INTRODUCTION TO DATA SCIENCE

Measuring progress towards the UN Sustainable Development Goal 8: Decent work and economic growth

Group K10

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1. Introduction

From 25-27 September 2015, world leaders gathered for the United Nations' Sustainable Development Summit, formally adopting the 2030 Agenda for Sustainable Development that introduced 17 Sustainable Development Goals. This blueprint established a roadmap that united countries with one goal: Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Marking the 10th year since its establishment, this report aims to assess the 6 inhabited continents' progress towards the following targets:

Target 1: Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product (GDP) growth per annum in the least developed countries (LDCs).

Target 2: By 2020, substantially reduce the proportion of youth not in employment, education or training (NEET).

2. Methodology

2.1 Terminology

Target	Quote	Interpretation
Target 1	Sustain per capita economic growth	non-LDCs: Maintaining **+2%** GDP per capita growth rate for a **5 year spell** LDCs: Maintaining **+7%** GDP per capita growth rate for a **3 year spell**
	National circumstances	Factors affecting the **economic output of the country**: political stability, public investment in infrastructure and human capital, etc.
	Least developed countries (LDCs)	LDCs are **low-income countries confronting severe structural impediments to sustainable development**. They are highly vulnerable to economic and environmental shocks and have low levels of human assets. (UN Department of Economic and Social Affairs)
Target 2	By 2020	'By the end of 2020' i.e. **including 2020.**
	Substantially reduce	Reduction **relative** to **existing** youth NEET rates (refer to section 2.5)
	Proportion of youth not in employment, education or training (NEET)	The proportion of youth who are **not in employment, education or training,** as a percentage of the total youth population of the country. 'Youth' are citizens who are **15 to 24 years old.**

2.2 Selection of Data Sets

We referenced the GDP per Capita data of all countries (1990-2023) and Youth NEET metrics (1976-2021) provided, additionally examining the Sustainability Development Index (SDI).

2.3 Data Cleaning

To ensure the quality of our data, we removed duplicate or unnecessary data entries from individual datasets, noting that the GDP per capita dataset possessed entries for countries that no longer exist, like "East Germany". We then computed new variables like GDP per Capita growth rate and weighted Youth NEET, tagging respective LDCs for further in-depth analysis.

To ensure missing data would not skew our findings, we calculated the percentage of missing GDP per capita and Youth NEET from 2010 to 2021, discovering a mean of 48.7% of data missing in each continent. Our remedy to this issue will be discussed further in section 2.5.

2.4 Target 1 Analysis

This analysis covers 42 of the 44 LDCs designated during the study period (2015-2023). Two LDCs (Bhutan and Eritrea) were excluded due to missing data. São Tomé and Príncipe, which graduated in December 2024, is included as an LDC throughout the analysis period.

Figure 1 analyses LDCs and DCs in their respective continents' ability to consistently achieve positive or greater than 7% GDP growth respectively. The time series allows us to attribute large fluctuations to key economic events that tie into national circumstance. However, considering the focus on sustained growth post SDG inception, we decided to examine sustained economic growth after 2015. Additionally, GDP growth averages were not aggregated by population to weigh the impact of individual countries on the continent's economic performance equally.

2.5 Target 2 Analysis

When establishing a guideline for 'substantial', we discovered that existing low Youth NEET engenders difficulty to further reduce Youth NEET. Early improvements come from integrating groups with low barriers, such as short-term job seekers and students in transition periods. However, further reduction would require correcting deeper structural issues, such as lack of motivation or education. Additionally, high Youth NEET rates (>30%) could be indicative of deeper structural inequality that would be more difficult to reduce. As such, the magnitude of expected NEET reduction would be tied to existing Youth NEET and increase until 30%. We thus propose the following bands:

Current Youth NEET rate (%)	Target Reduction (% of baseline Youth NEET)
<10	10
10-30	15
>30	10

Figure 1: Youth NEET Reduction Targets

Referencing figure 2, to ensure that sufficient countries are weighed to make the comparison of Youth NEET rates during SDG inception in 2015 vs 2020, we developed an alternative benchmark, comparing 2015 vs 2020 where applicable, else comparing the closest year between 2010-2014 if 2015 data is missing or the closest year between 2016-2019 if 2020 data is missing. This allowed for more holistic pre- and post-SDG comparisons for Youth NEET rates.

