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SELECTED ISSUES

February 8, 2023

Approved By
European Department

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CONTENTS

DUTCH INFLATION: DEVELOPMENTS, DRIVERS, AND THE RISK OF WAGE-PRICE SPIRAL 4

A. Different Measures of Inflation: A Methodological Review 4
B. The Role of Domestic and Global Factors: An Empirical Assessment 9
C. Wholesale Energy Price Pass-Through 11
D. Profits at Risk? Breaking Down the GDP Deflator 16
E. Conclusions 21

FIGURES

1. Dutch Inflation Developments 5
2. Measures of Inflation 8
3. Energy Consumption, Inflation Differential and Growth 9
4. Phillips Curve Coefficients for Headline and Core Inflation 10
5. Implied Contribution to Headline and Core Inflation 11
6. Gas and Electricity Prices for Households 13
7. Core Inflation Composition and Energy Pass-Through 14
8. NLD vs EA: GDP and ULC Composition 19
9. Quarterly GDP Deflator and ULC Composition in the Netherlands 20

References 23

ANNEX
I. Phillips Curve Specification 24

ASSESSING RECENT CLIMATE POLICY INITIATIVES IN THE NETHERLANDS 30
A. Introduction 30
B. Mitigation 30
C. Assessing Climate Risks and Adaption Initiatives in the Netherlands 44
D. Summary of Policy Recommendations 62

FIGURES
1. Household Burden from Price Shocks and Budget Shares for Energy, Selected European Countries, 2022 31
2. Trends in International Fuel Prices 32
3. Impact of €50 Pure Carbon Charge on Production Costs for Selected Industries in the Netherlands, 2030 36
4. Impact of a €25/tCO2 Carbon Tax on Residential Natural Gas Prices in the Netherlands 39
5. Projected Revenue from Km-Based Taxation, 2030 41
6. Current and Efficient Fuel Prices, Selected European Countries, 2020 42
7. Temperature and Precipitations: Observed Trends and Projections 47
8. Extreme Heat and Intense Rainfall: Projections 48
9. Projections of Drought Indicators 49
10. Debt-to-GDP Under Different Climate Change Scenarios 54

BOXES
1. Supporting Public Investments in Clean Technology Infrastructure 33
2. The Delta Programme 58
3. A Stylized Cost-Benefit Analysis of SLR Using CIAM from 2050 to 2079 61

TABLES
1. Climate-Related Investments in the Dutch Recovery and Resilience Plan 34
2. Tax Rates on Natural Gas and Electricity by Consumption Bracket 38
3. Percent Change in GDP per Capita 51
4. Economic Damage from Weather and Climate-Related Extreme Events,1980–2020 52
5. Estimated Damage for 2018-2050 52
6. Welfare Change from Selected Climate Impacts (Percentage of GDP) for the Central Europe North region and EU-27+UK for Two Levels of Global Warming 53

ANNEX
I. The Coastal Impacts and Adaptation Model 63

References 65

HOUSING SUPPLY IN THE NETHERLANDS: THE ROAD TO MORE AFFORDABLE LIVING 68

A. Introduction 68

B. Existing Government Housing Policies and Socio-Economic Implications 70

C. Challenges to Revive a Flagging Housing Supply 72

D. The Way Forward: Government Proposals and Policy Recommendations 75

E. Conclusions 79

FIGURES

1. Demographic Trends and Housing Valuations 69
2. Tenant Structure and Housing Affordability 70
3. Housing Cost Burdens and Distributional Equity Implications 73
4. Housing Investment 74
5. Population Density and Construction Costs 75

References 81

DUTCH INFLATION: DEVELOPMENTS, DRIVERS, AND THE RISK OF WAGE-PRICE SPIRAL

Global inflation surged in 2022, driven by high gas price growth. With Russia being a key supplier of energy products, the start of the war in Ukraine has led to strong inflationary pressures in the euro area (EA), given the region's significant exposure to the Russian gas. The price shock has been particularly strong in the Netherlands, largely due to the larger share of gas on the energy mix compared to other peers, making the country vulnerable to changing market conditions.

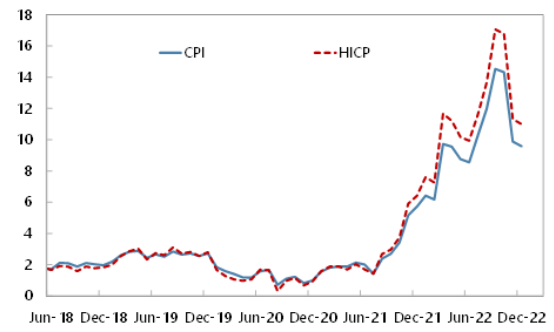
Against this background, this paper explores the nature of the recent acceleration of inflation in the Netherlands, taking into consideration different perspectives. The first section presents different measures of inflation and the methodological discrepancies among the indicators considered. Secondly, the paper presents an empirical assessment on the main drivers of inflation through a Phillips Curve estimation. The third section analyses the particularities of the Dutch energy mix compared to other EA peers, and the pass-through from wholesale to retail gas and electricity prices. In addition, as increasing inflation has raised concerns for a potential wage-price spiral, the fourth section presents empirical evidence on how the distribution of the total remuneration of productive factors - capital (profits) and labor (wages)- worked in the past. Finally, the paper summarizes the main findings of the study and further potential areas for research.

A. Different Measures of Inflation: A Methodological Review

1. In 2022, the Dutch headline inflation reached unprecedented levels since the 70's, largely driven by high energy price growth, with price pressures becoming increasingly more broad-based. After peaking at 17.1 percent year-on-year in September 2022—an all-time high, the HICP headline inflation slowed to 11.0 percent year-on-year in December 2022 driven by the easing of energy prices (Figure 1). Price pressures, however, have become more broad-based, with core inflation continuing to pick up to historical highs by end-2022, as higher energy prices are feeding though into core items.

2. In addition to the Harmonized Index of Consumer Prices (HICP), the Dutch Statistics Office (*Centraal Bureau voor de Statistiek*, CBS) also calculate consumer price index (CPI), with both indicators suggesting high inflation. As of December 2022, the HICP increased by 11.0 percent year-on-year, while the CPI grew by 9.6 percent, with the difference between the two measures increasing over time (text chart). There are two notable fundamental differences between these measures that drive the gap. First, the CPI includes imputed rents for

Inflation
(In percent, year-on-year)



Sources: Haver Analytics, CBS, and IMF Staff

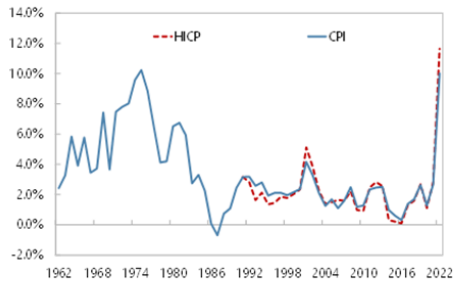
owner-occupied housing. Since rents are regulated, their growth in recent months has been less than that observed for other goods and services, thus, resulting in lower CPI inflation. Second, the energy weight in the HICP is higher than the one used in CPI calculation, making the HICP more sensitive to changes in energy prices. Higher energy weight, combined with large energy price increases in 2022, mainly drove the difference between the HICP and the CPI measures.

Figure 1. Dutch Inflation Developments

After peaking in September 2022 at an all-time high, the Dutch HICP headline inflation slowed to 11.0 percent in December 2022.

Historical Inflation

(Percent, year-on-year)

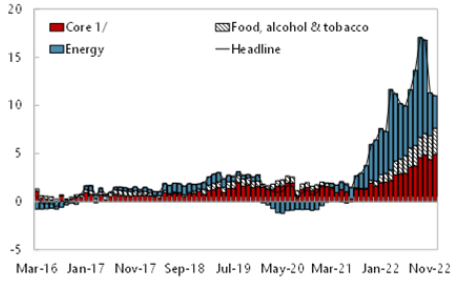


Sources: Haver Analytics, CBS and IMF staff

While surging energy prices have constituted the main driver in recent months, price pressures have become more broad-based.

Headline Inflation

(Percent, year-on-year, contributions in percentage points)

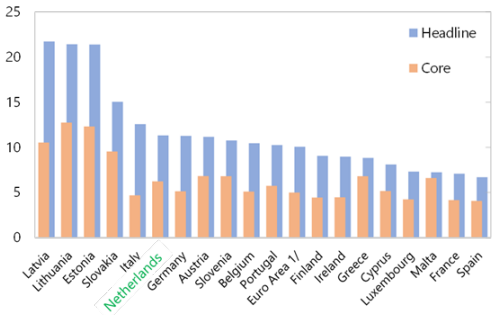


Sources: Haver analytics and IMF staff calculations

Despite some decline in prior months, the Dutch headline and core inflation remained high in December 2022 relative to other European peers.

Euro Area HICP Headline and Core Inflation

(In percent, year-on-year, November 2022 1/)

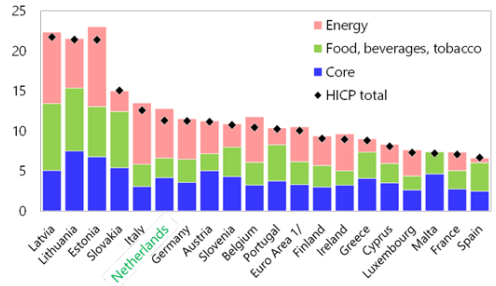


Sources: Haver Analytics and IMF staff estimates and calculations.
1/ Core inflation defined as headline inflation excluding energy, food, alcohol, and tobacco.

With energy prices as a key driver of inflation growth, while the contribution of food remains is rising but still below some European peers.

Euro Area Core HICP Inflation

(In percent, year-on-year, November 2022 1/)

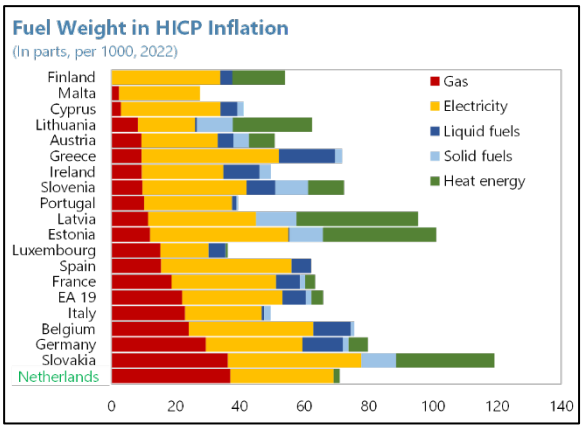


Source: Haver Analytics, and IMF staff estimates and calculations.
1/ Core inflation defined as HCPI inflation excluding energy goods, food, alcohol, tobacco. Euro Area MUICP, which is the Monetary Union Index of Consumer Prices of 19 countries. Core inflation defined as total excluding energy, food, alcohol, and tobacco.

Source: IMF staff estimates and calculations.
1/ Core inflation excludes energy, food, alcohol, and tobacco.

3. In broad terms, several factors help explain the high energy price growth in the Dutch statistics. Specifically:

- **A greater share of gas in the Dutch consumer price basket than in other EA countries**. Gas prices have experienced greater growth in recent months than other fuels. In the Netherlands, gas constitutes a larger portion of the consumer price basket than in other countries. Most of the electricity in the Netherlands is also produced by fossil fuel-fired powerplants, mainly natural gas. Thus, with gas price growth outpacing other fuels, a greater reliance on gas of the Dutch households has contributed to faster energy price growth in the Netherlands relative to other European countries.[1]



- **Liberalized energy markets increase price volatility and sensitivity to shocks in turbulent times.** The electricity sector in the Netherlands has been liberalized and open to competition since 2004 with about 53 suppliers active in the market.[2] This competition motivates wholesale market participants to adapt different business strategies, as setting prices in advance or to settle procurement of several months with commodity suppliers. As a competitive market, final energy suppliers adjust their final pricing strategy to the costs they face, including risks. Unlike in some other EA countries, there are no social tariffs in the Netherlands. This results in a stronger transmission of wholesale into retail energy prices, introducing more volatility particularly in the time of energy market stress.

- **Dutch TTF gas prices were somewhat higher than in other markets.** During the period of energy market turbulence in 2022, Dutch TTF spot gas prices—the European benchmark and the most liquid market, were somewhat higher than in some other markets, due to the large exposure of European countries to Russia's supplies.

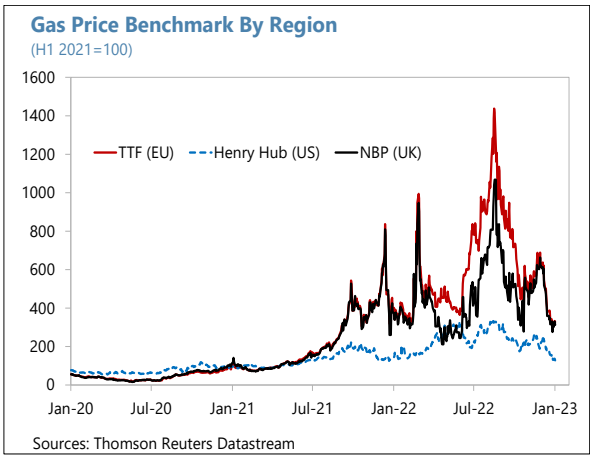
- **The current method of calculating consumer energy prices relies on variable rate contract pricing, resulting in an overestimated energy bill when energy prices increase sharply.** With the current method of estimation, consumer energy prices, which feed into the calculation of the HICP and the CPI indices, are overestimated when energy prices rise sharply and are underestimated when energy prices fall abruptly. This is because in the absence of readily available information on energy contract types and pricing, the current calculation method relies on the prices underlying variable rate contracts, thereby excluding nearly half of households,

[1] Source: https://www.eia.gov/international/analysis/country/NLD

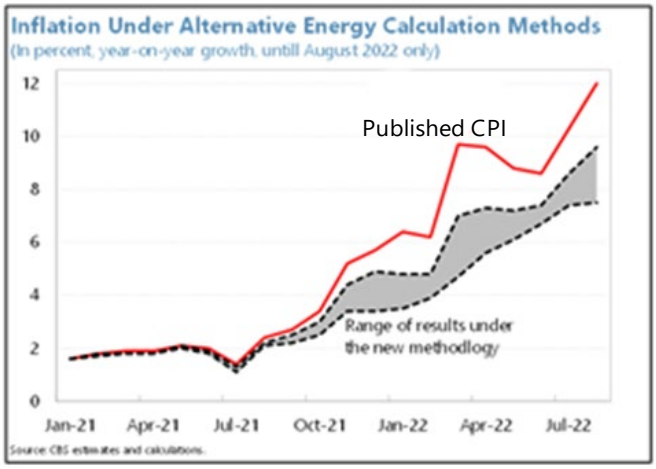
[2] Source: Eurostat's energy market indicators.

since about 44 percent of households remained on fixed energy contracts as of end-August 2022.[3] The share of fixed contracts, however, is quickly declining, since energy suppliers increasingly offer only energy contracts with a variable rate due to strong fluctuations in the energy markets, as fixing prices for a prolonged period exposes energy suppliers to more risk. While the current method of estimating consumer energy prices does not introduce any bias on the aggregate outcome with stable markets, the methodology falls short in volatile episodes, signaling some room for improvements in the future.

4. To better capture the average consumer energy prices, the CBS has been exploring alternative calculation methods since early 2022. To better understand the structure of household energy contracts and pricing mechanisms, the CBS launched a study in early 2022 to explore options for a more precise calculation of electricity and gas prices faced by an average consumer using information from utility companies, which currently covers about ¾ of all households with energy supply in the Netherlands.[4] The study investigates existing longer-term energy contracts to better reflect price discrepancies between fixed- and variable-rate, and new and existing contracts.



5. Preliminary analysis of alternative calculation methods suggests significantly lower CPI inflation than the official statistics report. Preliminary results based on the newly obtained prices of gas and electricity suggest that much lower electricity and gas prices experienced by an average consumer than the official statistics indicate. Specifically, as of August 2022, the latest data point released of alternative calculations, electricity price growth was in the range of 24–93 percent year-on-year instead of the reported 150 percent, and gas



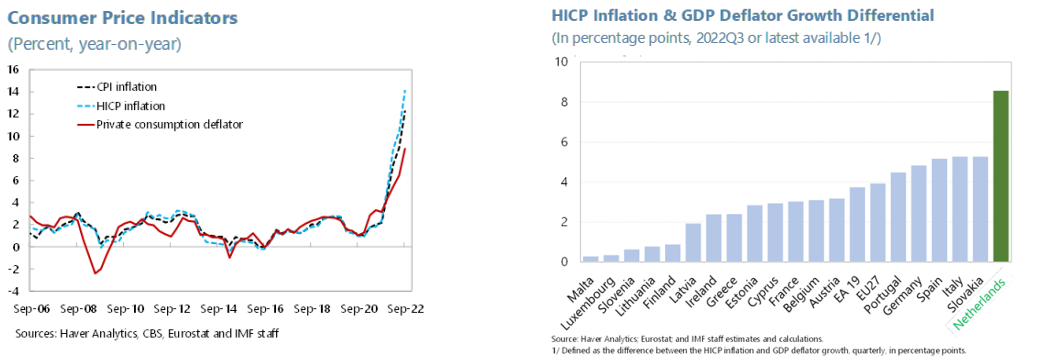
[3] As of end-August 2022, 56 percent of Dutch households had variable rate energy contracts. Among the remaining 44 percent of households with fixed variable contracts, 11 percent of households had contracts fixed for 1 year, 1 percent for 2 years, 25 percent for 3 years, and 8 percent for 5 years. Source: the Dutch Authority for Consumers and Markets (ACM). For details, see ACM: Number of households with a variable energy contract continues to rise.

[4] The CBS reportedly is still in discussion with the remaining energy companies to increase the coverage. The data are not yet sufficiently suitable for the use in the calculation of CPI inflation. Several calculation methodologies have been applied and compared. For details, see Towards a new method of calculating energy prices.

price growth in the range of 34–97 percent year-on-year instead of the published 170 percent. This would imply that the CPI inflation was about 2.4 to 4.5 percentage points lower than published (7.5–9.6 percent instead of the published 12 percent, text chart). The wide margins of the new estimated inflation reflect data imperfections. The introduction of a new methodology will likely take effect in mid-2023 for both CPI and HICP.

6. The private consumption deflator from National Accounts, an alternative method of measuring consumer prices, suggests more modest growth than the HICP inflation in the Netherlands. As CPI/HICP inflation began to rise in late 2021, the implied private consumption deflator increased less robustly, widening the gap between the two measures of price growth (Figure 2). This different performance is partially explained by discrepancies on the technical definition between the indicators. The CPI/HICP measures the level of retail prices at a particular point in time for a fixed basket of goods and services, whereas the private consumption GDP deflator measures inflation also accounting for changes in households' consumption and other goods and services not considered in the CPI/HICP. This methodological differences partially explain that, as of 2022Q3, the HICP inflation stood at 14.1 percent year-on-year, the average CPI at 12.3 percent, and the private consumption deflator at 8.9 percent.

Figure 2. Measures of Inflation

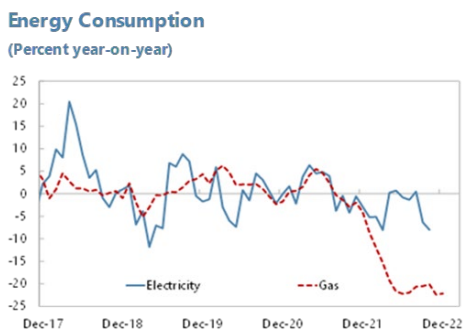


Source: IMF staff estimates and calculations.

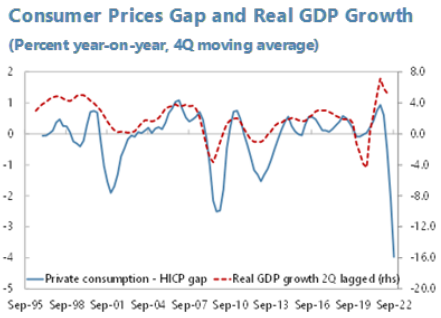
7. Consumer inflation, measured by the HICP and the CPI, may be also overestimated given that the consumer basket weights are updated with a delay at annual frequency. Both the HICP and the domestic CPI measures rely on weights of various items which are updated annually, based on households' budgetary survey. This implies that the HICP and the CPI do not account for changes in private consumption patterns observed within the year, failing to capture price elasticity effects on households' demand, and its effects on aggregated consumer prices calculations. In part, this explains the widening gap between HICP/CPI and the private consumption deflator from the National Accounts, which rely on updated weights at quarterly frequency. This methodological difference plays an important role, given that energy consumption in the Netherlands adjusted by more than 20 percent in 2022 (Figure 3).

