haunts least developed countries. <https://unctad.org/topic/least-developed-countries/chart-february-2022> (Assessed 4th December 2025)

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