Continent	Missing Data (%)	Missing Data after adjustment (%)
Africa	75.1	51.9
Asia	50.8	37
Europe	7.6	4.8
North America	59.6	58.6
Oceania	75	50
South America	24.2	18.2

Figure 2: Missing Youth NEET Data by continent

When observing the target reduction in our data, we noted that small countries like Laos (404%), Rwanda (407%) and Liberia (170%) skewed the scale of comparison of NEET change relative to time, with values greater than Q3+(1.5*IQR). However, considering the limited data available for analysis, we decided to keep the outlier data points. As such, we introduced a weighted average based on population, whereby small-populations would have a weaker effect for each continent, minimising its influence on target achievement.

2.6 Derivation of Metrics

2.6.1 Average GDP Growth Rate: Aggregating GDP values, with countries having equal weight.

$Y_j = \frac{1}{n}\sum_{i=n}^{n} g_{i,j}$, *where Y = GDP, n = number of countries, i = country, j = year*

2.6.2 Weighted NEET Rate: To account for population size when aggregating NEET rates across a continent.

$r_j = \frac{\sum_{i=n}^{n} R_{i,j}P_{i,j}}{\sum_{i=n}^{n} P_{i,j}}$, *where R = Youth NEET Rate, P = population, n = number of countries, i = country, j = year*

2.6.4 Weighted Target Achievement: For population size when aggregating NEET rates across a continent

$$t_k = \frac{\sum_{i=n}^{n} T_i P_{i,k}}{\sum_{i=n}^{n} P_{i,k}}, \; T = \text{target achievement}, \; P = \text{population}, \; n = \text{number of countries}, \; i = \text{country}, \; k = \text{comparison year}$$

3. Results

3.1 Target 1

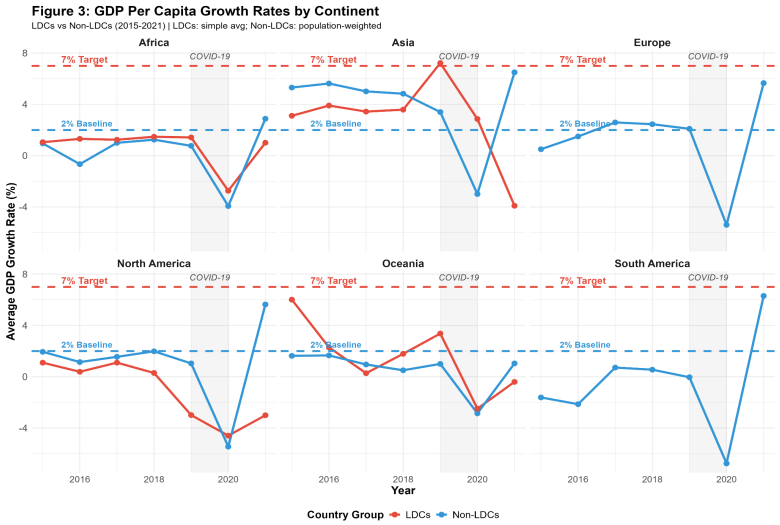
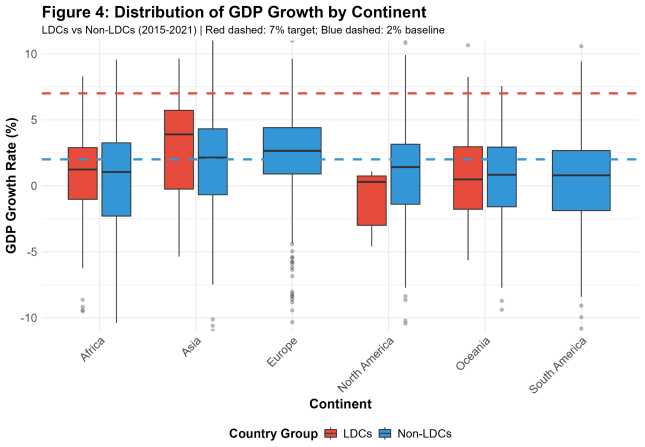


Figure 3 shows that LDCs in every continent fall short of the 7% target throughout the SDG period. Before COVID-19, only Asian LDCs occasionally approached this benchmark, with average per capita growth around 4–5%, while African LDCs remained closer to 1–2% and displayed much higher volatility, consistent with commodity dependence and political fragility. The shaded COVID period (2019–2020) marks a sharp collapse: all regions record negative growth in 2020, and the subsequent recovery is incomplete, with 2021–2023 growth still below pre-COVID levels and far from 7%. Even before the pandemic, sustained 7% growth was rare; COVID-19 has pushed the target further out of reach. This trend is echoed in non-LDCs: only Asian non-LDCs achieved a successful growth spell, while North America and Europe fluctuated near the 2% baseline, subsequently falling dramatically during the COVID years.