8. The widening gap between the HICP and the private consumption GDP deflator may be indicative of an economic slowdown. With consumer price growth at historically highs, the difference between the HICP and the private consumption deflator has also increased significantly. Abrupt demand changes usually take place when an economy faces a shock with immediate or second-round effects on demand. Historically, widening gaps between the HICP and the private consumption deflator overlapped with economic slowdowns in the early 2000's, the global financial crisis and the European sovereign debt crisis, as consumer prices, measured by the private consumption deflator, quickly adjusted to a falling demand (Figure 3).

Figure 3. Energy Consumption, Inflation Differential and Growth



Sources: Thomson Reuters Eikon and IMF Staff calculations



Sources: CBS, Haver Analytics and IMF Staff calculations

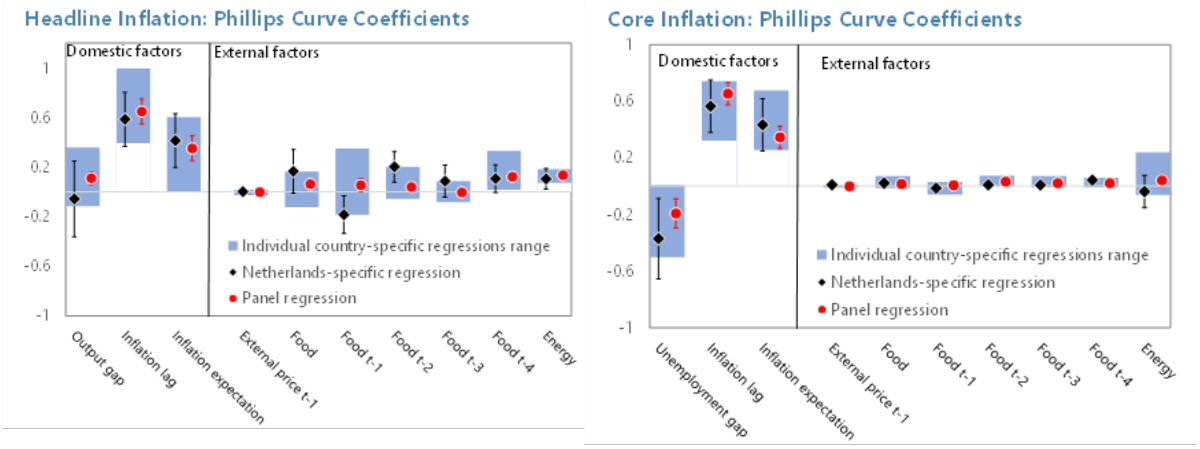
B. The Role of Domestic and Global Factors: An Empirical Assessment

9. The assessment of the role of domestic and foreign factors in determining inflation is based on empirical analysis. To understand the drivers of inflation, this section focuses on the Phillips curve, which relates inflation to its past and expected future values, and domestic economic slack. The Phillips curve analysis is also augmented with foreign price developments to assess the importance of foreign factors in determining inflation. A Phillips curve is estimated for a panel of 17 EA economies and separately for each country with sufficient comprehensive data over 2000Q1–2022Q2. Rolling window panel are also estimated to assess changes over time. The estimated coefficients for the Netherlands are compared to other countries and to the panel estimation results and are used to calculate implied contributions to inflation dynamics. Data sources, country coverage, and the methodology used in the Phillips curve estimation as well as the main results are detailed in the Appendix I.

10. Overall, the analysis reflects the key role of past and future inflation expectations in determining consumer price growth (Figure 4). The first takeaway from the proposed Phillips curve is consistent with the economic theory and most recent estimations (ECB, IMF's 2022 October Regional Economic Outlook), with lagged inflation and the 3-year-ahead inflation expectations statistically significant and showing the largest estimated coefficients. This is the case in both panel data results for the euro area and the Netherlands-specific regression estimates, and for both headline and core inflation rates. The latter results confirms that inflation is backward- and forward-looking even accounting for volatile components such as energy prices.

11. Dutch domestic cyclical conditions, as proxied by the unemployment gap, are statistically significant in determining Dutch core inflation. Three different variables are used to proxy and quantify domestic cyclical conditions in separate regressions: unemployment gap, output gap, and a combined measure of slack.[5] At the euro area level, the coefficients obtained on the different regressions confirm that all three measures are statistically significant and positively correlated with both headline and core inflation, suggesting the positive relation between inflation and the position in the economic cycle (Annex 1 Table 1). In the Netherlands-specific regressions, however, the results suggest that other factors different than the economic cycle contribute to consumer's price growth, resulting from the no significance of the coefficients estimated in the different specifications with only one exception. The Dutch unemployment gap is statistically significant in determining core inflation rate -but neither the output gap nor the principal components measure-, highlighting the relevance of the Dutch labor market in non-volatile domestic prices performance. Similarly to the panel data setting at the euro area level, the size of the impact is relatively small: a one percentage point increase in the unemployment gap is associated with 0.35 percentage point decline in core inflation under the Netherlands-specific baseline specification regression; and about 0.2 in the panel data setting.

Figure 4. Phillips Curve Coefficients for Headline and Core Inflation
(Range of coefficients obtained in different specifications)

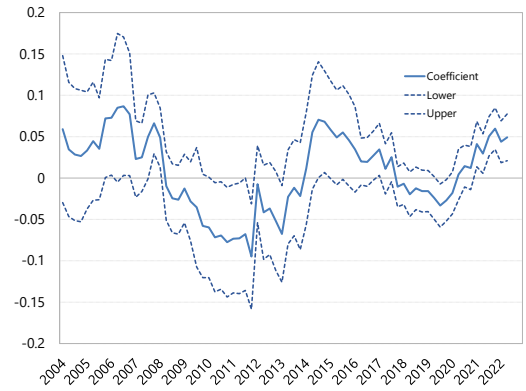


Sources: IMF staff estimates and calculations.
Note: Error bars correspond to 90th – 10th percentile confidence intervals. All estimates shown correspond to the baseline regression specification with imposed restriction of sum of expected inflation and the lag of inflation to equal one. Estimates with robust standard errors, and country fixed effects for the panel regression.

[5] The domestic slack variable is measured as the first principal component of seven variables: output gap, participation rate, unemployment gap, hours worked gap, self-employment gap, and the deviation of the share of part-time employment and temporary employment from their corresponding long-run averages.

12. External factors also constitute important determinants of the EA headline inflation dynamics. The measure of external price pressures is not statistically significant in most regression specifications neither in the panel setting, nor in the country-specific regressions. Commodity prices, however, are an important determinant of inflation, given the positive and statistically significant signs on the energy and food price coefficients both for the EA and for the Netherlands. Rolling window analysis undertaken using panel data suggests that the pass-through from energy to core inflation has increased substantially in the EA. with a higher coefficient on lagged inflation. The latter suggests that EA inflation has become more backward-looking and persistent.

Core Inflation Rolling Window Regression Coefficient on Energy in the Euro Area 1/

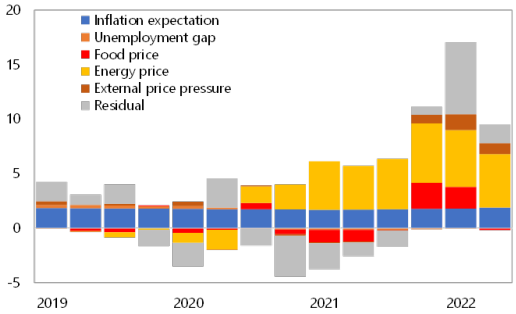


Sources: IMF staff estimates and calculations.
1/ Results based on panel-data setting. Solid lines indicate rolling regression coefficients of the headline (left) or core (right) regressions. Dashed lines show their 10th –90th percentile confidence intervals. Estimates are based on the baseline constrained regressions with country fixed effects and cover a rolling window of 16 quarters ending in the quarter indicated on the x-axis.

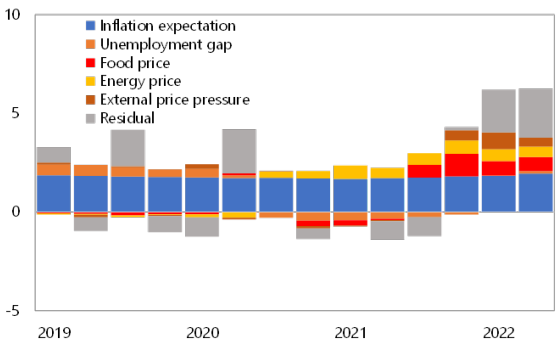
13. Global commodity prices have also played a key role in determining headline and core inflation in the Netherlands. Contributions of each driver are computed using dynamic simulations of the estimated Netherlands-specific Phillips curve. The results confirm that global commodity prices, specifically food and energy, have played a key role in inflation developments in the Netherlands. Energy prices, and to a lesser extend food prices, have been a major driver of the Dutch headline inflation since 2021. Meanwhile, food and energy price growth has also been key to core inflation acceleration since mid-2021.

Figure 5. Implied Contribution to Headline and Core Inflation

Implied Contributions to Headline Inflation Dynamics
(In percentage points, quarter-over-quarter seasonally adjusted annualized)



Implied Contributions to Core Inflation Dynamics
(In percentage points, quarter-over-quarter seasonally adjusted annualized)



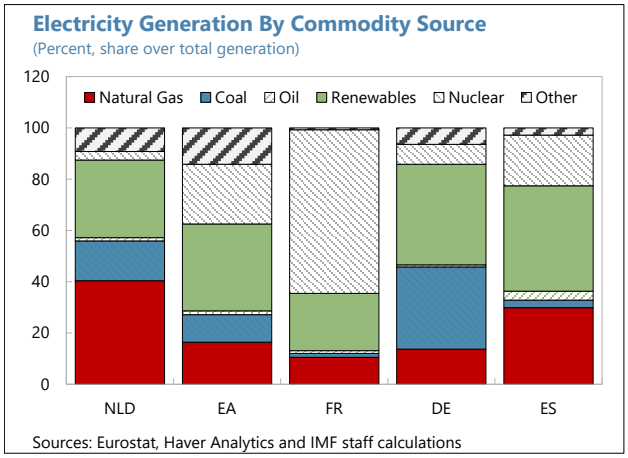
Sources: IMF staff estimates and calculations.
Note: Contributions are calculated based on the dynamic simulations of the Netherlands-specific Phillips curve regression.

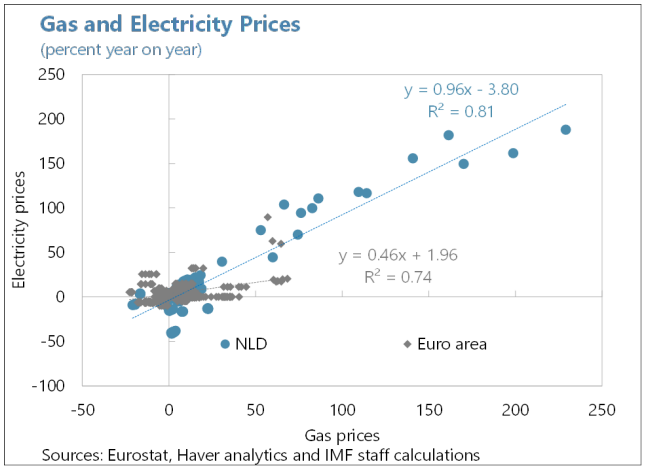
C. Wholesale Energy Price Pass-Through

14. The increasing role of gas and electricity price contribution to consumer's inflation has led to a greater cross-country heterogeneity in the euro area. This is linked to differences in the

pass-through from wholesale to consumers prices, depending on different factors such as the energy mix in electricity generation, the price-setting mechanism, and the price composition. Moreover, the impact of wholesale price changes depends on whether tariffs are set at a variable price, implying a fast adjustment of consumer prices, or are set at a pre-fixed level (ECB, 2022).

15. The large share of gas in the Dutch energy mix largely explains higher inflation in the Netherlands than in other EA peers. We find three factors that largely explain higher inflation in the Netherlands. First, as previously discussed, the consideration of variable-rate contracts on CPI/HICP methodology introduces some bias on inflation estimations.[6] Second, on the demand side, the share of gas and electricity items in the final consumer basket is one of the highest in EA, only surpassed by Slovakia. Third, on the supply side, the use of gas in electricity generation in the Netherlands is comparatively high, making electricity prices more sensitive to changes in gas prices (text chart). The EU's wholesale market relies on the system of marginal pricing, where all electricity generators get the same price for the power they are selling at any given moment, with independence on the commodity used on the process. However, electricity price depends on the source of energy for its generation, with fossil fuel typically more expensive than renewable energy. When national electricity producers bid into the market, the cheapest electricity is purchased first until the demand is met, but the last producer's price becomes the prevailing final price that all producers receive. Member states typically try to cover as much demand as possible with the less costly commodity source. Given that gas has been the most expensive commodity-source for electricity, the threshold for gas prices to determine electricity prices is lower in the Netherlands than in other EA countries, which contributes to the larger elasticity of Dutch electricity prices to gas markets (text chart).



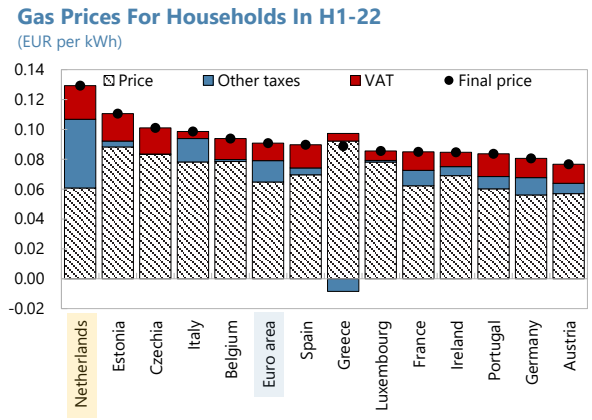


16. Item composition of consumer gas and electricity bills, also a key driver for final consumer's cost. The average household bill in Europe can be broken down into three basic components: the price of the commodity (including transportation and distribution costs to final users), value added tax (VAT), and other taxes (Figure 3). In the Netherlands, the latter component

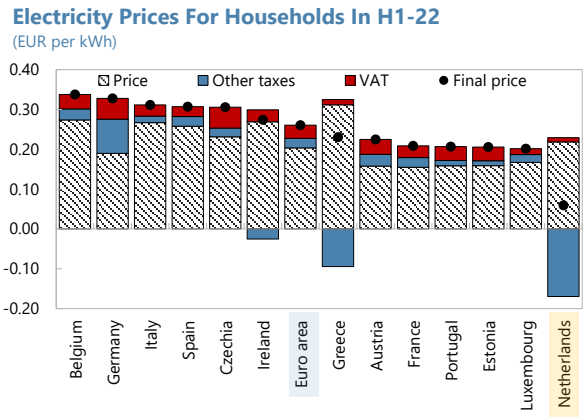
[6] As discussed in section A, gas and electricity prices in the Netherlands HICP refers to variable-price contracts which are closely determined by wholesale prices.

includes the ODE tax[7], meant to stimulate financing of the production of sustainable energy and the energy tax. In addition, electricity bills also include the energy tax refund or energy tax credit, which is a deduction on the taxes on the use of electricity awarded per electricity connection.

Figure 6. Gas and Electricity Prices for Households



Sources: CBS, Eurostat and IMF staff



Sources: CBS, Eurostat and IMF staff

17. Taxes play a key role in promoting a consumption shift. Gas and electricity are taxed in the Netherlands through the ODE and the energy tax as set in the Environmental Taxes Act. With the decline in the domestic gas production over the last decade, the strategy towards a more efficient and less gas-dependent economy has gained relevance, shifting taxation towards gas usage while promoting efficiency in electricity use. In the first half of 2022, the energy tax on gas usage was at 0.26 EUR/m3, up from 0.16 EUR/m3 in 2018; while the energy tax on electricity has been reduced to 0.037 EUR/kWh[8] from 0.10 EUR/kWh in 2018. In addition, an energy tax credit is applied per electricity connection, as a way to protect a basic amount of consumption of electricity by eliminating the energy tax up to a basic amount. The government sets the amount of the tax credit each year. In 2022, the tax credit was 681.6 EUR from 308 EUR in 2018.

18. The relevance of natural gas sector in the Netherlands has contributed to a stronger pass-through from wholesale prices into the wider economy. Despite the shift from a net gas exporter to a net importer, the Netherlands has faced a relatively mild terms-of-trade shock. However, the large share of gas in the Dutch energy mix, including electricity generation, has exposed the country to more intense domestic inflationary pressures, now also passing-through to core items.

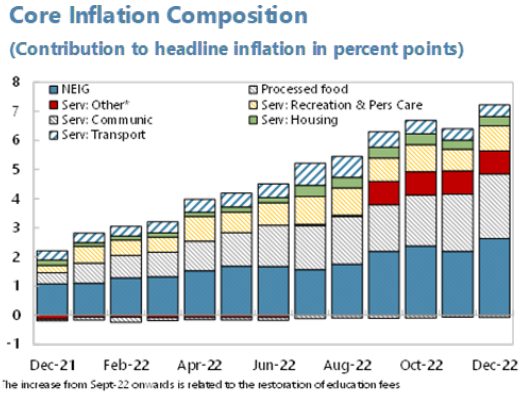
19. By end-2022, the Dutch core inflation accelerated faster than the EA average. Core inflation in the Netherlands has gained traction in 2022 to reach 8.4 percent in December

[7] Sustainable Energy Surcharge (*Opslag Duurzame Energie,* ODE)

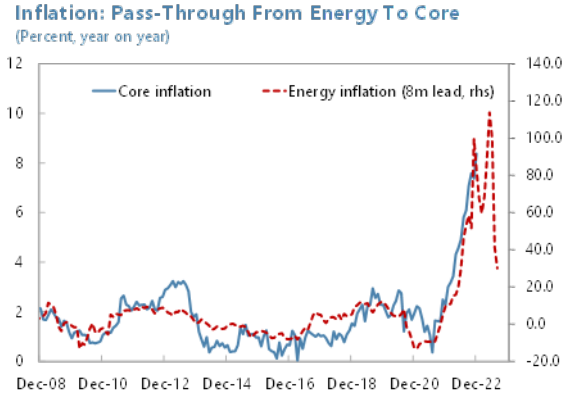
[8] The energy tax on electricity was markedly lowered to 0.037 EUR/kWh in January 2022 from previous 0.094 EUR/kWh, as a measure to help to offset the increase in gas and electricity prices recorded in 2021H2.

(6.6 percent in EA) from 2.3 percent in December 2021 (2.7 percent in EA), with the positive contribution of its three aggregates: processed food (14.1 percent in December from 2.4 percent in December 2021), non-energy industrial goods (NEIG) (8.8 percent in December from 3.4 percent in December 2021), and services (5.8 percent in December from 1.3 percent in December 2021). This outcome is partially related to supply chain disruptions (mostly on NEIG) and post-pandemic effects (services), but the role of both energy and non-energy commodity prices in the increase of input costs cannot be ignored (Figure 4).

Figure 7. Core Inflation Composition and Energy Pass-Through



Sources: Thomson Reuters Eikon and IMF Staff calculations



Sources: CBS, Haver Analytics and IMF staff calculations

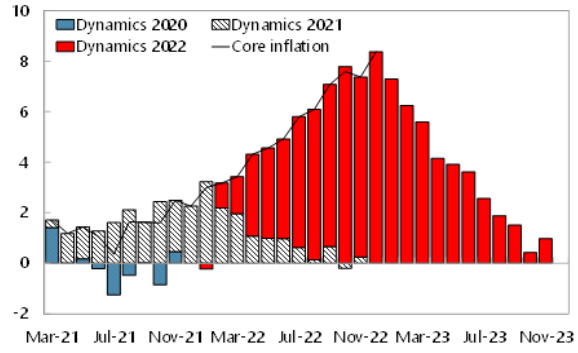
20. Empirical evidence suggests it takes about 6–8 months for energy prices to pass-through to core items, increasing the likelihood of inflation persistence and adding downside risks for domestic demand (Figure 4). With volatile components excluded, such as energy and unprocessed food, core inflation typically displays a more stable pattern. As a result, core inflation becomes more persistent after a shock. The lead-lag structure of the pass-through from energy to core inflation and different estimations on its persistence suggest that the effects of high energy prices could last up to 18 months.

21. Food price growth acceleration and persistently high energy prices could result in further deterioration of the cost-of-living, with particular impact on low-income households. High inflation disproportionately affects lower-income households due to the lack of substitution capacity towards cheaper items, given that they tend to consume cheaper white-label products, while richer households usually consume more-expensive/branded products. In addition, low-income households also show a higher marginal propensity to consume and have less room to preserve their consumption through savings, with a lower value of liquid assets (ECB, 2022).

22. The key role of monetary policy with increasing risks of persistence. From a purely quantitative approach, i.e., without considering the economic relationships, core inflation acceleration during 2022 automatically translates into strong base effects for 2023, indicating that elevated core inflation rates will remain in place in the coming months. The 2022 carry-over effect will account for 3.7 percentage points in the average core inflation rate in 2023. On a monthly basis, this effect will maintain the year-on-year core inflation reference above 2 percent until August 2023 (text chart). This means that, in the absence of a strong adjustment of core prices throughout the year, non-volatile inflation will remain above its historical average. With both domestic and external drivers of inflation still adding upward risks, monetary policy tightening should diminish inflationary pressures on core at some point, reducing its persistence and pass-through effects in the economy.

Core Inflation

(Percent year-on-year and contributions in pp)



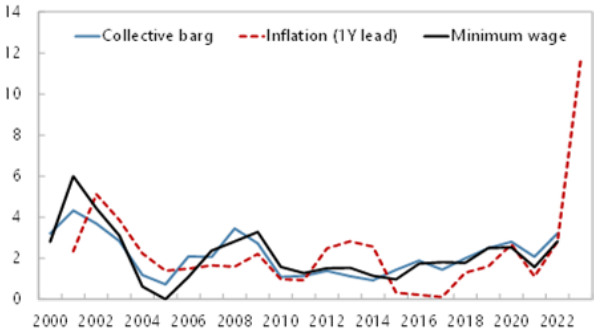
Sources: Haver analytics and IMF Calculations

23. The dynamic interaction between prices and wages is time-varying and depends on the stage of the economy. Increasing core inflationary pressures may call for result in wage increases, protecting households' purchasing power while stimulating demand and fulfilling a wage price spiral. ECB research finds that the pass-through of wages into prices is systematically lower in periods of low inflation as compared to periods of high inflation. This theoretical finding raises concerns about potential risks of strong wage growth, potentially leading to negative effects on the domestic economy. On the one hand, corporate profits may face liquidity and solvency problems due to the strong increase of input costs, particularly in a context of deteriorating economic conditions. On the other hand, strong wage increases could preserve purchasing power of employees, reinforcing demand and adding inflationary pressures into the economy (a wage-price spiral process).

24. To date, the pass-through from inflation into wages remains moderate. Collective bargaining agreements in Europe is closely linked to inflation performance, with several countries relying on inflation-linked annual indexation of wages, pensions, and other social benefits. However, there are no inflation-linked clauses in the Dutch regulatory framework, increasing the flexibility to the negotiation process among social partners and allowing for a healthy economic interaction between wages and corporate profits. This is also the case for the minimum wage, which

Inflation and Wages

(Percent year-on-year)



Sources: Haver analytics and IMF Calculations

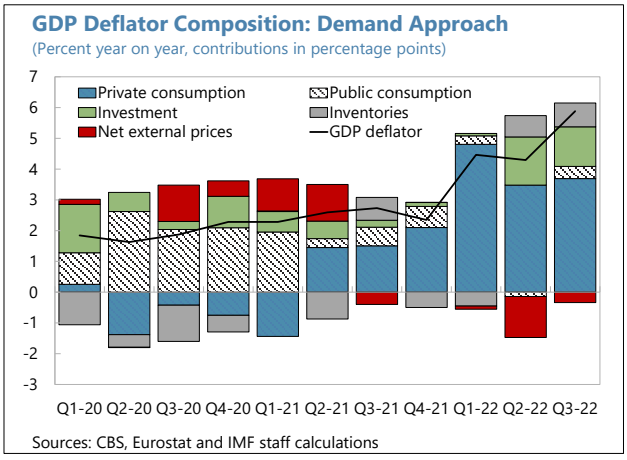
is linked to the evolution of contractual wages through a legal indexation mechanism. The latest available information confirms the recent acceleration of wages, despite remaining well below the inflation rate (text chart). Contractual wage growth, which refers to newly agreed wages, reached 5.0 percent in December 2022, up from 1.0 percent one year earlier. As some collective agreements are signed on a multi-year basis, the average wage remained contained growing by 3.7 percent year-on-year. In the case of the minimum wage, the increase by 10.3 percent in early 2023 will help to support purchasing capacity of low-wage employees and benefit claimants, partially offsetting the effects of high and persistent inflation on the most vulnerable groups, while preserving a basic demand.

25. The extend to which higher wages translate into higher inflation depends on profit margins. In a context of deteriorating macroeconomic outlook and increasing input costs (intermediate consumption and wages), the capacity of producers to absorb the shock will depend on their flexibility to adjust profits, or to pass-through higher costs into final consumer prices. The unprecedented acceleration of energy prices, combined with the post-pandemic shock, has raised concerns over the economy's capacity to increase wages (supporting purchasing capacity) without compromising corporates' profits. In this context, the following section reviews the performance of income distribution between capital (profits) and labor (wages) in past episodes, bringing some empirical evidence on the flexibility (or not) of the Dutch economy.

D. Profits at Risk? Breaking Down the GDP Deflator

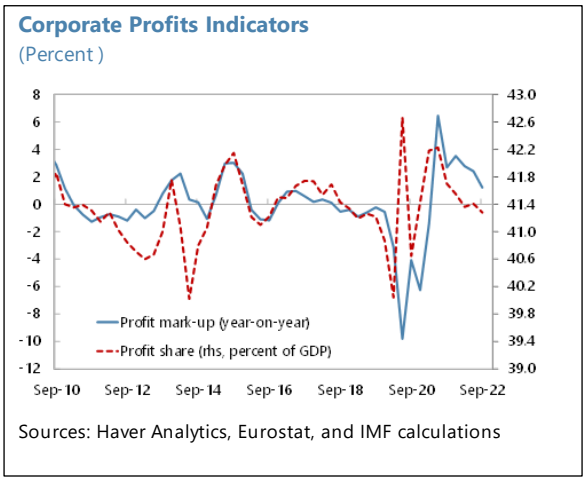
26. Together with wages, profits are a key determinant of domestic price pressures. As previously discussed, inflation is driven by both domestic and external factors (see section B). On the domestic front, final consumer prices are to a large extent influenced by producer prices, inflation expectations and the interaction of wages and corporate profits. On a broad basis, domestic prices could be understood as the evolution of profits charged by corporates over the costs they face. From a macroeconomic perspective, the National Accounts framework provides for the decomposition of the GDP deflator into its main components, adding complementary information on the different drivers of final prices.

27. From the demand perspective, the GDP deflator growth in 2022 was mostly driven by private consumption prices and moderated by the external sector. Since energy prices started to accelerate in 2021Q2, purchasing prices in the economy accumulated an increase of 6.8 percent until 2022Q3, led by the strong increase in final consumer prices by 9 percent resulting from the pass-through from wholesale to retail energy prices, and the post-pandemic



recovery.[9] The slowdown of private consumption over 2022 helped to moderate the impact of accelerating consumer prices on the GDP deflator, despite remaining historically high. By the same token, moderated investment growth in the second half of 2021 avoided a further contribution of increasing prices to the GDP deflator. However, the recovery of investment growth from 2022Q2 onwards coupled with the acceleration of capital investment prices, translating into an acceleration of the GDP deflator. The intensification of domestic demand was minored by the net impact from the external sector, as the strong performance of exports and the capacity of domestic producers to re-export imported inflation, reduced the impact of imported prices on the domestic economy. Still, as a net energy importer, increasing energy prices induced a deterioration in the terms-of-trade, eroding the income used to remunerate domestic factors of production. The rest of this section will focus on the distribution of domestic income between labor and capital in the Dutch economy.

28. Domestic prices can be also interpreted as the combination of the remuneration of capital (profits) and labor (wages). There are several measures to quantify profits in national accounts terms. One is the *profit share*, which is the ratio of the gross operating surplus (or the gross value added) to GDP. This measure is of interest for macroeconomic analysis since movements in the profit share are primarily determined by the relative dynamics of the gross operating surplus and labor costs. The second measure is the *profit mark-up* which, at a macro level, can be proxied by the difference between gross value added and remuneration of employees. While both measures, the *profit mark-up* and the *profit share*, constitute a good proxy of corporate profits, methodological discrepancies among the two indicators bring relevant analytical information. Unlike the gross operating surplus, the gross value added excludes intermediate consumption (such as energy and other input costs), becoming a key reference in the current episode driven by the hike in energy costs. However, the profit share reflects the interaction of corporate's income with other sectors, a relevant measure when analyzing the interaction between profits and labor costs. The latter helps to explain the different performance of both indicators since the pandemic, with the public sector playing a key role in the profit share performance (to be shown later). However, going forward, as the effect of the pandemic income support is fully phased out, energy prices remain high and the economic slowdown materializes, the profit mark-up may deteriorate further driven by both declining value added, with accelerating input costs and raising wages.



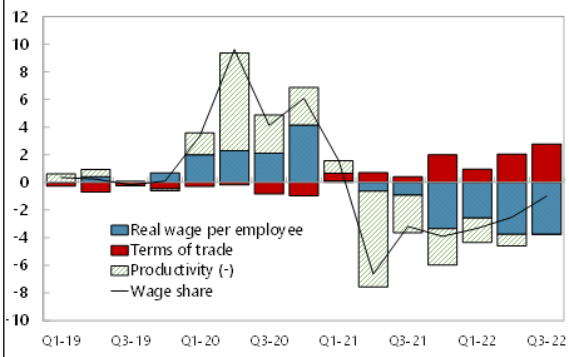
29. Increasing inflation and the strong economic performance have lowered the wage share since early 2021. Complementary to profits performance, a key reference for household's

[9] The final contribution of each component is determined in nominal terms, capturing the performance of prices and quantities purchased in the quarter.

income is the wage share, measured as the representativeness of wages over total income.[10] Based on the National Accounts, the wage share can result from the combination of real consumer wages (measured by nominal wage per employed person divided by the private consumption deflator), labor productivity and terms of trade performance (proxied by the GDP deflator-to-private consumption deflator ratio).[11] Understanding these relationships may help design economic policy when an unprecedented shock takes place, benefiting economic policy outcomes. In the absence of a strong economic shock, the wage share is inversely related to the profit share, meaning that a decreasing wage share takes place on the back of raising profits. According to the proposed decomposition, the wage share can be lower due to decreasing real wages, increasing labor productivity and/or a relevant terms of trade shock. Since consumer prices started to accelerate in mid-2021, the Dutch wage share has maintained a declining path, largely driven by the loss of labor income purchasing capacity (text chart).

Wage Share

(Percent year on year, contributions in pp)



Sources: CBS, Haver Analytics, and IMF calculations

30. The dynamics between profits and wages can be also analyzed from the GDP income approach. The GDP composition from the income perspective includes the gross operating surplus, which is a measure for corporate profits, compensation of employees and the remuneration of the public sector, measured as indirect taxes net of subsidies. This approach allows to understand the price/cost per unit of output as the result of the remuneration to corporates, workers, and the public sector. With taxes and subsidies already set, and wage growth mostly determined in collective bargaining agreements, profits are the most flexible component when a sudden sock takes place. The extent to which corporates pass-through an increase in other costs to domestic prices depend on their willingness -or capacity- to absorb the shock on the back of their own profits.

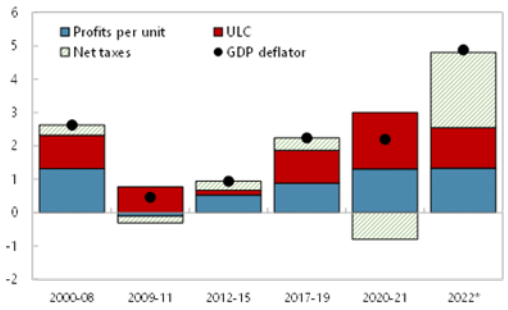
31. Labor productivity is also a key determinant of the impact of increasing wages into labor costs. Intuitively, wages are the key reference to analyze labor costs, and their impact on corporate profits. However, the extent to which wage growth affects labor costs depends also on labor productivity, measured as units produced per worker. Unit labor costs can be then further broken down into wages and labor productivity. While wage performance will positively affect unit labor costs (ULC), labor productivity growth will be inversely related to ULC, helping to offset wage performance on corporates' costs. This means that a relevant pick-up in wages could be offset by a similar increase in productivity, reducing the final impact of ULC on prices.

[10] Calculated as nominal compensation of employees over nominal GDP.

[11] $Wage\ share = \left(\frac{Wage\ per\ employee}{Priv.C\ Deflator}\right) * \left(\frac{Employment}{Real\ GDP}\right) * \left(\frac{Priv.C\ Deflator}{GDP\ Deflator}\right) = Real\ wage\ per\ employee * \frac{1}{Productivity} * \frac{1}{ToT}$

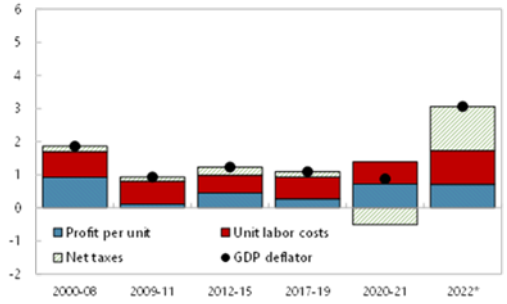
Figure 8. Netherlands vs Euro Area GDP and ULC Composition

GDP Deflator Composition in the Netherlands
(Percent year-on-year and contributions in percentage points)



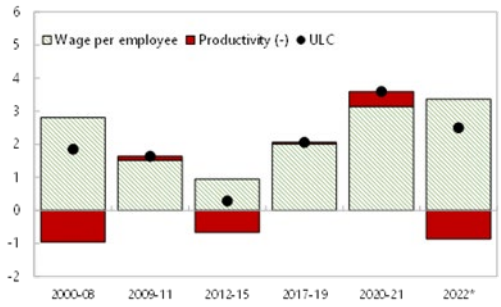
Sources: CBS, Haver Analytics, and IMF calculations

GDP Deflator Composition in the Euro Area
(Percent year-on-year and contributions in percentage points)



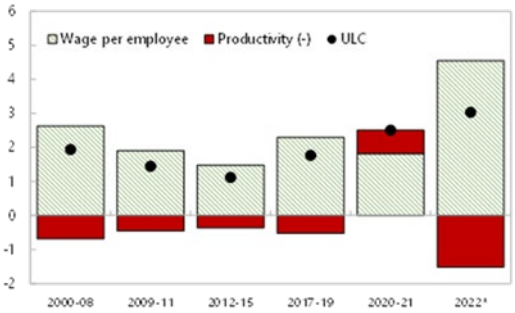
Sources: Haver Analytics, Eurostat, and IMF calculations

ULC Composition in the Netherlands
(Percent year-on-year and contributions in percentage points)



Sources: Haver Analytics, Eurostat, and IMF calculations

ULC Composition in the Euro Area
(Percent year-on-year and contributions in percentage points)



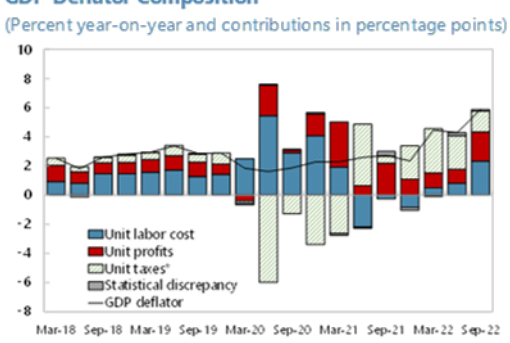
Sources: Haver Analytics, Eurostat, and IMF calculations

Note: Information until 2022Q3

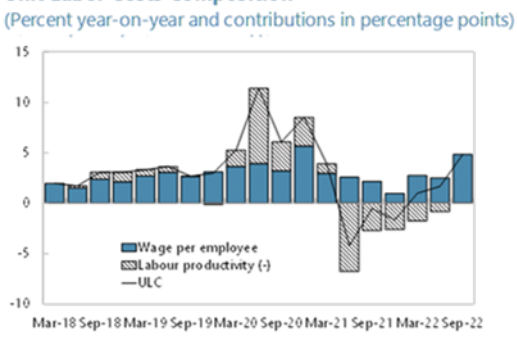
32. From a historical perspective, profits have been more stable in the Netherlands than in the Euro Area, providing some buffer against short-term cyclical fluctuations in ULC (Figure 5). Growth of domestic prices in the Netherlands has been more intense and volatile than in the EA over the last 20 years. From an income perspective, this performance has been driven by the larger flexibility shown by both corporate profits and wages to changes in the economic cycle. Domestic prices in the Netherlands grow stronger than the EA average during the upswings, while moderate faster during the downturns. Moreover, the composition of final prices, measured from the income approach, reveals the key role played by the profit and wage flexibility on the capacity of domestic prices to adapt to changes in economic growth. For example, the sudden impact of 2008 global financial crisis on demand was completely absorbed by corporate profits, avoiding the pass-through of increasing wages and the productivity loss to final prices. However, Dutch corporate profits recovered faster and stronger than in the EA during the years after the sovereign debt crisis in 2011–12, without adding inflationary pressures, supported by more moderate wage growth and stronger productivity gains than the EA. From 2017 until 2020, the strength of the economic performance of the Netherlands translated into a more intense recovery of wages and corporate profits, increasing Dutch domestic prices in times of strong economic growth.

33. The role of government support has markedly shaped domestic prices since 2020 while preserving wage and corporate profits' growth (Figures 5 & 6). The unprecedented support from the public sector during the pandemic in 2020–21 was notably channeled through subsidies to corporates, reflected in the strong negative contribution of public sector income to overall domestic costs.[12] This support allowed corporates to partially pass-through higher ULC to final consumers, while preserving their profits during the pandemic without increasing final prices. This effect was more visible in the Netherlands than in the EA, driven by a larger public support, and due to a stronger wage growth. By the same token, public sector income per unit continued playing a relevant role in domestic inflation. The end of the remaining pandemic-income support has played a key role in 2022, driven by the increase of indirect taxes and the end of the remaining pandemic-income support (that is to say, lower subsidies).

Figure 9. Quarterly GDP Deflator and ULC Composition in the Netherlands



Sources: CBS, Haver Analytics, and IMF calculations



Sources: CBS, Haver Analytics, Eurostat and IMF calculations

34. As the effects from the pandemic vanish, the remuneration of corporates and labor will determine domestic prices. The acceleration of inflation in mid-2021 coincided with the gradual re-opening of European economies, masking the impact of raising prices on economic activity. The unprecedented fiscal support during the pandemic also affected the income distribution between wages and profits, as well as the final impact of wage performance on labor costs. The latest information related to 2022Q3 confirms the increasing weight of wages on labor costs, and the lack of productivity growth in a context of economic slowdown. However, higher labor costs did not impeed corporate profits also to accelerate, translating into a new acceleration of the GDP deflator growth.

35. Based on the healthy interaction between profits and wages in the past, risks for a wage-price spiral appear to be limited at an aggregate level. The Dutch economy faces the energy and cost-of-living crises with a positive output gap and a tight labor market, which could further fuel wage bargaining. However, the latest statistics confirm that wage growth remains well below inflation, despite the tight labor market, and the wage shares accumulates five-quarter in a

[12] Public sector income is defined as indirect taxes net of subsidies.

row on a decreasing trend. This, together with past experiences, reduces the likelihood for wage increases that would compromise corporate profits or result in a price spiral in the economy.

36. With different sectors of economy affected differently by the high energy prices, ability to adapt to the new environment and improve productivity is key. At an aggregate level, the remuneration of capital and labor show a typical interaction when determining final prices. However, energy prices, particularly in post-pandemic, may affect different sectors of the economy differently, compromising the viability of some Dutch firms or sectors. The ability of these vulnerable sectors to adapt to the new energy environment and to improve productivity is key to preserving employment through competitive wages and their own profits.