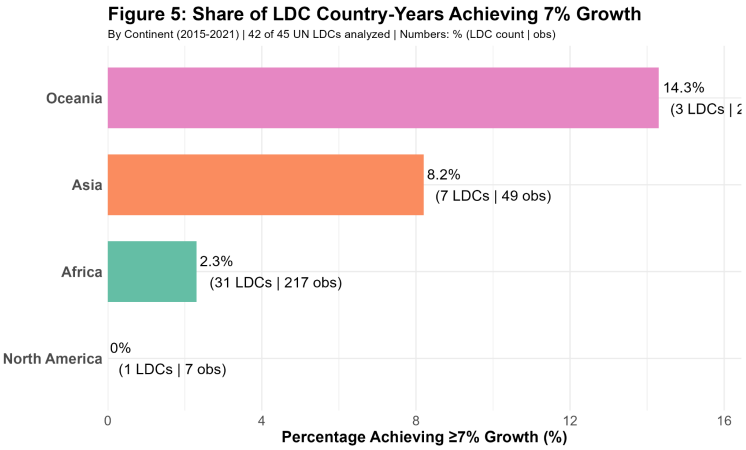


Figure 4 summarises the distribution of annual growth rates for LDCs and non-LDCs. In Africa and Asia, LDCs have wider boxplots and more extreme negative outliers than their non-LDC neighbours, indicating slower average growth and greater vulnerability to sharp contractions. Non-LDCs in Europe and North America cluster around 2–3% with little volatility, which is typical of mature economies where very rapid growth is structurally difficult. Figure 5 converts these patterns into frequencies: over 2015–2023 only 14% of LDC country-years in Oceania, 8% in Asia and 2% in Africa reach or exceed 7%, while the North American LDC in our sample (Haiti) never does so. Even from 1990-2023, **no** LDCs were able to achieve the 7% over 3 consecutive years mark for sustained growth spells, while 62 (41.6%) non-LDCs were able to achieve sustained growth spells in that period. High-growth events are therefore occasional rather than systematic, undermining the notion of' 'sustained' progress towards the target.

At the country level, our calculations show that only one of the 42 LDCs in our sample, East Timor, achieved mean per capita growth above 7% between 2015 and 20291 (around 7.3%). Other relatively successful cases such as Bangladesh and Ethiopia still fall short, while several LDCs record near-zero or negative average growth. These contrasts highlight how uneven progress is within the LDC group and how large intra-continent differences can be: for example, Africa contains both fast-growing Ethiopia and stagnating Angola, suggesting that institutions, economic structure and exposure to conflict matter more than geography alone. This pattern is consistent with the wider growth literature, which finds that truly 'sustained' growth spells (periods of at least 2% per capita growth maintained for 5 years) are relatively rare in Latin America and Africa but much more common in high-income and East Asian economies.

Figure 6 links these heterogeneous growth outcomes to the Sustainable Development Index (SDI), which measures environmental and social performance alongside income. The relationship between SDI and growth is weak and differs across continents, with non-LDCs not exceeding an R-value of |0.200|. Among LDCs, only Asia saw R-values greater than |0.300| for a moderate linear correlation. African and North American LDCs have almost flat regression lines, indicating that higher SDI is not associated with faster growth in these regions. Asian LDCs cluster at low SDI scores (0.4–0.6) but show very dispersed growth rates, suggesting that rapid industrialisation can come at significant environmental and social cost. In contrast, high-SDI non-LDCs in Europe experience stable but modest growth around 2–3%, reflecting the constraints faced by mature, highly regulated economies.

Taken together, the evidence indicates that Target 1 is not being met. Fewer than 5% of all LDC country-years in 2015–2021 reach the 7% threshold, and only one LDC achieves this level on average across the 9-year period. Volatility, the COVID-19 shock and structural weaknesses such as conflict, commodity dependence and weak institutions prevent most LDCs from sustaining rapid growth. Even where growth is relatively strong, as in Bangladesh or Ethiopia, it remains below the target and may involve environmental trade-offs highlighted by the SDI patterns. Meeting Target 1 would therefore require not only better domestic policies but also a more supportive global environment, including easier access to finance and trade opportunities that recognise very different national starting points.