E. Conclusions

37. A combination of domestic and external factors has led to high inflation, with price pressures becoming broad-based, increasing inflation persistence, and adding risks for domestic demand. In 2022, the Dutch headline inflation reached unprecedented levels since the record began, largely driven by high energy price growth, with price pressures becoming increasingly more broad-based. Despite some decline in the last few months of 2022, inflation remained high by end-2022 compared to the country's historical performance, and also to the growth rates recorded by other EA peers. Several factors help explain the higher energy price growth in the Netherlands. These include: a greater share of gas in the Dutch energy mix, liberalized energy markets, and the current method of energy inflation calculation, among others. Different specifications of the Phillips curve analysis suggests that past and future inflation expectations are the main determinants of consumer prices, while the contribution from domestic and external factors is statistically significant but less dominant in determining inflation dynamics. During 2022, price pressures have become more broad-based, with core inflation continuing to pick up, as higher energy prices are feeding though into core items. Empirical evidence suggests it takes about 6–8 months for energy prices to pass-through to core items, increasing the likelihood of inflation persistence and adding downside risks for domestic demand.

38. Despite the recent acceleration in wages, risks for a wage-price spiral remain low. Contractual wages started to rise in 2022, on the back of a strong post-pandemic recovery and a tight labor market. Still, the pass-through from inflation into wages remained moderate and real wage growth continued falling. With no inflation-linked clauses in the Dutch regulatory framework, the flexibility to negotiate among social partners allows for a healthy economic interaction between wages and corporate profits. While the Dutch economy faces the energy and cost-of-living crises with a positive output gap and a tight labor market, the risks for a wage-price spiral appears to be limited at an aggregate level based on the historical performance and the Dutch regulatory setting. However, there is a large heterogeneity at a micro-level on the capacity of corporates to absorb higher input costs in a context of economic slowdown. In addition, as risks of high inflation persistence increase, the effects of the loss of purchasing power for households will be also heterogeneous among different income quintiles, with unclear effects on demand and economic activity overall. The capacity of the Dutch economy to adapt to the new energy environment and to improve productivity is key to preserving employment, growth, and profits.

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Annex I. Phillips Curve Specification

This annex provides information on data sources, country coverage, and methodology used in the Phillips curve estimation and summarizes main results.

Data Sources and Panel-Data Analysis Country Coverage

1. The Phillips curve analysis is conducted for 17 Europe Area economies, including Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Netherlands, Portugal, Slovak Republic, Slovenia, and Spain.[1]

2. Annex I Table 1 summarizes the data sources for the key variables. The analysis was conducted in quarterly frequency, covering the period 2000Q1–2022Q2. Data availability varies by year and by country.

Annex I. Table 1. The Netherlands: Data Sources

Variable	Source	Frequency
Core/headline consumer price index	Haver Analytics	Quarterly
Energy and food weights in HICP	Haver Analytics	Quarterly
Three-year-ahead inflation expectations	Consensus Economics	Quarterly
World food price index	IMF, International Finance Statistics	Quarterly
World energy price index	IMF, International Finance Statistics	Quarterly
External price pressure	IMF staff calculations	Quarterly
Producer price index	Haver Analytics	Quarterly
Nominal effective exchange rate	IMF, INS	Quarterly
GDP deflator	Haver Analytics	Quarterly
Bilateral imports	IMF, Direction of Trade Database	Quarterly
Real GDP	Haver Analytics	Quarterly
Nominal GDP	Haver Analytics	Quarterly
Unemployment rate	Haver Analytics	Quarterly
Participation rate	Haver Analytics	Quarterly
Share of part-time employment	Haver Analytics	Quarterly
Share of temporary contracts	Haver Analytics	Quarterly
Share of self-employed	Haver Analytics	Quarterly
Hours worked per employee	European Commission	Annual

Sources: IMF staff compilation.

[1] Luxembourg and Malta were excluded from the sample of Euro Area countries due to limited consistent data on inflation expectations.

Phillips Curve Specification

3. A Phillips curve was estimated to assess key drivers of inflation, with the baseline specification as the standard New Keynesian Phillips curve augmented with variables that proxy for global price developments.[2]

$\pi_{i,t} = \beta_1\pi_{i,t-1} + \beta_2\pi^e_{i,t} + \beta_3 y_{i,t} + \beta_4 Energy_{i,t} + \sum_{k=0}^{4}\beta^F_k Food_{i,t-j} + \beta_5 extP_{i,t-1} + FE_i + \varepsilon_{i,t}$, where

- $\pi_{i,t}$ is the quarter-over-quarter seasonally adjusted annualized HICP headline/core inflation in country i in quarter t.

- $\pi^e_{i,t}$ represents the three-year-ahead inflation expectations, defined as the three-year-ahead expected inflation, taken from the Consensus Economics, which report the average inflation forecast across professional forecasters.

- $y_{i,t}$ is the measure of domestic economic slack, which is proxied by three variables:

    - unemployment gap, defined as the deviation from the Hodrick-Prescott (HP) filtered unemployment rate;
    - output gap, defined as the deviation from the HP filtered real GDP; and
    - domestic slack variable, measured as a principal component of seven variables: output gap, participation rate, unemployment gap, hours worked gap, self-employment gap, and the deviation of the share of part-time employment and temporary employment from their corresponding long-run averages.[3]

- $Energy_{i,t}$ and $Food_{i,t-j}$ are quarter-over-quarter annualized growth rates of the world food and energy price indices, weighted by the shares of these items in the domestic HICP baskets.

- $\beta_5 extP_{i,t-1}$ denotes the lagged external price pressures, defined as the quarter-on-quarter annualized percent change in the import-weighted producer price index (PPI) of countries j from which country i imports, converted to local currency using the trade-weighted nominal effective exchange rate, and relative to the percent change in the GDP deflator (Bems et al., 2018).

- FE_i are the country fixed effects.

- $\varepsilon_{i,t}$ is the error term.

4. The baseline specification includes contemporaneous energy prices, and contemporaneous food prices with four lags to account for the longer speed of pass-through of food than energy

[2] The model follows the methodology used in Chapter 2 "Inflation in Europe: Assessment, Risks, and Policy Implications" of the IMF's Regional Economic Outlook (October, 2022).

[3] The first principal component explains about 30 percent of the total variance.

prices to domestic inflation. The benchmark specification imposes a constraint on the sum of coefficients on past inflation and inflation expectation to be equal to one. This is done to introduce forward- and backward-looking components of inflation consistent with the assumption of inflation equal to expected inflation over the long run. This assumption is relaxed in alternative specifications (OLS, and median regressions).

Phillips Curve Estimation Results

5. The Phillips curve is first estimated in a panel setting for the 17 euro area economies, with the estimation results reported in Annex I Table 1. Results of the alternative specification with added time fixed effects are reported in Annex I Table 2. The analysis is then repeated with individually for each country with at least 30 quarters of data available. The results are qualitatively comparable to IMF (2022).

6. Overall, explanatory variables account for about 66 (65) percent of the variation of headline (core) OLS regressions with country fixed effects.[4] In median regressions, the estimated pseudo R-squared declines to 0.38 (0.32) for headline (core) regressions.[5]

7. The findings suggest that inflation rates are backward-looking, given the statical significance of the coefficient on the lag of headline/core inflation. The price-setting also appears to be to some extent forward-looking, as the estimated coefficients on the three-year-ahead inflation expectations are statistically significant in most regression specifications and range between 0.4 and 0.6 for headline, and 0.2 and 0.4 for core inflation regressions. Inflation persistence is lower and coefficients on inflation expectations are higher when time fixed effects are included (Annex I Table 2).

8. Domestic cyclical conditions, as proxied by the output gap, unemployment gap, and the measure of economic slack, are all statistically significant in determining headline/core inflation. The size of the impact, however, is relatively small: a one percentage point increase in the output gap is associated with an increase in the headline (core) inflation rate by about 1.1 (0.9) percentage points; one percentage point increase in the unemployment gap is associated with 0.2 percentage point decline in headline/core inflation; and one percentage point increase in the measure of economic slack is associated with about 0.2 percentage point increase in inflation under the baseline specification.

9. With respect to the external variables, the external price pressure measure is not statistically significant in most regression specifications. The variable is only significant in core regressions with country and time fixed effects. Commodity prices, however, are an important determinant of inflation, given the positive and statistically significant sign on the energy price and food price coefficients.

[4] R-squared increases marginally upon inclusion of time fixed effects to 0.73 and 0.71 for headline and core OLS regressions, respectively.

[5] Pseudo R-squared increases marginally to 0.45 and 0.38 for headline and core median regressions when time-fixed effects are included.

Annex I. Table 2. The Netherlands: Phillips Curve Panel Estimation with Country Fixed Effects

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Full sample									
		Headline inflation					Core inflation				
	Expected sign	Constrained regressions			OLS	Median regression	Constrained regressions			OLS	Median regression
Lag of inflation	(+)	0.650***	0.649***	0.636***	0.651***	0.553***	0.676***	0.629***	0.575***	0.683***	0.658***
		(0.0456)	(0.0613)	(0.0745)	(0.0271)	(0.0237)	(0.0495)	(0.0534)	(0.0609)	(0.0309)	(0.0346)
Inflation expectations: 3 years ahead	(+)	0.350***	0.351***	0.364***	0.151	0.603***	0.324***	0.371***	0.425***	0.0886	0.183
		(0.0456)	(0.0613)	(0.0745)	(0.186)	(0.120)	(0.0495)	(0.0534)	(0.0609)	(0.170)	(0.123)
Unemployment gap	(–)	-0.163**			-0.176***	-0.152***	-0.166***			-0.179***	-0.154***
		(0.0738)			(0.0560)	(0.0399)	(0.0632)			(0.0530)	(0.0400)
Output gap	(+)		0.111***					0.0879***			
			(0.0319)					(0.0245)			
Measure of economic slack				0.190***					0.183***		
				(0.0665)					(0.0483)		
Food price $_{t}$	(+)	0.0665***	0.0632***	0.0578**	0.0684***	0.0425***	0.0107	0.0244	0.0358**	0.0128	0.0170
		(0.0223)	(0.0221)	(0.0228)	(0.0120)	(0.0133)	(0.0173)	(0.0170)	(0.0174)	(0.0162)	(0.0133)
Food price $_{t-1}$	(+)	0.0580*	0.0538*	0.0535*	0.0586	0.0145	0.0734***	0.0755***	0.0723***	0.0741***	0.0546***
		(0.0338)	(0.0319)	(0.0317)	(0.0397)	(0.0124)	(0.0182)	(0.0182)	(0.0178)	(0.0159)	(0.0125)
Food price $_{t-2}$	(+)	0.0445*	0.0395	0.0335	0.0463*	0.0572***	0.0396**	0.0314*	0.0251	0.0413***	0.0343***
		(0.0257)	(0.0256)	(0.0259)	(0.0245)	(0.0107)	(0.0178)	(0.0177)	(0.0174)	(0.0154)	(0.0117)
Food price $_{t-3}$	(+)	0.00122	-0.00470	-0.000168	0.00219	0.0140	0.0217	0.0262*	0.0341**	0.0228*	0.00985
		(0.0205)	(0.0214)	(0.0227)	(0.0124)	(0.0111)	(0.0142)	(0.0143)	(0.0146)	(0.0125)	(0.0101)
Food price $_{t-4}$	(+)	0.124***	0.122***	0.116***	0.125***	0.0521***	0.0766***	0.0820***	0.0779***	0.0780***	0.0596***
		(0.0251)	(0.0235)	(0.0232)	(0.0210)	(0.0108)	(0.0150)	(0.0150)	(0.0150)	(0.0120)	(0.0110)
Energy price	(+)	0.140***	0.136***	0.148***	0.137***	0.137***	0.0291***	0.0194**	0.0203**	0.0263***	0.0245***
		(0.0134)	(0.0134)	(0.0138)	(0.0102)	(0.00702)	(0.00947)	(0.00952)	(0.00971)	(0.00735)	(0.00788)
External price pressure $_{t-1}$	(+)	-0.000607	-0.00141	-0.000876	-0.000717	-0.00216	0.000513	-0.00160	-0.00191	0.000393	-0.00106
		(0.00314)	(0.00300)	(0.00304)	(0.00358)	(0.00148)	(0.00197)	(0.00189)	(0.00197)	(0.00148)	(0.00150)
Observations		1,218	1,208	1,183	1,218	1,218	1,218	1,208	1,183	1,218	1,218
Number of countries		17	17	17	17	17	17	17	17	17	17

Source: IMF staff estimates and calculations.

Note: Robust standard errors reported in parentheses. All regressions include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Annex I Table 3. The Netherlands: Phillips Curve Panel Estimation with Country and Time Fixed Effects

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Full sample									
		Headline inflation					Core inflation				
	Expected sign	Constrained regressions			OLS	Median regression	Constrained regressions			OLS	Median regression
Lag of inflation	(+)	0.373***	0.398***	0.409***	0.371***	0.349***	0.474***	0.486***	0.463***	0.474***	0.447***
		(0.0444)	(0.0519)	(0.0584)	(0.0478)	(0.0326)	(0.0509)	(0.0519)	(0.0561)	(0.0497)	(0.0252)
Inflation expectations: 3 years ahead	(+)	0.627***	0.602***	0.591***	0.800***	0.832***	0.526***	0.514***	0.537***	0.550***	0.507***
		(0.0444)	(0.0519)	(0.0584)	(0.167)	(0.141)	(0.0509)	(0.0519)	(0.0561)	(0.185)	(0.108)
Unemployment gap	(–)	-0.360***			-0.349***	-0.294***	-0.289***			-0.288***	-0.196***
		(0.0733)			(0.0733)	(0.0454)	(0.0634)			(0.0669)	(0.0357)
Output gap	(+)		0.121***					0.0896***			
			(0.0358)					(0.0307)			
Measure of economic slack				0.278***					0.231***		
				(0.0765)					(0.0641)		
Food price $_{t}$	(+)	0.0739***	0.0542**	0.0194	0.0739***	0.0785***	0.00873	0.0104	0.00935	0.00874	0.00899
		(0.0234)	(0.0234)	(0.0262)	(0.0138)	(0.0170)	(0.0176)	(0.0172)	(0.0187)	(0.0187)	(0.0118)
Food price $_{t-1}$	(+)	0.101**	0.0904**	0.0701**	0.101**	0.0469***	0.0692***	0.0708***	0.0641***	0.0690***	0.0512***
		(0.0403)	(0.0372)	(0.0341)	(0.0409)	(0.0163)	(0.0200)	(0.0196)	(0.0194)	(0.0180)	(0.0120)
Food price $_{t-2}$	(+)	0.128***	0.125***	0.122***	0.128***	0.0998***	0.0606***	0.0568**	0.0555**	0.0606**	0.0294**
		(0.0276)	(0.0283)	(0.0279)	(0.0325)	(0.0173)	(0.0218)	(0.0224)	(0.0220)	(0.0259)	(0.0131)
Food price $_{t-3}$	(+)	0.0790***	0.0632**	0.0433*	0.0779***	0.0537***	0.0498***	0.0488***	0.0474**	0.0496***	0.0429***
		(0.0253)	(0.0251)	(0.0252)	(0.0173)	(0.0163)	(0.0184)	(0.0185)	(0.0189)	(0.0172)	(0.0125)
Food price $_{t-4}$	(+)	0.124***	0.118***	0.0953***	0.123***	0.0541***	0.0631***	0.0681***	0.0604***	0.0630***	0.0323***
		(0.0277)	(0.0255)	(0.0232)	(0.0275)	(0.0147)	(0.0172)	(0.0171)	(0.0173)	(0.0175)	(0.0107)
Energy price	(+)	0.140***	0.132***	0.153***	0.141***	0.136***	0.0300***	0.0195*	0.0247**	0.0301***	0.0206***
		(0.0144)	(0.0146)	(0.0148)	(0.0109)	(0.00985)	(0.0104)	(0.0108)	(0.0108)	(0.00821)	(0.00596)
External price pressure $_{t-1}$	(+)	-0.00519	-0.00585*	-0.00422	-0.00522	-0.00192	-0.00408**	-0.00513***	-0.00439**	-0.00409***	-0.00277**
		(0.00318)	(0.00311)	(0.00305)	(0.00365)	(0.00159)	(0.00182)	(0.00187)	(0.00193)	(0.00146)	(0.00120)
Observations		1,218	1,208	1,183	1,218	1,218	1,218	1,208	1,183	1,218	1,218
Number of countries		17	17	17	17	17	17	17	17	17	17

Source: IMF staff estimates and calculations.

Note: Robust standard errors reported in parentheses. All regressions include country and time fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Contribution to Inflation Dynamics

10. Country-specific coefficients are used to calculate contributions to inflation dynamics from each regression in every quarter using dynamic simulations to account for the persistence of inflation. Specifically, $C_{i,t}^{x}$, which is the contribution of each explanatory variable x to inflation dynamics in country i at time t is calculated using the following formula:

$$C_{i,t}^{x} = \widehat{\beta_t^x} x_{i,t} + \widehat{\beta_1}\, C_{i,t-1}^{x},$$

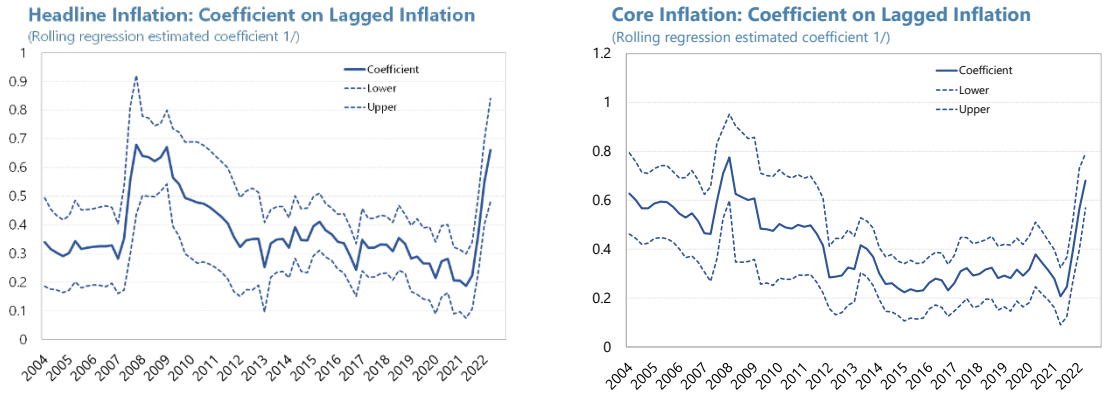
Where $\widehat{\beta_t^x}$ is the corresponding coefficient on variable x obtained from country-specific Phillips curve regressions; $\widehat{\beta_1}$ is the coefficient on lagged inflation.

Stability of the Phillips Curve Estimates

11. To examine possible structural shifts and change in estimated coefficients over time, the panel-data Phillips curve is estimated on a rolling basis, using the panel data for 17 economies over 16 quarters. Estimated coefficients with their corresponding 90th percentile confidence intervals are included in Annex Figure 1.