3.2 Target 2

Figure 7: Population-Weighted NEET Change
Baseline: 2010-2015 vs Recent: 2016-2020 (Latest available)

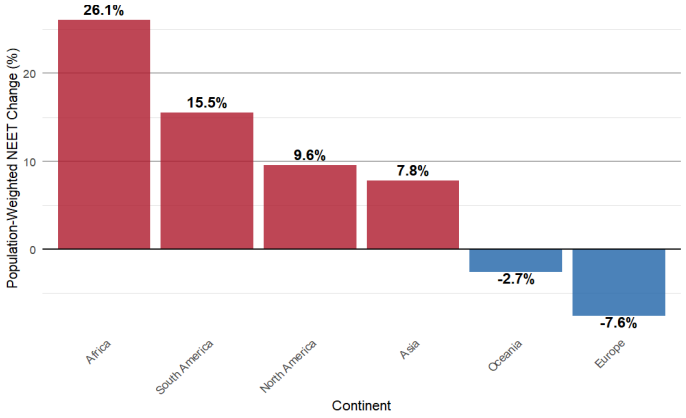
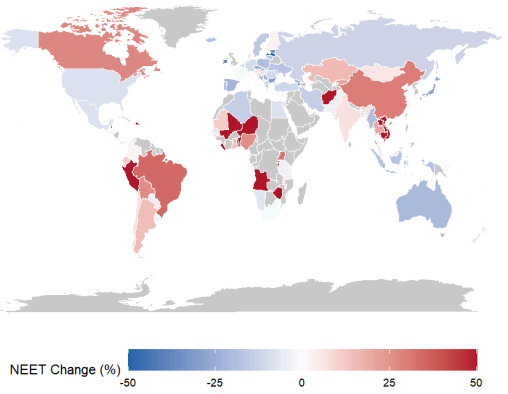


Figure 8: Baseline-relative Percentage Change in Youth NEET Share
Country Level Comparison



To assess progress in 'substantially' reducing youth NEET, we compared the mean NEET change for each continent against their baseline-dependent reduction targets in Figure 7. Surprisingly, none of the continents achieved the target reductions. Instead, four out of six continents experienced rising NEET shares, most notably Africa (+26.1%), South America (+15.5%), and North America (+9.6%), indicating widening challenges in labour market absorption and post-school transitions. Asia (+7.8%) also recorded increases, though at a more moderate level. Only Europe (-7.6%) and Oceania (-2.7%) achieved declines, yet these reductions still fell short of what would be required to be considered 'substantial' progress. Overall, figure 7 suggests that rising economic vulnerability and limited policy effectiveness outweighed intervention efforts during this period.

Figure 8 reinforces this by illustrating where these changes are concentrated, noticing that change occurs at a regional level, instead of continental — notably in South America, South Asia, and West Africa, where limited post-school pathways and labour-market constraints contributed to rising NEET shares. In contrast, high-income countries experienced small (<10–15%) relative reductions, suggesting slow but insufficient progress. Together, the two figures highlight a widening divide between high- and low-income regions, indicating that structural conditions remain the key determinants of NEET outcomes.

Figure 9: NEET Reduction Target Achievement
Population Weighted Continent Level Comparison