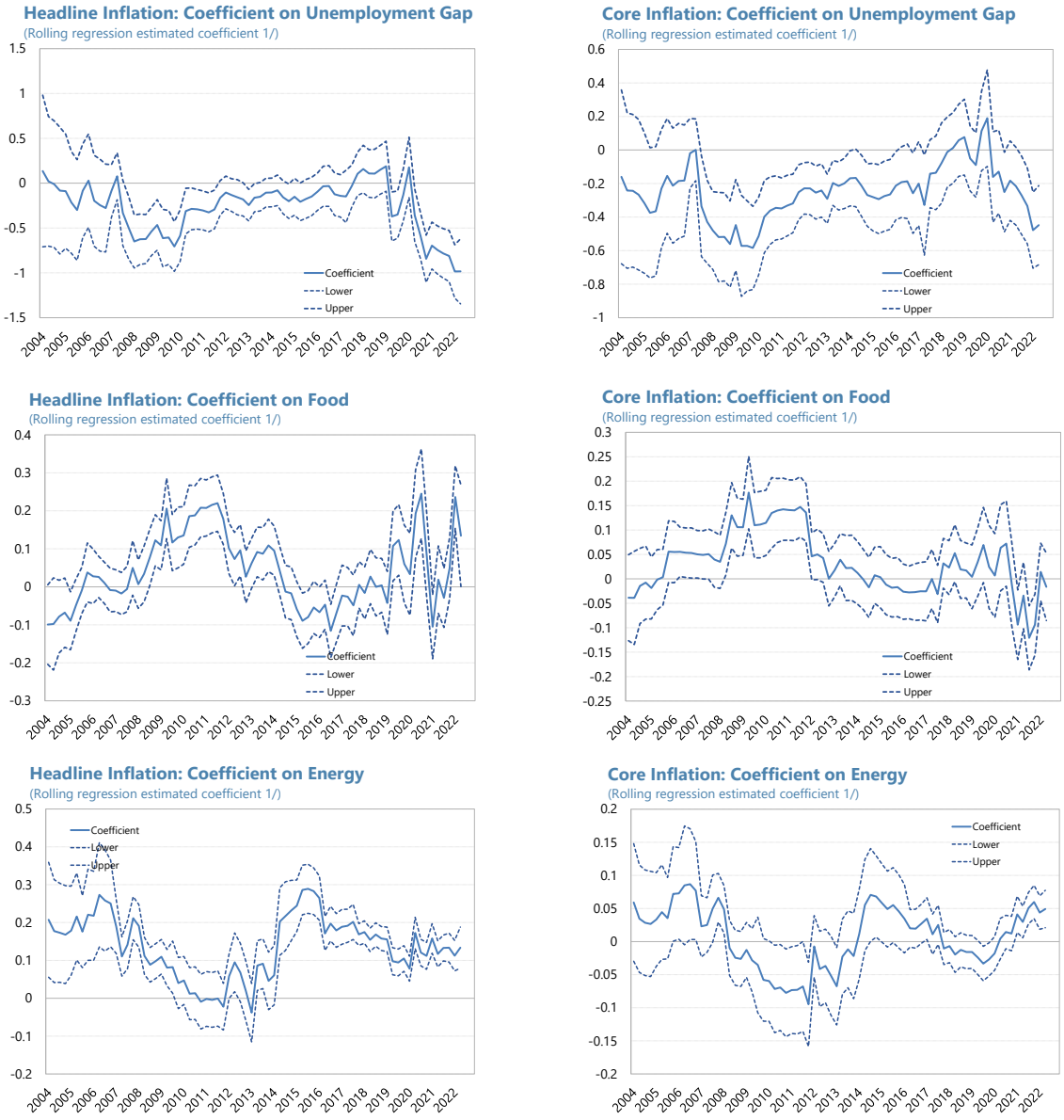
12. Estimates of the rolling regressions indicate changes in the Phillips curve coefficients in recent periods. First, the estimated coefficient on the lagged headline (core) inflation has significantly increased in the last 3 rolling window periods, suggesting that inflation has become more backward-looking. The pass-through of the energy prices has increased substantially to core inflation. The coefficient on the unemployment gap suggests that the Phillips curve has become steeper over the last few years. Given few data points that underlie the change in estimated coefficients, it is premature to suggest any long-lasting changes in the structural relationships. However, greater pass-through of commodity prices into core inflation increases susceptibility to negative supply shocks, while the larger effect of the past inflation on the current inflation suggests potential difficulties in reducing inflation going forward.

Annex I. Figure 1. Phillips Curve Rolling Regression Results



1/ Solid lines indicate rolling regression coefficients of the headline (left) or core (right) regressions. Dashed lines show their 10th –90th percentile confidence intervals. Estimates are based on the baseline constrained regressions with country fixed effects and cover a rolling window of 16 quarters ending in the quarter indicated on the x axis

Annex I. Figure 1. Phillips Curve Rolling Regression Results (Concluded)



Sources: IMF staff estimates and calculations.

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1/ Solid lines indicate rolling regression coefficients of the headline (left) or core (right) regressions. Dashed lines show their 10th –90th percentile confidence intervals. Estimates are based on the baseline constrained regressions with country fixed effects and cover a rolling window of 16 quarters ending in the quarter indicated on the x axis.

ASSESSING RECENT CLIMATE POLICY INITIATIVES IN THE NETHERLANDS[1]

A. Introduction

1. Climate change is an important consideration in Dutch national policies. The Netherlands committed to EU targets of 55 percent emission reduction in 2030 relative to 1990 levels and climate neutrality in 2050. The recent energy price surges added urgency to transitioning away from fossil fuels. At the same time, the country is vulnerable to sea-level rise (SLR) and flood risks, as about one-quarter of the country is below sea level and a large part of the lowlands are in a delta. The impacts of higher temperature and changes on the frequency of extreme events appear to be modest for the Netherlands by mid-century, but highly uncertain depending on warming scenarios, which in turn depend on global mitigation actions.

2. The Netherlands is pursuing strong policies on emission mitigation and on climate change adaptation. The government's mitigation actions include a comprehensive set of measures and investments that are effective and designed with acceptability in mind. The government has also introduced a variety of measures to assist households for sharply higher energy prices. And thanks to a centuries-long tradition of effective coastal and flood management, the country is uniquely prepared to deal with SLR. The climate adaptation strategy is well-developed, reflecting strong institutional capacity, financial resources, and knowledge support.

3. The paper is organized as follows. Section II reviews recent policy initiatives in climate mitigation in the Netherlands and suggests some modifications to existing policies that might be considered. It covers carbon levies for the industry and power sectors, energy and car tax reforms, and air passenger tax. Section III provides assessments of hazards and macroeconomic risks from weather shocks and climate change in the Netherlands. The adaptation plan is reviewed and assessed against key principles on how to mainstream climate change into macro-fiscal planning recently developed at the IMF. The section further analyses sea-level rise risks and costs of protection, using the global model of the Coastal Impacts and Adaptation Model (CIAM). A final section summarizes policy recommendations.

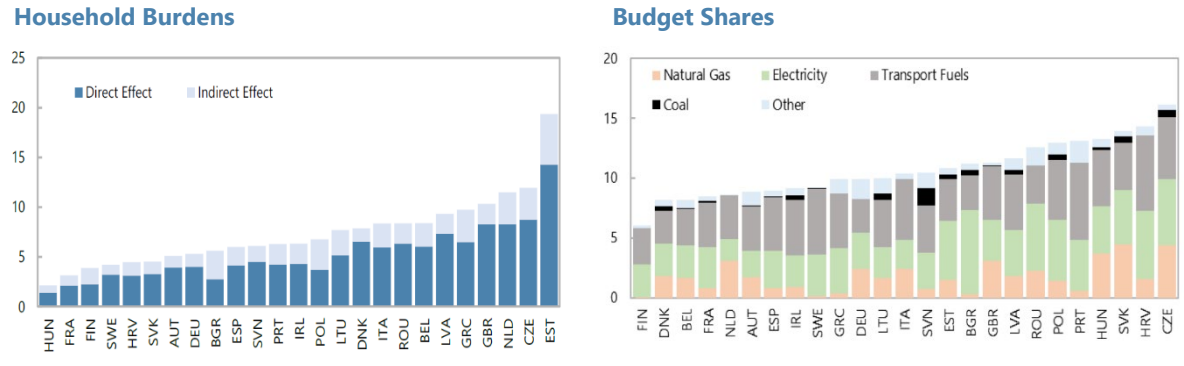
B. Mitigation

4. An immediate priority for the Netherlands authorities is to provide robust assistance to help households with higher energy bills. According to the International Energy Agency (IEA), consumer prices for electricity and natural gas more than tripled between January 2020 and November 2022, though pump prices for gasoline only increased about 5 percent. These price shocks imposed a burden on the average Dutch household of 12 percent of their consumption,

[1] Prepared by Chen Chen, Geoffroy Dolphin, Koralai Kirabaeva, Emanuele Massetti, Danielle Minnett, Ian Parry, Tjeerd Tim, and Sylke von Thadden-Kostopoulos.

higher than in most other countries reflecting relatively high household budget shares for natural gas in the Netherlands—see Figure 1.

Figure 1. Household Burden from Price Shocks and Budget Shares for Energy, Selected European Countries, 2022
(Average in percent of total consumption)



Source: Ari and others (2022)
Notes: Direct and indirect burdens in panel (a) are from higher prices for energy products and other (general) consumption goods respectively. Burdens are assessed by comparing actual prices in mid-2022 with price projections for mid-2022 as of early 2021.

5. The Dutch government has introduced a variety of measures to assist households for sharply higher energy prices. These include:

- *Reduced taxes on selected energy products*: the VAT rate on natural gas, electricity and heat from district heating was temporarily lowered to 9 percent (from 21 percent) effective July 1, 2022; the excise duty rate on gasoline and diesel was reduced by 17.3 and 11.1 cents/liter,[2] respectively, bringing respective rates to 65.1 and 41.8 cents/liter. The reductions in excise duty are applicable from April 1, 2022.

- *A cap on electricity and natural gas prices for households and other low-volume users*: at the level of January 2022, starting on January 1, 2023. For gas the maximum rate will be €1.45 per cubic meter (m^3) up to a consumption of 1,200 m^3. For electricity the maximum rate will be lowered to €0.40 per kilowatt hour (kWh) up to consumption of 2,900 kWh. For usage that exceeds these thresholds, the rates for low-volume users remain as is stated in their energy contract.

- *One-off financial support measures:* A one-off (lump-sum) energy allowance of €1,300 for lower-income households (in 2022 and 2023) and €190/month rebate on energy (natural gas for heating and electricity) bills for small-scale consumers in November and December 2022. It was also decided that the energy tax refund (per electricity grid connection) would increase from €560 to €785.

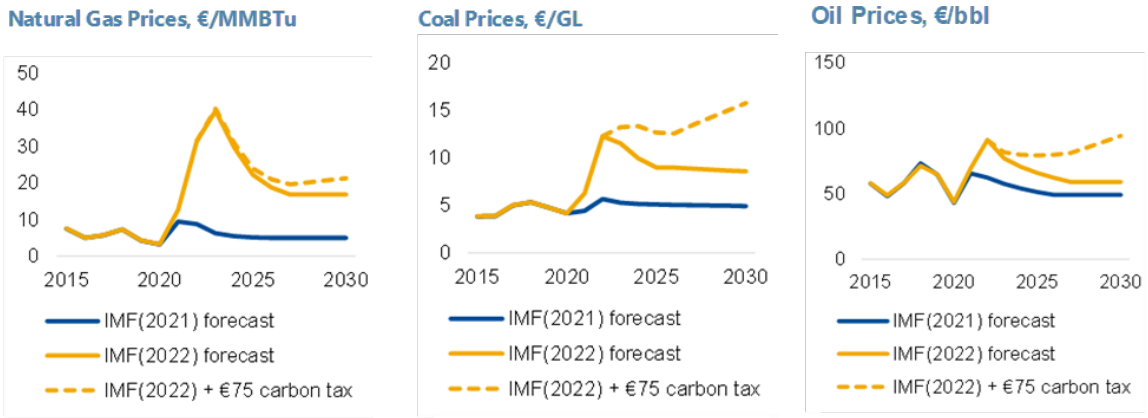
Ideally household assistance should be targeted (to limit fiscal costs) and unrelated to energy consumption (to preserve incentives for energy conservation). In this regard, the Dutch government

[2] All monetary figures below are in €.

might consider continuing to emphasize the temporary nature of the cap on electricity and natural gas prices.

6. The energy price surge has also strengthened the case for accelerating the transition away from fossil fuels—both to address the climate crisis and reduce dependence on insecure energy sources. Higher energy prices have caused only a modest reduction in global CO_2 emissions, as there has been a sharp increase in the price of gas relative to coal (causing some switching from the former to the latter, for example, in Germany), and investors expect much of the surge to be reversed as markets adjust.[3] Indeed, opposition to higher carbon prices, energy tax reform, and other mitigation measures could decline in the future as energy prices recede from peak levels—even an additional €75 per tonne increase in carbon prices on top of predicted international energy prices for 2030 would still result in international natural gas prices that are 30 percent lower than recently experienced levels. See Figure 2.

Figure 2. Trends in International Fuel Prices



Source: Black and others (2022).
Notes: Prices in real 2021€, deflated by respective IMF projections. Carbon tax starting at €10 in 2022 and rising to €75 in 2030 is assumed on top of IMF (2022b) baseline assuming elastic supply (this assumption is likely reasonable for coal and gas, although possibly less so for oil). Natural gas prices are a weighted average of natural gas in Europe, North America (Henry Hub), and LNG market (Japan). Coal prices are a weighted average of domestic sectoral coal prices in China, India, and the United States. Oil prices are an average of Brent, Dubai Fateh, and West Texas Intermediate. The carbon tax is assumed to be fully passed forward into demand prices. Figure uses USD to euro exchange rate from 11/9/2022 where 1USD=1Euro; bbl=billion barrels; GJ= gigajoule; MMBTu = Million British Thermal Units.

7. At the EU level, the key climate goal under the Fit for 55 Plan is to reduce EU greenhouse gas (GHG) emissions 55 percent below 1990 levels by 2030.[4] The EU has also pledged to achieve net zero GHGs by 2050. The centerpiece of EU-level mitigation policy is the Emissions Trading System (ETS) which specifies a trajectory of progressively tightening emissions caps for GHG emissions, primarily from power generation and industry, aligned with reducing combined emissions from these sectors 61 percent by 2030 below 2005 levels. For the non-ETS

[3] Black and others (2022).

[4] See https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/.

sector, primarily buildings, transport, and agriculture, Netherlands has been assigned a target of reducing emissions 48 percent below 2005 by 2030.[5]

8. A separate emissions trading system (ETS II) is being developed at the EU level for specific sectors. The new system—expected to start in 2027—will apply to distributors that supply fuels to the buildings, road transport, and certain other sectors that have been difficult to decarbonize so far. To smoothen the entry into force, the total amount of allowances auctioned in the first year will increase by 30 percent while a stabilization mechanism would automatically release additional allowances if the price per allowance exceeds €45 per tonne of CO_2 over a certain period to avoid excessive price increases.

Box 1. Supporting Public Investments in Clean Technology Infrastructure

There are two sources of public investments for clean energy infrastructure in the Netherlands over the next few years. First, the national climate and transition fund, which will mobilize €35 billion over the next ten years to help upgrade the energy infrastructure and make mobility and the built environment more sustainable.

Second, the Dutch Recovery and Resilience Plan allocates €846.9 million in funding for the following four climate-related investment programs—see Table 1 for the funding amounts.

Wind at Sea. This program seeks to double wind energy in the North Sea to 21 gigawatts by 2030. The financing is for integration costs (e.g., guaranteeing shipping safety, enhancing nature and protecting species, making the fishing sector more sustainable) rather than construction of wind farms themselves.

Green hydrogen. This program, which runs to 2028, provides funding for demonstration projects testing the feasibility of large-scale electrolysis, an R&D program to further develop hydrogen technology, and to ensure an adequate supply of relevant trained personnel.

The Zero Emission Services. This project provides funds for batteries, 45 fully electric inland vessels, and charging stations (with green electricity) to help kick start the market for fully electric inland shipping and the associated technologies and infrastructure.

Aviation in Transition. This multi-year program promotes the decarbonization of the aviation sector by 2050. The focus is on breakthrough technologies for ultra-efficient aircraft development and the associated long-term research and accompanying activities.

[5] Annex to the Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2018/842 on binding annual GHGs reductions by Member States from 2021 to 2030. The target presented in this proposal is not final and may change before final legislation is passed.

Table 1. The Netherlands: Climate-Related Investments in the Dutch Recovery and Resilience Plan

Investment program	Investment amount (€ million)
Wind at Sea	693.7
Green Hydrogen	68.5
Zero Emission Services	56
Aviation in Transition	28.7
Total	846.9

Source: MOF (2022).

9. At the national level, the Netherlands has implemented, and recently strengthened, a comprehensive set of national policies to complement EU level policy. Recent tax initiatives include revisions to the carbon dioxide (CO_2) levy for industry, an energy tax reform, a CO_2 price floor for power generation, a car tax reform, and an increase in the air passenger departure tax—most of these measures are outlined in the *Dutch Recovery and Resilience Plan*.[6] Other measures in the Plan include complementary public investments in clean technology infrastructure—see Box 1—and stronger regulatory and reporting requirements.[7] In addition, the stimulation of sustainable energy production scheme (SDE+) was expanded into SDE++, which now provides funding for renewable electricity, renewable heat, renewable gas, low-carbon heat and low-CO_2 production for entities in power generation, industry, transport and agriculture.[8]

10. This section describes and evaluates the recent tax measures. A 2022 IMF paper[9] provides a more extensive discussion of mitigation strategy in the Netherlands and fiscal policy options for enhancing the effectiveness of the strategy at the national and sectoral level.

CO_2 Industry Levy

11. In January 2021, Netherlands introduced a levy or target price on industrial CO_2 emissions. This scheme involves a charge equal to any positive difference between an escalating

[6] MOF (2022).

[7] The Energy Act aims to provide a modernized and updated regulatory and legal framework for gas and electricity.

[8] See OECD (2021), Netherlands Enterprise Agency (2020). Under the scheme, firms submit bids for subsidies based on the difference in costs between a CO_2-reducing technology and benchmark technology, net of savings in purchases of allowances under the EU ETS.

[9] Nicoletta Batini, Simon Black, Oana Luca, and Ian Parry, 2021, "A Comprehensive Greenhouse Gas Mitigation Strategy for The Netherlands." Working paper, IMF.

target price—the levy rate—and the prevailing EU ETS price. The levy applies to large industrial companies that also fall under the EU ETS as well as waste incineration plants and companies that emit large quantities of nitrous oxide. As an incentive to cut the emissions intensity of production, while avoiding significant reductions in production levels, the levy does not apply to all firm emissions but rather emissions over and above their "dispensation rights", where the latter are calculated as:

production × CO_2 related to this production based on EU ETS benchmarks × reduction factor

The EU ETS benchmark refers to the emission rate from the cleanest ten percent of firms in the industry at the EU-level and the reduction factor is set at 1.2 for 2021, declining to 0.69 by 2030. By itself, if binding, the scheme cost-effectively promotes reductions in the emissions intensity of production for firms with emissions exceeding their dispensation rights.

12. Initially the levy rate started at €30 per excess tonne of CO_2 emitted in 2021 and was set to rise in a straight line to €125 per excess tonne in 2030.[10] This rate schedule was aligned with an emission reduction target of 14.3 million tonnes in 2030 compared with business as usual (BAU) emissions projections for 2030 by the Netherlands Environmental Assessment Agency (PBL).[11] If, for example, the EU ETS price were €75 per tonne in 2030, the levy would impose a charge of €50 per excess tonne for ETS installations and €125 per tonne for the covered non-ETS installations. The reduction target has however been increased to 18.3 million tonnes and, accordingly, the rate schedule will be re-assessed in 2023 and 2025—PBL monitors, through the Climate and Energy Outlook, whether emissions are on track to meet the 2030 target.[12] Indeed, based on recent EU ETS price projections the CO_2 industry levy may not be binding under the current price schedule.[13]

13. The levy strikes a compromise between efficiency and competitiveness/leakage concerns… A pure tax on all industry emissions would be more efficient in the sense that it would induce a larger reduction in domestic production levels as charges on all (rather than a portion of) remaining emissions are reflected in higher production costs. This would imply a larger loss in competitiveness for domestic firms (as foreign producers are not subject to the same charge on their emissions) and greater risk of emissions leakage.[14] In quantitative terms however the differences between a pure tax and a levy are not large—for example, a €50 tax (on top of the prevailing EU ETS price) in 2030 would increase production costs for selected Dutch industries by 2 percent or less—see Figure 3 (though this general picture masks significant differences at finer levels of industry disaggregation) and is more practical administratively than other options. A carbon

[10] See https://carbonmarketwatch.org/2020/12/21/what-can-we-learn-from-the-dutch-national-carbon-tax.

[11] PBL (2019).

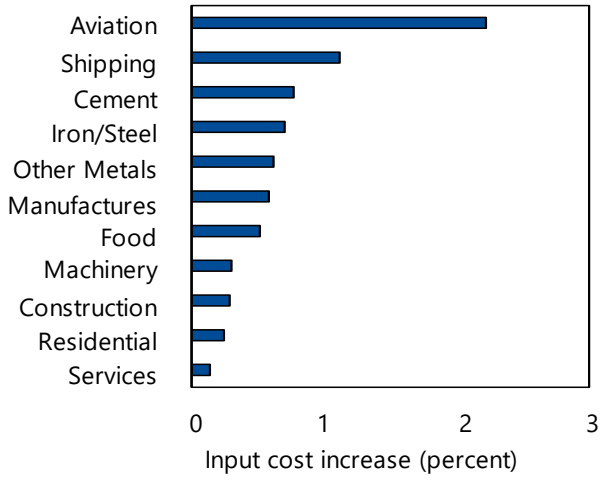
[12] Dispensation rights for 2023 have been reduced to align with the new target. However, no adjustment to the rate has yet been made. The government of the Netherlands is planning to decide on an additional climate policy package this spring. An increase of the rate could be a part of this package.

[13] Pietzcker and others (2021) projected an EU ETS emissions price of €129 per tonne in 2030.

[14] See www.pbl.nl/publicaties/economische-effecten-van-co2-beprijzing-varianten-vergeleken for modelling results on leakage and Parry and others (2021a) on policies to address it.

tax could be combined with output-based subsidies for industrial firms, but these approaches are more administratively complex than the Dutch levy

Figure 3. Impact of €50 Pure Carbon Charge on Production Costs for Selected Industries in the Netherlands, 2030



Source: IMF staff.

14. A modest reform to the levy—converting it into a feebate—could provide more robust incentives for relatively clean firms. Currently, if a company emits less CO_2 than allowed based on its dispensation rights, the unused dispensation rights can be carried back to the previous five years or sold to other firms subject to the levy, but this leaves incentives uncertain. A modification of the levy is a feebate under which firms would pay a fee given by:

$$CO_2 \text{ price} \times \{CO_2/\text{production} - \text{pivot point } CO_2/\text{production}\} \times \text{production}$$

The CO_2 price could be the same as currently envisioned for the levy, but the base of the feebate would reflect the difference between a firm's emission rate and a 'pivot point' emission rate—firms with emission rates above the pivot point would therefore pay taxes, while those with emission rate below the pivot point would receive subsidies. In the latter regard, the scheme would generalize the subsidies provided by SDE++ by directly linking them to the observed emission rates of firms. If the pivot point is set equal to the average emission rate for the domestic industry in the previous year, and updated annually, the feebate would be (approximately) revenue neutral over time.[15] The feebate is slightly more effective and efficient than the levy, as all firms face the same ongoing and

[15] In sectors dominated by one or a few firms (for example, steel), if an above-average polluter tries to decrease its emissions, the benchmark emissions also drop, which may erode incentives to reduce emissions (that is, such a firm would likely internalize its own impact on the benchmark). In these cases, the pivot point emission rate could be set exogenously and made progressively more stringent over time.

certain reward for cutting emissions by an extra tonne, regardless of whether they are currently paying fees or receiving subsidies.

Energy Tax Reform

15. This reform includes a shift in taxation away from electricity consumption (and onto natural gas) and a termination of the renewable energy tax (*Opslag Duurzame Energie, ODE)*. The tax rate on natural gas increased by 4 cents per cubic meter (m^3) in 2020 and the rate in the 1st bracket of gas was supposed to increase by a further 5.23 cents per m^3 a year during 2023–2028. The rate for the 1st bracket for electricity is supposed to be reduced by 5.23 cents per kilowatt hour (kWh) during 2023-2028—. These planned reductions would benefit households—especially low-income households—more than businesses. In parallel, it was decided to repeal the ODE, whose revenue was used to finance SDE+ (now SDE++). SDE++ will now be funded with revenues raised through general taxation and energy taxes.

16. Changes to the tax rate for natural gas and electricity implemented in 2022 and 2023 (see Table 2) follow the principle set out in the energy tax reform but further adjustments would be needed to achieve the initially intended shift.[16] The rate changes differ from those initially announced in the reform. In particular, (due to the energy price shock) the tax rate on natural gas is not increasing as much as planned. A review is scheduled for 2023 to examine whether the proposed increase in natural gas tax is still necessary for mitigation objectives, in view of market developments.[17]

17. The reform seeks to reinforce demand shifting away from gas to electricity, thereby lowering domestic CO_2 emissions. Natural gas combustion generates 0.055 tonnes of CO_2 emissions per gigajoule (GJ) of energy while at present power generation in the Netherlands produces 0.09 tonnes of CO_2 per GJ. The latter, however, will decline progressively with decarbonization of the power sector and, more importantly, additional generation capacity to meet higher demand will likely come from renewable sources (rather than the current mix of renewable and fossil sources).[18] Raising the relative price of natural gas will reinforce behavioral responses like adoption of electric space heating and conservation (e.g., turning down the heating).

[16] This section focuses on the reform of energy taxation. However, subsidies to fossil fuel consumption are equally important to assess a country's fiscal measures on fossil energy. For a discussion of such subsidies in the case of the Netherlands, see OECD/IEA (2020).

[17] The reform also broadens the base of energy taxes by removing favorable rates for glasshouse horticulture, the energy tax exemption for mineralogical and metallurgical processes, and limits the input exemption for combined heat pumps.

[18] Even if extra power generation in the Netherlands caused more CO_2 emissions, at the EU level (if the Market Stability Reserve is not operating) there would be no change in emissions from the power and industry sector which are fixed by the EU emissions cap.

Table 2. The Netherlands: Tax Rates on Natural Gas and Electricity by Consumption Bracket

Natural Gas, €/m^3

Consumption Bracket, m^3				
Year	**0 – 170,000**	**170,001-1 million**	**1 – 10 million**	**> 10 million**
2021	0.349	0.065	0.024	0.013
2022	0.363	0.066	0.024	0.013
2023	0.49	0.096	0.051	0.04

Electricity, €/kWh

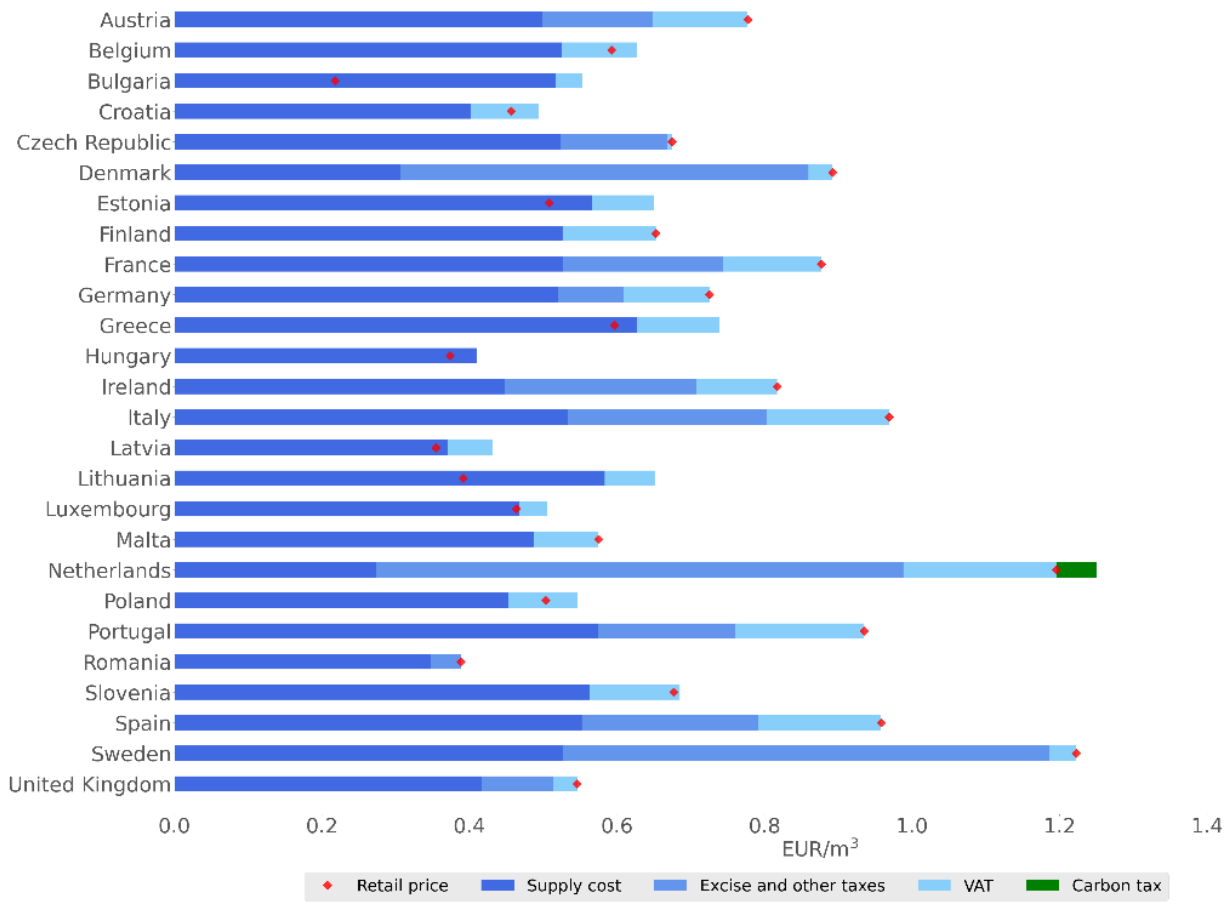
Consumption Bracket, kWh					
Year	**0-10,000**	**10,001 – 50,000**	**50,001 – 10 million**	**> 10 million (household)**	**> 10 million (business)**
2021	0.094	0.052	0.014	0.001	0.0006
2022	0.037	0.044	0.012	0.001	0.0006
2023	0.013	0.1	0.039	0.002	0.001

Sources: Tax Administration Netherlands and Budget proposal 2023. [1/]
Notes: Tax rates exclude VAT.
[1/] Tabellen tarieven milieubelastingen (belastingdienst.nl)

18. Building a charge on CO_2 emissions—aligned with prevailing CO_2 prices for power and industry—could promote cost-effective emissions reductions across the building and ETS sectors, depending on prices that might emerge in the planned introduction of an EU-level ETS for the transport and building sectors. The retail (i.e., including taxes) natural gas price for residential use in the Netherlands is already among the highest in Europe. The introduction of a charge on CO_2 emissions on natural gas for residential use (e.g., €25/tCO_2) would further increase the retail price, but only moderately (to approximately €1.27/m3).[19] See Figure 4.

[19] A €25/tCO_2 tax is the current price in the German emissions trading system for heating and road transport fuels in force since January 2021. A full alignment with carbon prices prevailing in EU ETS sectors would raise the retail price further.

Figure 4. Impact of a €25/tCO$_2$ Carbon Tax on Residential Natural Gas Prices in the Netherlands



Source: IMF staff.

CO$_2$ Price Floor

19. The Netherlands has also implemented a price floor on CO$_2$ emissions from power generation, but applying to all emissions, and with much lower rates than for industry. The floor price came into effect on April 5, 2022, following final passage of a legislative proposal initially introduced in June 2019. As with the CO$_2$ industry levy, it imposes a charge equal to the difference between a target rate and the price of EU ETS allowances. Unlike the CO$_2$ industry however: (i) there is no exemption analogous to dispensation rights (i.e., the levy applies to all emissions); and (ii) at present it has a much lower set of target prices. Indeed, the target rate is €14.9 per tonne in 2022 and, while it is set to rise to €31.9 in 2030, these targets are far from binding.

20. Converting the scheme into a feebate, and harmonizing it with the industry levy, would increase effectiveness and efficiency, while avoiding a significant increase in electricity prices. If the current power sector price floor were binding it would impose a first-order charge on

generators equal to the emissions price times their remaining emissions—at the industry level these charges would be largely passed forward in higher electricity prices.[20] In turn, this would work against the goal of the energy tax reform to induce switching from gas to electricity. Converting the power sector price floor into a feebate—applying fees to electricity producers with above average emission rates and rebates for generators with below average emission rates—would avoid the pass through of first order charges into electricity prices. The feebate cost-effectively promotes the same responses for fuel switching in power generation as carbon pricing but it does not promote the same reduction in electricity demand. Harmonizing emissions prices across the power and industry sector would then strike the cost-effective balance between emissions reductions across both sectors.[21] That is, both feebates would bind at the same time, and only when the EU ETS price is below the current target level for industry.

Car Tax Reform

21. The Netherlands plans to transition to a nationwide system of taxing driving in passenger cars and delivery vans in proportion to vehicle kilometers (km) driven, thereby providing a more robust source of revenue. The tax system will replace revenues from vehicle and fuel taxes, which are declining with greater penetration of electric vehicles (EVs) into the new, and on road, vehicle fleets.[22] Developments in metering technologies such as global positioning systems imply that people's driving could be tracked and billed accordingly. Exemptions from vehicle purchase taxes for internal combustion engine commercial vans will also be phased out from 2024-2026, while the exemption for electric delivery vans (which has an environmental justification) will continue.

22. Maintaining current fuel/vehicle tax revenue as a percent of GDP requires a projected charge of 4.5 cents per vehicle km in 2030. Projected revenues are only slightly sensitive to alternative assumptions about the price responsiveness of vehicle km travelled. See Figure 5.

23. Ultimately, the reform could also effectively address the remaining external costs of driving. As internal combustion engine vehicles are progressively retired from the vehicle fleet this will reduce, and eventually eliminate, externalities associated with fuel combustion—CO_2 emissions and local air pollution. In the interim, the km-based tax is projected to reduce CO_2 emissions by 2.5 million tonnes in 2030.[23] Important externalities will remain however, including traffic congestion—which is severe in many European countries—accidents, and (for trucks) road damage, all of which vary with km driven for all vehicles (including EVs). In European countries (see Figure 6), current gasoline and diesel prices largely fall short of efficient fuel prices—that is the prices needed to cover supply costs, environmental costs, and (where fuels are consumed at the household level)

[20] For example, Bushnell and others (2013), Sijm and others (2006).

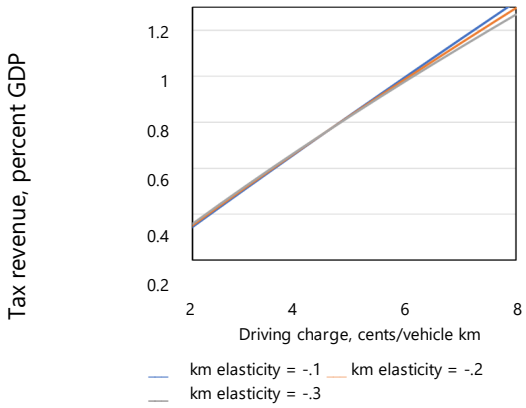
[21] See Batini and others (2021) for further discussion of these types of feebates.

[22] The tax will be non-discriminatory in the sense that it applies to both cross-border and domestic driving.

[23] MOF (2022).

general consumer taxes—aside from countries where traffic congestion externalities are more moderate.

Figure 5. Projected Revenue from Km-Based Taxation, 2030



Sources: IMF Staff calculations
Notes: Km elasticity refers to the fuel price elasticity conditional on a fixed level of fuel economy.

24. A charge averaging upwards of 8 cents per km is warranted by congestion, though it should vary according to where driving occurs and time of day.[24] The efficient charge on a road class is the marginal external congestion cost (MECC), that is, the added cost to other road users from the extra congestion caused by an additional vehicle km driven.[25] At the nationwide level, the MECC for Netherlands has recently been estimated at around 8–16 cents per vehicle km,[26] though MECCs are highly sensitive to region and time of day. The government decided against nationwide congestion pricing for now due to public opposition. But the policy may gain traction over time, for example if local pricing schemes emerge, people gain familiarity with km-based taxes, and successful experiences elsewhere (e.g., London, Milan).

25. In principle, accident externalities could be effectively reduced by varying km-based charges according to driver and vehicle characteristics… Some accident costs are internal to drivers (e.g., own-driver injury risks in single vehicle collisions) but other costs are external (e.g., injuries to pedestrians/cyclists, injury risk to others in multi-vehicle collisions, insurance and medical costs borne by third parties).[27] Accident risks vary with both driver and vehicle characteristics (e.g., heavier vehicles pose greater injury risks to occupants of lighter vehicles in multi-vehicle collisions).

[24] Ideally, charges would also rise and fall over the course of the rush hour to promote a flattening of the distribution of trip departure times (e.g., Arnott and others 1993).

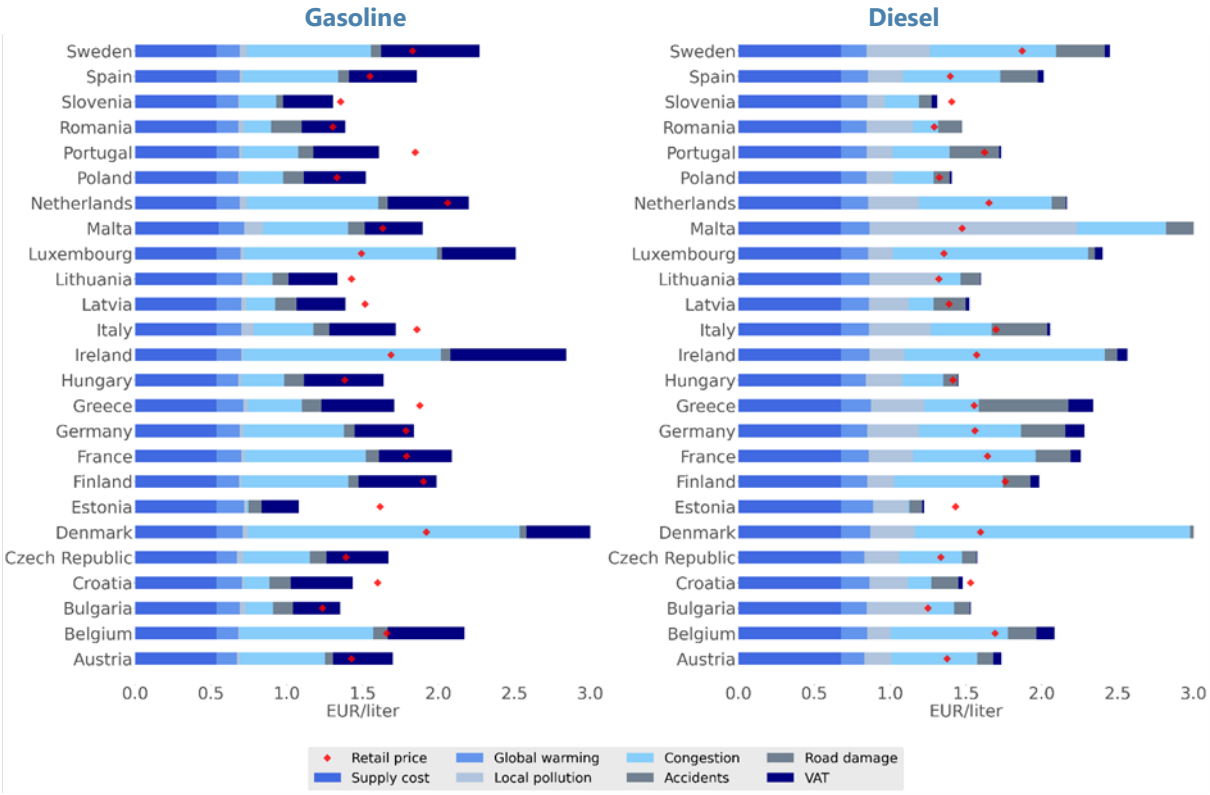
[25] The MECC depends on how extra km driven affects road speeds and travel delays for other road users which can be inferred from speed-flow relationships on different road classes and data on average vehicle occupancy rates. It also depends on how people value travel time, which is a function of the prevailing market wage. See, for example, Small and Verhoef (2007).

[26] From CE Delft (2019) and IMF staff calculations from CPAT.

[27] See for example Parry (2004).

It may, however, be more practical to promote pay-as-you-drive (PAYD) vehicle insurance.[28] A system of per km fees varying with both drivers and vehicles would be complex—both in terms of assessing, and updating, fee structures and administration. Another option is to build off existing private sector capacity at auto insurance companies. To an approximation, traditional insurance premiums are lump-sum and do not vary according to how much people drive. In contrast, under PAYD a driver's annual premium would equal km driven times their premium per km. Existing rating factors, as determined by insurance companies, could be used to set per km charges for different drivers as an (albeit imperfect) proxy for external accident risk: drivers with higher rating factors would pay higher variable charges and would have the greatest incentive to drive less.[29]

Figure 6. Current and Efficient Fuel Prices, Selected European Countries, 2020



Source: Parry and others (2021b).
Note: Calculations assume a CO_2 price of €55 per tonne.