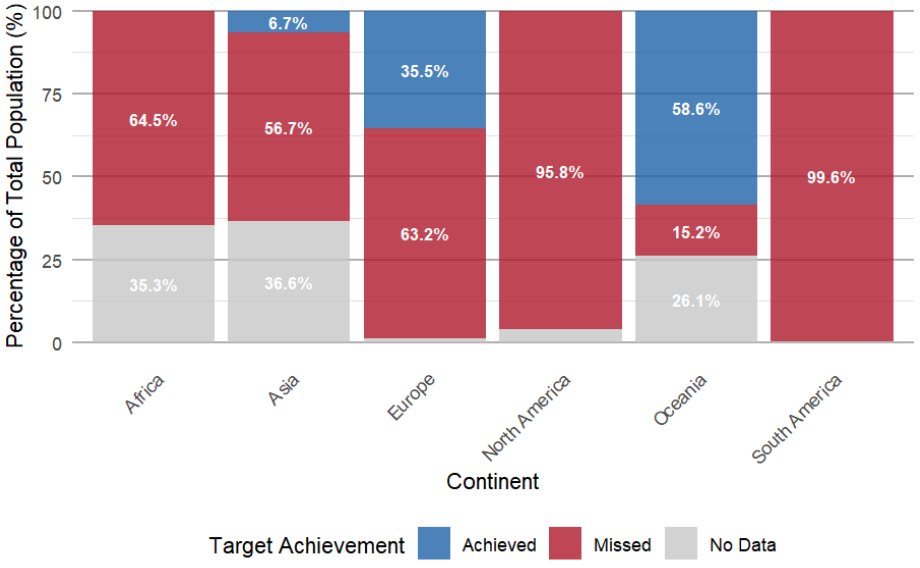


Figure 9 shows that only a small proportion of the global population lives in countries that met their NEET reduction targets. Oceania is the only continent where a majority (over 50%) achieved its target, largely driven by Australia's population size and its progress in reducing NEET. Europe performs moderately, with around one-third meeting their target—mainly Southern European countries such as Spain, Ireland, Portugal and Greece. In contrast, Asia, Africa, and the Americas overwhelmingly missed their targets, accounting for over 85–95% of their population.

This limited achievement reflects the slow-moving nature of NEET's underlying drivers, where weak labour markets, limited vocational pathways, and slower economic growth restricted the absorption of young people into employment. Economic disruptions during 2015–2020, including global slowdown and COVID-19, further impeded transitions from education to work. As a result, most regions were unable to achieve the required 10–15% reduction thresholds within the timeframe.

Figure 10: Variance of Youth NEET Rates by Continent
Baseline Period: 2010-2015 (Last Available Year)

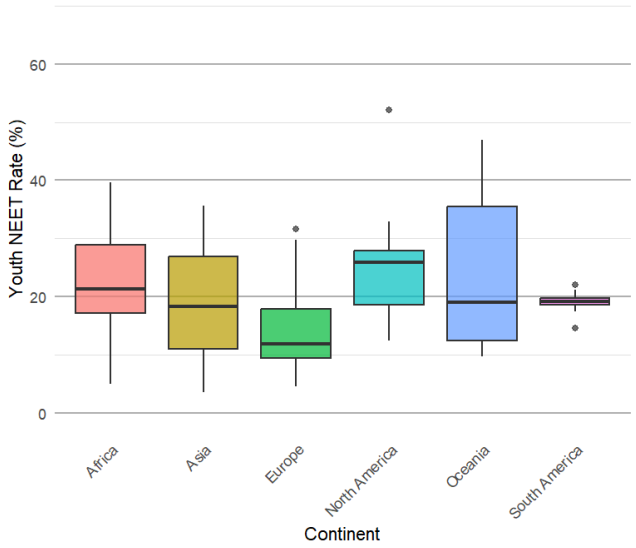
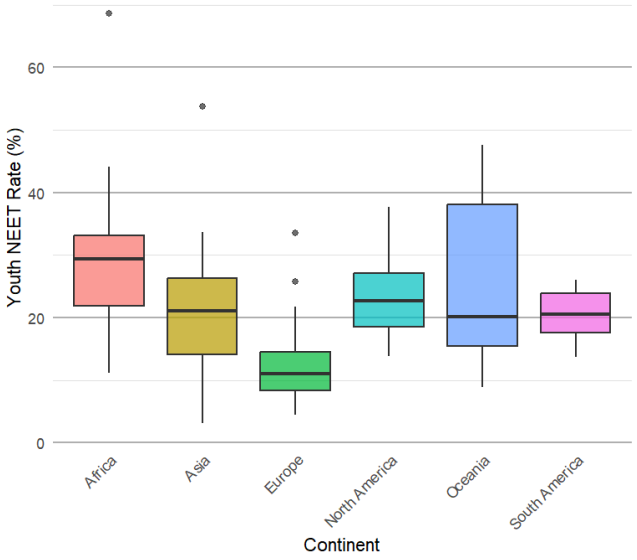


Figure 11: Variance of Youth NEET Rates by Continent
Comparison Period: 2016-2020 (Prioritize 2020, Then Last Available)



However, Figure 10 and 11 examine the variance of Youth NEET levels post-SDG, displaying weak upward pressures on youth NEET levels. Asia, Americas and Oceania displayed an increase in whisker length, despite IQRs shrinking for all but South America, and median figures remaining fairly consistent for all but Africa. This is indicative of an increase in extreme data points, corroborated by figures 12a and 12b.