[28] See also https://cedelft.eu/publications/pay-as-you-drive-payd/.

[29] A significant portion of traffic accidents are caused by drunk drivers. For this case, an option is to mandate interlock technologies (which prevent the vehicle being started, or driven, by a driver under the influence) in vehicles driven by convicted drunk drivers.

26. The transition to PAYD could occur on a voluntary, market-driven basis, with the government reinforcing the process through fiscal incentives. Drivers with below-average annual km driven would have the strongest incentives to take up PAYD and, as they switched, premiums would rise for the remaining pool of drivers with lump-sum insurance, encouraging further shifting to PAYD. The transition could be reinforced through fiscal incentives at the level of the household or insurance company. On average, PAYD would raise the marginal cost of driving by about 5 cents per km.[30]

Air Passenger Tax

27. The departure tax (paid by airline operators) for passenger flights is set to triple on January 1, 2023, from its current rate of €7.95 per trip. With the increase, the tax will generate projected annual revenues of €600 million from 2023 (up from €200 million).

28. The charge helps to address fiscal distortions… International air travel is undertaxed from a broader fiscal perspective. It is not subject to value added tax (unlike most other consumer products) and, due to the 1944 Chicago Convention and bilateral air service agreements, aviation fuel is not subject to excises that are routinely applied to other transportation fuels. The air passenger duty helps to counteract the bias in air travel over other transport modes and excessive fuel use promoted by these broader tax exemptions.[31]

29. …and environmental concerns—but to a limited degree. The increased tax will be equivalent to a charge of about €90 per tonne of CO_2 from air travel out of the Netherlands,[32] which above the current EU ETS price, though well below recent estimates of the social cost of carbon (SCC).[33] And while the fee is levied per trip, rather than in proportion to flight distance, it imposes disproportionately large price increases on shorter flights which has some justification from an environmental perspective as environmental costs are also disproportionately larger for shorter trips (given the large amount of fuel combusted during takeoffs). A fee on aviation fuel use would be more effective as it would also promote travel in more fuel-efficient planes.[34] This would complement efforts by the Dutch government on the supply-side to advance cleaner aircraft technologies.[35]

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[30] Assumes annual insurance premium of €900 and annual driving of 17,000 km (https://dutchreview.com/expat/car-insurance-the-netherlands).

[31] For example, Keen and others (2015).

[32] From dividing expected revenue by CO2 emissions from international aviation (from https://di.unfccc.int/detailed_data_by_party).

[33] The SCC is the present discounted value of global damages from an extra tonne of CO_2 emissions. Rennert and others (2022) put the SCC at $185 per tonne.

[34] Although there is scant empirical evidence, Keen and others (2013) suggest that about 40 percent of the reduction in aviation fuel use in response to fuel taxes would come from higher fuel economy (60 percent would come from reductions in travel demand).

[35] MOF (2022).

30. If international agreements preclude fuel taxation, another option would be to vary the fee with a metric related to CO_2 emissions per passenger trip. In principle, emissions per passenger trip could be based on fuel consumption for the trip divided by number of passengers. This would be complicated to administer however, as it would require operators to report their fuel consumption and number of passengers per trip and the resulting fee structure would be very granular. A more practical approach might be to link passenger fees to an aircraft's fuel economy and default load factors.

31. Airport congestion is also a growing problem, but this is more efficiently addressed through peak-period landing fees. Airport congestion raises costs for operators and leads to risk of flight delays for passengers—congestion is related to the frequency of aircraft landings over the course of the day (relative to airport capacity). The most efficient approach is to vary aircraft landing fees according to the expected level of congestion, thereby encouraging more flights at off-peak period.[36]

C. Assessing Climate Risks and Adaption Initiatives in the Netherlands

32. This section reviews climate trends and scenarios for the Netherlands, estimates of macroeconomic risks, and climate adaptation policies. A sub-section is dedicated to risks from coastal and river flooding. The climate adaptation strategy in the Netherlands is well-developed and documented, which reflects strong institutional capacities, financial resources, and knowledge supports. Thanks to a centuries-old tradition of effective coastal and riverine flood management, the Netherlands is much better prepared, than other countries, to address challenges from sea-level rise and changes in river flows in the 21st century. Nonetheless, the discussion suggests further efforts to mainstream climate change adaptation at all government levels and provides guiding principles for efficient adaptation strategies.

Overview of Climate Trends and Scenarios

33. The Netherlands has a temperate oceanic climate, with mild temperatures and evenly spread precipitations across seasons. Ocean currents play an important role in shaping climate in the Netherlands, by mitigating winter cold and summer heat for countries at the same latitudes. During the period 1991–2020 winter average temperature was equal to 3.9°C and summer average temperature was equal to 17.3°C (World Bank Climate Change Knowledge Portal). Precipitations are evenly distributed across the year, with an average of 67 mm/month (World Bank Climate Change Portal).

34. Average temperature in the Netherlands is increasing, a trend that is expected to continue even in low emission scenarios, but precipitation scenarios are more uncertain. Average annual temperature in 1991–2020 was about 1°C higher than in the period 1901–1990, when there was no discernible trend. The warming trend has accelerated in recent decades (Figure 7, panel a). Future scenarios indicate additional warming of 1.0 °C, 1.2 °C, and 1.4 °C in 2041–2060 with

[36] This applies even at hub airports where there is a dominant carrier and a competitive fringe (see Brueckner 2002).

respect to the period 1995–2014 (panel b). Warming will be stronger during summer months in all scenarios[37](panel c). There is a moderate long-term trend in total annual precipitation, but the trend is small compared to natural variability (panel d). Future scenarios do not indicate discernible changes in total precipitations with respect to historical trends and among different emission scenarios (panel e). Future scenarios suggest a possible shift of the seasonal distribution of precipitations, with a modest decline (approximately 10 percent) during summer months and an increase of similar magnitude during winter months. Large natural variability (panel c) and large differences across projections from different climate models (panels d and e) suggest that precipitation changes are not robust.

35. Climate models project increased frequency of extreme heat and heavy precipitation. Dangerously hot days with maximum temperature above 35 °C (Hot Days) are historically rare but are expected to increase without strong global mitigation action (Figure 8, panel a). Heavy precipitation events are projected to increase slightly (panel b) but uncertainty is large, and a substantial invariance of present trends cannot be ruled out (panel c) However, projections of extreme events from models can be inaccurate. In the Netherlands, models tend to underestimate trends in extreme hot days. Models are also unable to describe convective process that give rise to thunderstorms that are responsible for heavy precipitation events. KNMI combines observations, simulations, conceptual models and physical principles to project with high confidence an increase of heavy precipitation on a sub-hourly and daily timescale (KNMI, 2014). A significant increase in thunderstorms is found using the highest warming scenarios during the summer season.

36. There is substantial uncertainty about trends in drought conditions at national level using global models, but drought conditions intensify according to KNMI analysis. The SPEI Drought Index—which accounts for the effect of both temperature and rainfall on soil moisture availability—does not show any significant trends in all scenarios (Figure 9, panel a). Models project an increase in the maximum number of consecutive dry days in a year—an alternative indicator of drought-like conditions—especially during summer months, but with considerable uncertainty (panels b and c). KNMI projects an increase of the mean highest precipitation deficit during the growing season in all scenarios (KNMI, 2014).

37. The Netherlands is a delta country with approximately 55 percent of the land exposed to potential flood risks. With a long coastline relative to its area, about one-quarter[38] of its total area below sea-level, and at the delta of major rivers, the country has been historically exposed to coastal and riverine floods, for which strong defenses are in place. As sea-level rise and intense precipitations will intensify over the next decades, risks will increase if planned upgrades to the flood

[37] The lowest amount of warming is associated with strong climate mitigation action (SSP1-2.6). The intermediate warming scenario assumes continuation of present trends (SSP2-4.5). The highest amount of warming assumes no effort to curb emissions (SSP3-7.0).

[38] Source: https://www.pbl.nl/correctie-formulering-over-overstromingsrisico.

protection system will not be in place.[39] Because of its importance, the risks from floods and sea-level rise in particular will be discussed in Section D.

38. Projected increase in river discharge, particularly from the Meuse can add further stress if adequate measures are not put in place. The occurrence of conditions that may lead to riverine floods depends on meteorological and topographical conditions, land use, economic activity, and policy responses along the entire catchment basins of the Rhine and Meuse rivers. In Summer 2021 the peak discharge of the Meuse reached the record high since 1911 and was highly unusual because conditions that can lead to floods usually occur in winter.[40] Looking forward, climate scenarios point to the further intensification of extreme rainfall events in the major catchment basins in the Netherlands.[41] This is in line with the projection of more erratic water discharges (Klijn et al, 2015). In all KNMI'14 scenarios high water discharges in 2050 will increase sharply. Uncertainty about the medium-term has declined with new evidence.

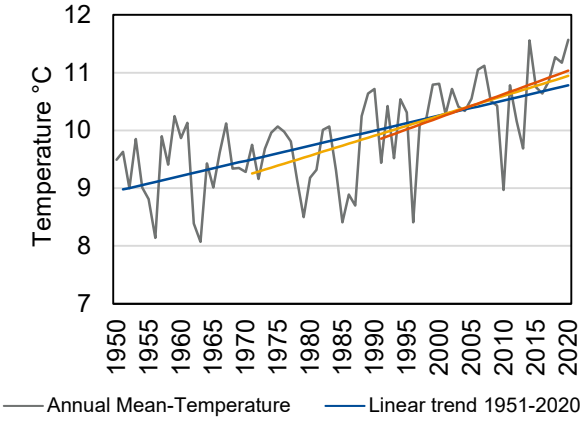
[39] Source: https://www.pbl.nl/correctie-formulering-over-overstromingsrisico.

[40] Source: https://www.deltares.nl/en/issues/high-water-on-rivers/.

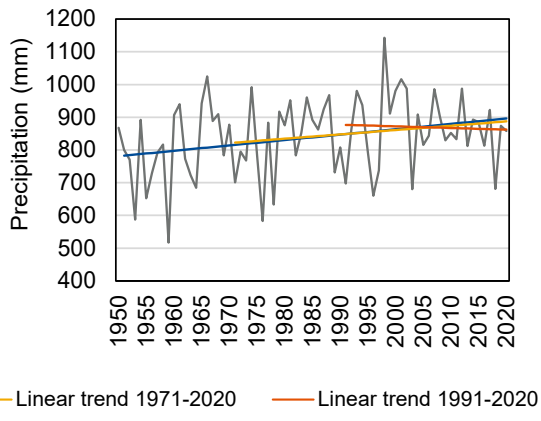
[41] IPCC Interactive Atlas https://interactive-atlas.ipcc.ch/. Maximum 1- and 5-day precipitation. Western and Central Europe Region. Fewer than 66 percent of the models show change greater than the internal-variability bounds.

Figure 7. Temperature and Precipitations: Observed Trends and Projections

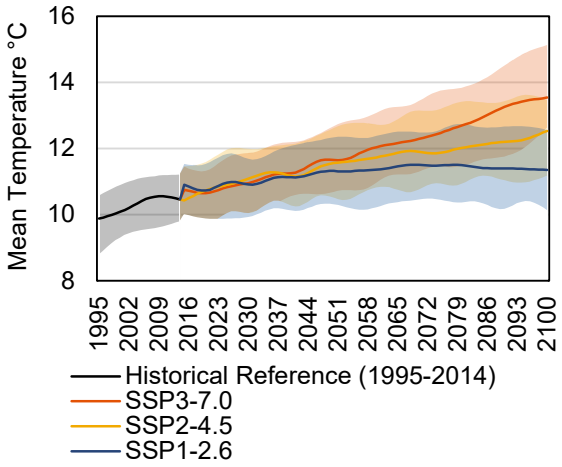
Mean-Temperature



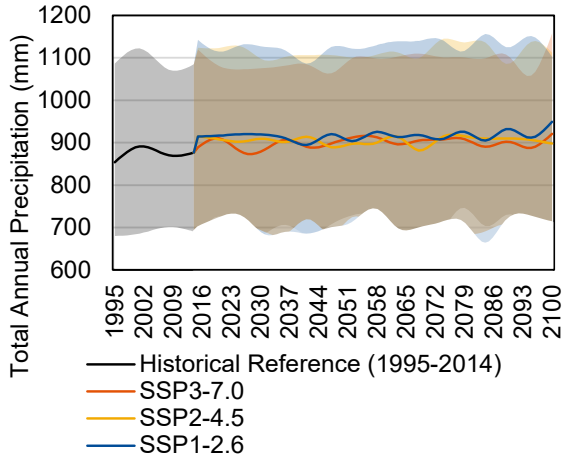
Precipitation



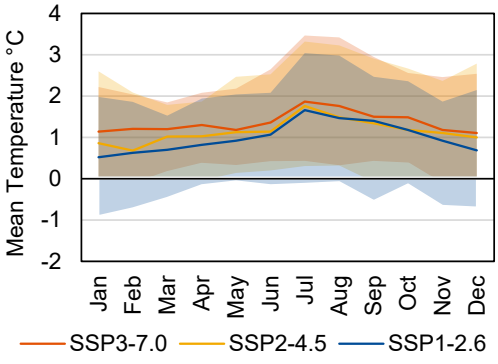
Projected Mean-Temperature



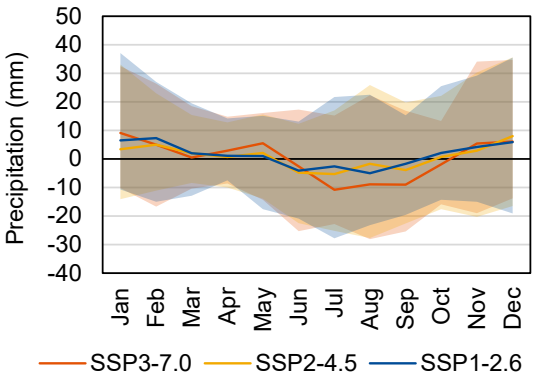
Projected Precipitation



Projected Mean-Temperature Anomaly by Month in 2040–2059



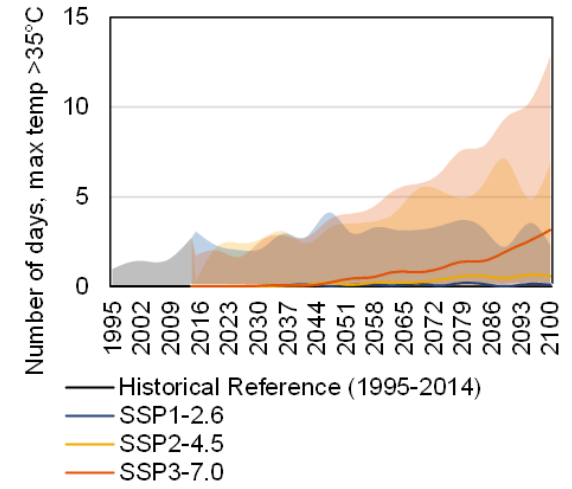
Projected Precipitation Anomaly by Month in 2040–2059



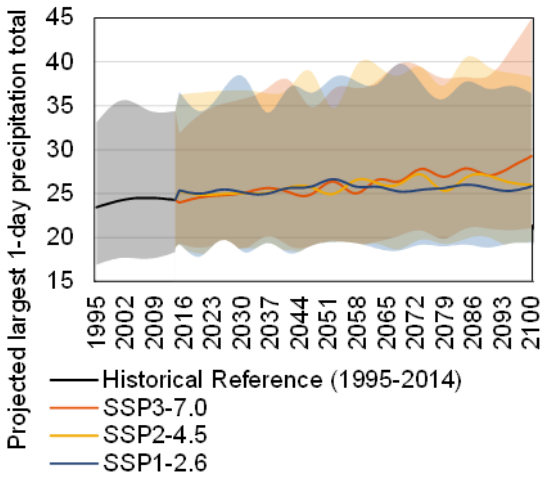
Source: World Bank Climate Change Knowledge Portal based on CMIP6 database.
Notes: Graphs (c) to (f) display the multi-model ensemble mean, 10th and 90th percentiles. Graphs (e) and (f) are with respect to 1995–2014.

Figure 8. Extreme Heat and Intense Rainfall: Projections

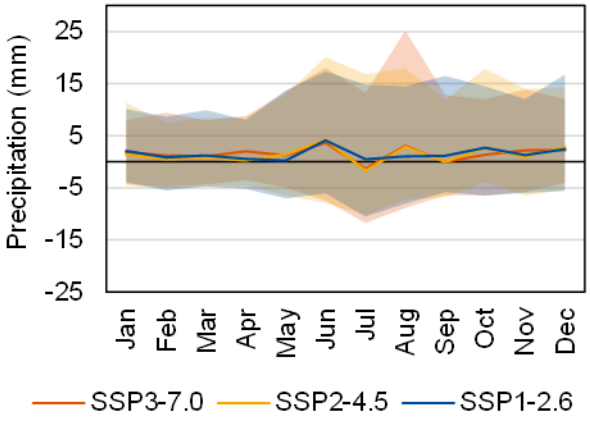
Projected Number Hot Days



Projected Largest 1-Day Precipitation



Projected Largest 1-Day Precipitation Anomaly by Month in 2040–2059

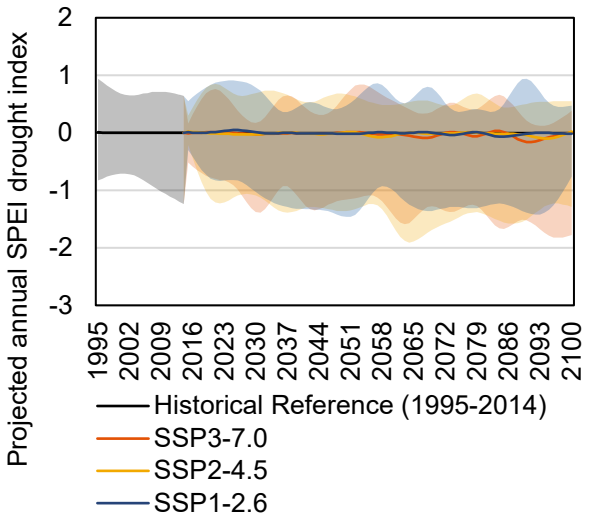


Source: World Bank Climate Ch

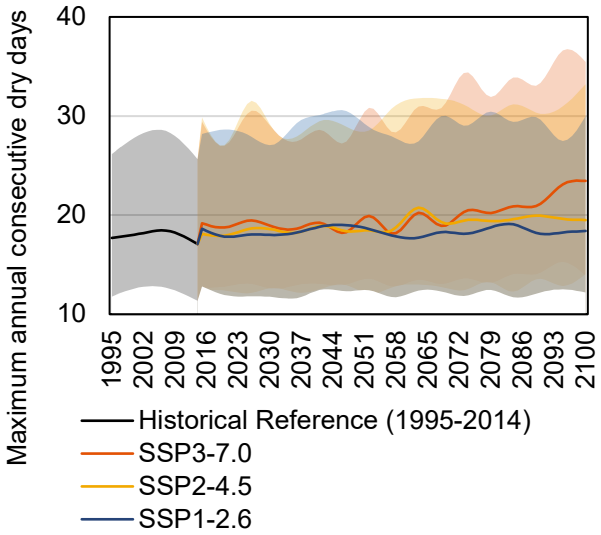
Notes: (a) Projected number of days with maximum temperature greater than 35C; (b) Projected largest 1-day precipitation total, averaged over the entire country; and (c) Projected largest 1-day precipitation total, averged over the entire country, monthly anomaly in 2040–2059 with respect to 1995–2014. All panels display the multi-model ensemble mean, 10th and 90th percentiles

Figure 9. Projections of Drought Indicators

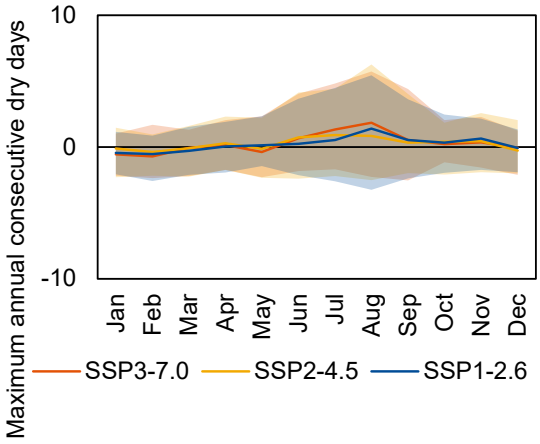
Projected Annual SPEI Drought Index



Projected Max Number of Consecutive Dry Days



Projected Max Number of Consecutive Dry Days Anomaly by Month in 2040–2059



Source: World Bank Climate Change Knowledge Portal based on CMIP6 database.
Notes: (a) Projected annual SPEI drought index. Negative values of the SPEI indicate below normal moisture; positive values indicate above normal moisture; (b) Projected maximum annual number of consecutive dry days (days with less than 1 mm of precipitation); and (c) Projected maximum annual number of consecutive dry days, monthly anomaly in 2040-2059 with respect to 1995-2014. All panels display the multi-model ensemble mean, 10th and 90th percentiles.