Figure 12a: Distribution of Baseline NEET Levels by Continent (2010–2015)

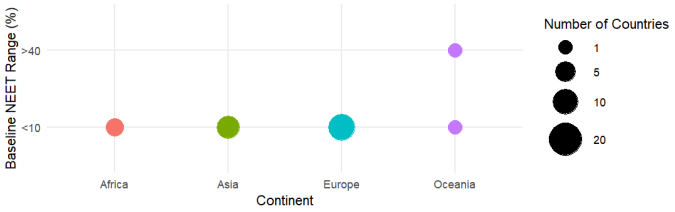
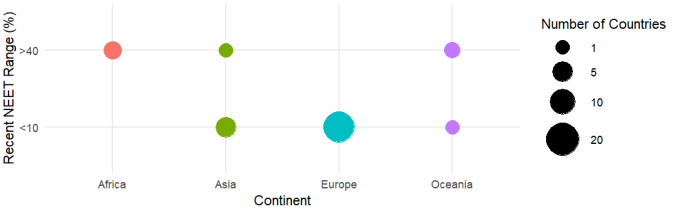


Figure 12b: Distribution of Comparison NEET Levels by Continent (2016–2020)



These figures highlight an increase of the number of countries at the extreme ends of NEET levels, particularly in Asia and Africa, towards NEET levels >40%, implying that increases in averages at the continental level could be overplayed as NEET levels are influenced by extreme cases, rather than the continent as a whole.

4. Discussion

Firstly, analysis was necessary on the circumstantial shocks surrounding the data to understand the results. The Covid-19 Pandemic was an anomalous event that caused global recession (-3.0% Global GDP), raising Youth NEET Levels worldwide (+1.5%). Excluding data from 2019 and 2020 would increase Youth NEET target achievement by 5-60% in all continents except South America, suggesting that without the Pandemic, target achievement for continents might be possible. However, removing this data from our analysis would be unrealistic for our analysis of Goal 8.1 as it considers 2030 the target year for sustainable development. Hence, understanding the impact of the pandemic is pertinent for analysis of accelerated recovery growth and NEET levels in the future.

Next, there was exceeding difficulty in computing youth NEET levels due to missing data in 2015 and 2020 respectively. We thus expanded the baseline and comparison years, weighing population based averages to minimise the effect of anomalies as mentioned in section 2.4. However, this is not truly representative of the 5-year change sought by the target because of the variance of youth NEET levels. The mean global population-weighted YoY percentage change of NEET is +0.60%, ~5% of the target reduction rates established. As such, each year deviating from the comparison decreases the reliability of our assessment of a country or continent's ability to hit the NEET reduction target significantly, especially for countries on the borderline of

the goal. Countries like Jamaica with baseline data from 2014 achieved the target by 0.01%, possibly missing the target had the data been more recent.

Finally, although there was a distinction in the expected growth rate between LDCs and DCs (7% vs 2%), this comparison is arbitrary and ignores how economic development exists along a continuum. Not all LDCs and DCs are equally developed, as recently promoted countries like Equatorial Guinea and Vanuatu still experience high growth rates associated with emerging economies as a non-LDC, skewing results for the country and the continent as a whole. The converse is also true, with countries like Bangladesh, Laos and Nepal set to be re-classified as non-LDCs in 2026. There remains a spectrum of economic levels among countries in the two bands that skews the percentage achieving growth targets.

5. Conclusion

Overall, continents around the globe were unable to hit both the targets set by the UN. In Asia, although LDCs observed higher growth rates, they struggled to maintain momentum. Africa, facing similar circumstances, often experienced shorter and more erratic growth periods, reflecting structural inability to maintain progress towards sustained growth. Although regions with fewer LDCs demonstrated more stable growth trends,these regions still saw large variances in growth, lacking successful growth spells to constitute sustained economic expansion.

Youth NEET reduction goals were equally difficult, as significant reductions occurred in isolated instances rather than comprehensive continental level improvements. Europe saw larger Youth NEET levels and reductions, whereas Asia, Africa and America saw rates rise in numerous countries.

However, assessing whole continents with different circumstances and economic levels under blanket metrics is unfair. Examining data at a country or regional level displays significantly higher target achievement than continental-levels. Similarly, many countries were on pace to meet growth targets before the pandemic, after which they are expected to see significant improvements riding accelerated post-recession growth. Hence, considering anomalous real world events and the success of individual regions, we remain cautiously optimistic for the overall goal of global sustainable development by 2030.

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