Assessment of Macroeconomic Risks

39. Climate change has the potential to generate macro-critical impacts, that may vary greatly across countries. Climate affects the macro-economy with productivity shocks, such as losses of labor productivity or low crop yields due to sub-optimal temperature, or with direct destruction of physical and human capital, usually due to extreme events such as floods. Damage to capital stock and lower investment due to weaker growth prospects and higher uncertainty would result in lower capital accumulation in the longer-term. Households' welfare is negatively affected because of higher health risks resulting in increased mortality and hospital admissions as well as lower income prospects and potential need for relocation. Climate change has also the potential to increase productivity, for example by extending the growing season. Higher temperatures during winters reduce heating costs in cold countries. Higher winter temperature reduces mortality and morbidity from cold-related diseases. The net balance of negative and positive effects is affected by the initial climate of each country.

40. As the rise in global temperature is a gradual process and the frequency of extreme weather changes slowly, the near-term impact of climate change may be limited and not easily distinguishable from normal variabilities. Average temperature rise and sea-level rise pose a gradual but constant challenge. Intensification of extreme events may lead to less frequent but potentially more severe losses.

41. Estimates of climate change impacts on the economy of the Netherlands are highly uncertain but several estimates indicate that losses may be relatively small by mid-century. Large differences in sectoral coverage, warming scenarios, climate phenomena considered, methods, and assumption complicate the comparison of different studies, but the overall picture that emerges from the available evidence is that warming and changes in precipitations up to 2050 may lead to modest economic losses, or even some gains according to some studies. The high level of development of the country, effective risk-management, a small share of value added from agriculture, forestry, and fishing (less than 2 percent of GDP)[42] and relatively mild temperatures also during summer, contribute to explaining the relatively low sensitivity of the economy to projected changes in climate until mid-century.

42. Top-down econometric estimates of warming that include adaptation indicate no losses or even modest gains up to 2050. By extrapolating the estimated relationship between GDP per capita growth and temperature trends observed with present warming trends, GDP per capita in 2050 does not change under a fast warming scenario, and modest gains are possible with a low

[42]Source: FAOSTAT.

warming scenario (Kahn et al, 2021). [43] These estimates assume slow but gradual adaptation to higher temperatures– such as increased penetration and use of air conditioning – and exclude impacts from sea-level rise, or changes in the frequency or intensity of extreme weather events (Table 3).

Table 3. The Netherlands: Percent Change in GDP per Capita

	2030	2050	2100
SSP1-2.6	0.11	0.25	0.43
SSP2-4.5	0.02	0.05	0.11
SSP3-7.0	-0.11	-0.31	-0.89

Notes: Staff calculations based on Kahn et al. (2021). Positive number indicate a gain. SSP1-2.6 is an emission scenario compatible with the Paris Agreement goal of keeping global mean temperature increase below 2 °C by 2100. SSP2-4.5 assumes continuation of current trends, including committed emission reductions. SSP4-7.0 is a high emission scenario that assumes no efforts to reduce emissions.

43. Estimates of economic impacts from changes in the frequency of extreme events are rare and highly uncertain. With slow (SSP1-2.6) and fast warming (SSP3-7.0), respectively, IMF Staff estimates a very small reduction of annual real GDP per capita growth rates between 2020 and 2050 from changes in the frequency of extreme heat, severe droughts, and moderate temperature. This leads to annual total losses of GDP ranging between €0.5-1.5 billion in 2030 and €2.2-6.2 billion in 2050.[44] These estimates rely on machine learning methods to select only the most important climate variables among hundreds potential candidates (Berkay, Bellon and Massetti, 2022). The analysis is limited to weather shocks that occur within the country and do not include, for example, the impact from changes in river flows due to extreme precipitations in other countries. As a comparison, the European Environmental Agency estimates that the total economic damage caused in the country by weather and climate-related extreme events between 1980-2020 is equal to €9.3 billion, or 1.2 percent of 2020 GDP. The annual average loss is equal to €0.2 billion.

[43] Losses and gains are measured by comparing a scenario with present warming trends to scenarios with trends compatible with long-term scenarios of temperature change used in the literature. Kahn et al (2021) use the RCP2.6 scenario (slow warming) and the RCP8.5 scenario. As the RCP8.5 scenario is considered to be extreme and inadequate for studying socio-economic impacts of climate change, we interpolate impacts linearly to determine GDP per capita changes for the high warming RCP7.0 scenario. Using the RCP8.5 scenario Kahn et al. (2021) find that GDP per capita declines by 0.42 percent in 2050 relative to baseline warming.

[44] The scenario assumes a 25 percent increase in the frequency of droughts for the slow warming scenario, and a doubling for the fast-warming scenario. As changes in the frequency of droughts are highly uncertain, these are conservative assumptions that may overestimate costs.

Table 4. The Netherlands: Economic Damage from Weather and Climate-Related Extreme Events, 1980–2020

	Euros	Percent of 2020 GDP
Cumulative losses, in bn €	9.3	1.2
Annual losses, in bn €	0.2	0.0
Cumulative losses per capita, in thousand €	5.1	11.1
Annual losses per capita, in €	0.1	0.3

Sources: European Environmental Agency, IMF Staff calculations

44. National bottom-up estimates of climate impacts indicate similar output losses. The Climate Damage Atlas estimates that total damages over the period 2018-2050 are expected to be in the range of €54 to €122 billion, or €1.7–€3.8 billion on average per year (see table 5) under assumption of no further adaptation measures. Damages from drought and heat contribute with €15–€72 billion, and €7–€8 billion, respectively[45]. Damages from pluvial floods are estimated to range between €32–€42 billion (reflecting large uncertainty about precipitation trends) or €1.0–€1.3 billion per year. Annualized total losses are less than 0.5 percent of GDP. Flood risk management, including land-use regulations that prohibit building in unprotected areas, greatly contributes to reduce losses from floods, which also helps to reduce financial stability risks. Caloia and Jansen (2021) find that the banking sector is sufficiently capitalized to withstand floods in unprotected areas, where there is relatively little real estate. However, they show that capital depletions could increase quickly in case more severe floods hit the densely populated part of the country.

Table 5. The Netherlands: Estimated Damage for 2018–2050

	Cumulative				Annual			
	in billion euros		in percent of 2018 GDP		in billion euros		in percent of 2018 GDP	
	min	max	min	max	min	max	min	max
Drought	15.3	72.7	2.0	9.4	0.5	2.3	0.1	0.3
Flooding	31.9	41.5	4.1	5.4	1.0	1.3	0.1	0.2
Heat	7.1	8.1	0.9	1.0	0.2	0.3	0.0	0.0
Total	**54.3**	**122.3**	**7.0**	**15.8**	**1.7**	**3.8**	**0.2**	**0.5**

Source: Jacobs et al., 2019, IMF Staff calculations

[45] The updated estimates for droughts by the Climate Damage Atlas are €38.5–€124 billion (€1.1–€3.9 billion annual average), increasing total damage estimates to €77.5–€173.6 billion (€2.4–€5.4 billion per year on average).

45. A comprehensive bottom-up analysis for Europe confirms that impacts for the Netherlands tend to be small and may even be positive in a low warming scenario. This is in large part explained by the relatively mild climate of the country. Table 6 displays impact estimates from a large study led by the Joint Research Centre of the European Commission. Impacts are reported for two warming scenarios equal to +1.5 °C and +3.0 °C with respect to the pre-industrial level.[46] Estimates for the whole EU indicate larger losses, reflecting significantly larger negative impacts in southern countries. Compared to the EU, the Netherlands and other countries in the Central Europe North region (Belgium, Germany, Luxemburg, Poland) have smaller estimated impact from droughts and improvement in agriculture productivity. Human mortality from extreme heat (increase) and cold (reduction) dominates the overall impact.

Table 6. The Netherlands: Welfare Change from Selected Climate Impacts for the Central Europe North Region and EU-27+UK for Two Levels of Global Warming
(Percentage of GDP)

The results represent change with respect to current economy.

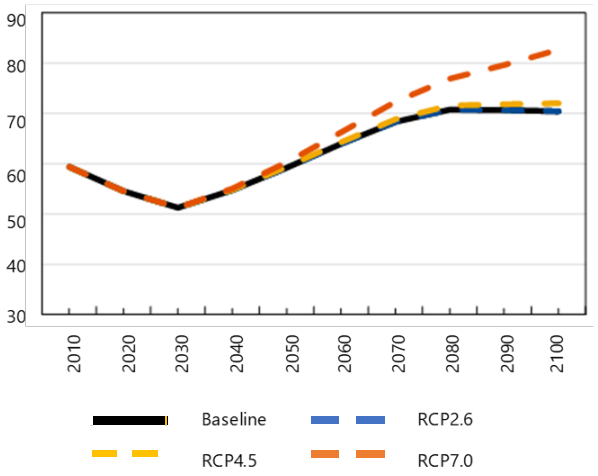
Sector	Region	Welfare Change as Share in GDP (%)	
		1.5ºC	3ºC
Inland Floods	Central Europe North	-0.03	-0.13
	EU + UK	***-0.04***	***-0.16***
Coastal Floods	Central Europe North	-0.01	-0.08
	EU + UK	***-0.02***	***-0.16***
Agriculture	Central Europe North	0.09	0.05
	EU + UK	***0.03***	***-0.03***
Droughts	Central Europe North	0.01	-0.02
	EU +UK	***-0.01***	***-0.08***
Energy	Central Europe North	0.00	0.00
	EU +UK	***0.00***	***0.00***
Mortality	Central Europe North	-0.17	-0.43
	EU +UK	***-0.29***	***-0.96***
Sum of the Sectors	Central Europe North	-0.11	-0.61
	EU +UK	***-0.33***	***-1.39***

Source: PESETA IV, 2020 (Szewczyk et al. 2020).

[46] Impacts are estimated using a comparative static exercise in which different levels of global temperature are used to estimate impacts on the current economy using a CGE model. This is a comparative static exercise that does not consider changes in technology, economy and society. This exercise also does not include effects associated with triggering climate tipping points, ecosystems degradation and loss of habitats and species. Therefore, the integrated economic impacts do not constitute the totality of economic impacts of climate change in Europe. Only very aggressive global mitigation can stabilize temperature increase to +1.5 ºC while +3.0 ºC can be reached in 2100 with continuation of present policy trends (SSP2–4.5).

46. Public finances in the Netherlands could be adversely affected by lower economic productivity growth only if climate change were drastic. In the RCP2.6 and RCP4.5 climate change scenarios, the average temperature increase is not expected to significantly affect productivity growth per capita[47]. However, in the more severe RCP7.0 climate change scenario, and in the absence of any policy change, debt-to-GDP could increase as lower economic productivity would translate into lower government revenues (Figure 10). As presented in the chart below, illustrative calculations[48] indicate that by 2100, in the RCP7.0 scenario, debt-to-GDP could be 10 percentage points higher compared to the baseline scenario. However, the annual buildup of debt-to-GDP towards the 10 percent point difference by 2100 could be offset by modest annual budgetary adjustment.

Figure 10. Debt-to-GDP Under Different Climate Change Scenarios



Source: IMF Staff estimates

47. While the available empirical evidence indicates that macro-economic risks for the Netherlands may be small, uncertainties are large. Some impacts may be missed – as for example cross-border spillovers[49] from neighboring countries or global upheaval due to extreme weather conditions in vulnerable nations. Evidence based on the observation of the economic impact of past shocks may fail to capture the compounded effect of multiple new risks occurring simultaneously or in rapid sequence. These risks can be explored only by developing scenarios and uncertainty cannot be quantified objectively.

[47] IMF staff estimates for the impact of higher average temperature on productivity growth is based on empirical data generated by IMF Staff in accordance with the Kahn (2019) methodology.

[48] The calculations and chart are developed for illustrative purposes to show the possible deviations from the baseline path for debt-to-GDP and they are not representing IMF-views on a likely debt-to-GDP path for the baseline scenario. The calculation assumes that a GDP deflator of 2 percent, 2.3 percent interest rate on government debt, nominal GDP growing in line with total population, revenue remaining constant as percent of nominal GDP and high expenditure rigidity.

[49] The shares of agricultural goods in exports and imports are small (less than 1 percent of GDP), especially with non-EU countries. So, the trade-associated risks are likely to be limited.

48. Impact estimates do not account for global climate tipping points. Quick disintegration of the Greenland and West-Antarctica Ice Sheets may pose the most challenging threat to the country due very high sea-level rise, but risks are low during this century (Dietz et al, 2021). A more imminent threat is an acceleration of warming due to release of methane hydrates, which could also increase the intensification of extreme events. An abrupt collapse of the Atlantic Meridional Overturning Circulation (AMOC) does not appear to be likely before 2100, but if it were to occur it would cause abrupt cooling in the Netherlands and shifts in the water cycle (IPCC AR6, TS, Box TS.3).

Assessment of Adaptation Policies

49. Climate adaptation policy in the Netherlands is governed by the National Climate Adaptation Strategy (NAS) and by the Delta Programme. The Climate National Adaptation Strategy (NAS) serves as the overarching policy framework that sets out the overall agenda for climate change adaptation. The country published its NAS in 2016 and its implementation program in 2018 (Uitvoeringsprogramma Nationale klimaatadaptatiestrategie, UP NAS). [50] The 2020 National Climate Adaptation Perspective report reviews accomplishments and contains guidelines for a NAS working program for 2020 and beyond. The government is in the process of updating the NAS, based on the 2023 KNMI climate scenarios published in 2023, which will include a climate change adaptation monitoring framework that the government is currently developing. The Delta Programme, implemented since 2010, deals with adaptation to climate change with a particular focus on protecting the Netherlands from high water and flooding, freshwater availability, and spatial adaptation. The 2023 Delta Programme provides the most recent assessment of risks, adaptation measures, and budget.[51]

50. Considering the long-term process of climate change, the approach of the GON is to update its climate strategies and programs to reflect new information. The same inherently adaptive approach of coastal protection and flood defense strategies can be extended to cover all other climate hazards. While incremental adjustments—for example higher flood barriers—can be sufficient to deal with future risks for an extended period, it is important not to ignore "policy tipping points" (Klijn et al. 2012), when totally new approaches are needed to abrupt changes in physical risks and/or non-linearities in costs and benefits of adaptation. The establishment of the National Knowledge Programme on SLR—a six-year study programme to gain information on the effects of SLR up to 5 meters, is an example of analysis of alternative approaches to long-term challenges.[52]

51. Generally, the optimal level of governance should closely match the geographic or sectoral scope of climate risks. Through various centrally coordinated institutions and knowledge platforms, national, regional and local governments are stimulated to integrate climate change

[50] https://ruimtelijkeadaptatie.nl/publish/pages/125102/nas_implementation_programme.pdf

[51] Home | Delta Programme (deltaprogramma.nl)

[52] https://english.deltaprogramma.nl/delta-programme/knowledge-development/sea-level-rise-knowledge-programme

adaptation considerations into their investment and policy plans. Climate adaptation has a regional approach. For instance, water district boards are responsible for the flood risk management in their district and municipalities are responsible for climate adaptation at the local level. Coordination is done through e.g., the delta programme or the union of the water boards.

52. There is a clear role for the central government in ensuring that adaptation principles are embedded in national legislation, policy and public finance management. In line with the EU legal framework for climate adaptation, the Netherland has been putting in place a comprehensive legal and regulatory framework that provides climate mitigation and adaptation regulations and guidelines. On the policy front, the purpose of the UP NAS was to integrate climate adaptation into policy and implementation by embedding climate adaptation considerations in government investment programs. This entails factoring climate risks and adaptation measures into medium- and long-term planning, budgets, the management of public investment, and assets and liabilities management. Important progress has been made to integrate climate change considerations into investment planning, and the authorities indicated to be developing a framework for monitoring and evaluation climate adaptation at the central government level. However, opportunities seem to exist to integrate climate adaptation considerations more comprehensively in all stages of the government investment and policy frameworks. For example, ex-post reviews, such as climate informed impact assessments, are at an early stage and there is no (legally enshrined) accountability mechanism in place that ensures that authorities at all levels of the government are held accountable for the (un)successful implementation of climate adaptation considerations.

53. Adaptation plans would be most effective if holistically integrated into long-term planning frameworks of the government. Amid competing needs, the efficient allocation of resources across sustainable development goals will deliver the highest net social returns. Staff welcomes and encourages the explicit mention in the UP NAP of the importance of weighing cost and benefits of alternative adaptation strategies. Despite its limitations, cost-benefit analysis, complemented by analysis and adjustment of distributional impacts, can help to ensure the best use of scarce resources, as for other development objectives.

54. Government action will be most effective and efficient if it focuses on:

- Adaptations that have large positive externalities—e.g., research about adaptation technologies, updating building codes, reinforcing infrastructure, developing early warning systems—are not efficiently provided by markets and should be a priority for governments.

- Removing barriers to efficient private adaptation—e.g., by removing legislative obstacles or other market imperfections—would allow firms and individuals to choose the efficient mix of adaptations leveraging their specific knowledge of costs and benefits of alternative options (Bellon and Massetti, 2022).

- Dealing with equity issues, for example by compensating vulnerable parts of the population that are negatively affected by adaptation policies.

55. The UP NAP would benefit from highlighting the cost of distortions and distributional impacts in markets for inputs and outputs. Distorted markets lead to inefficient allocation of resources, including in climate change adaptation. Future NAPs could assess the impact of market inefficiencies on adaptation costs and benefits and their distributional effects – a principle also stressed by OECD (2014). For example, implicit or explicit subsidies to fresh- and groundwater use may lead farmers to use water inefficiently to deal with higher summer temperature. Investing in efficient irrigation or switching to methods or products that are less water intensive would be discouraged, causing welfare losses. Efficient allocation of water would have immediate positive welfare impacts and would facilitate dynamic efficient adaptation but may be opposed by the beneficiaries. There could also be undesirable distributional effects if subsidies are used for income support. To facilitate market reforms and alleviate equity concerns, compensations could be paid to individuals adversely affected.

56. The UP NAP correctly highlights the importance of insurance in dealing with residual climate risks but could also support reforms to ensure efficient risk pricing. As fully offsetting climate change impacts may be either too expensive or impossible, government, individuals, and firms will have to deal with residual risks. Insurance can help spread these risks efficiently across time and across society. The UP NAP mentions this important role for insurance, but its message could be stronger, highlighting the need for efficient insurance markets. Ensuring competitive market access to insurance providers that satisfy all the financial requirements and efforts to ensure complete information is key to competitive risk pricing. Despite these efforts, some insurance for residual risks may be unaffordable for private individuals and firms. Subsidies can reduce the cost of insurance, but they distort private behavior by shifting the cost of risk from private to public budgets. Without appropriate countermeasures —such as upgraded and enforced building codes or land use restrictions—subsidies induce a sub-optimal aggregate risk level. Although the distributional impact of this outcome may be desirable, the efficiency cost should be carefully assessed.

57. Present financing of flood protection is based on cost-sharing and mutuality principles but without strong institutional constraints mutuality may lead to inefficient risk taking. We welcome the Recommendation 2 of the Deltacommission 2008 to grant permits to new development in low-lying flood-prone areas based on cost-benefit analysis in a fiscally responsible way, so that protection costs fall on the beneficiaries rather than on other administrative levels (Deltacommissie, 2008, p. 12).

Adaptation to Increased Risks from Coastal and River Flooding

58. The Netherlands is exposed to both coastal and river flooding but is considered prepared to deal with these challenges because of its long-term flood risk management practices. Around 55 percent of the country is susceptible to flooding. 26 percent is below sea-level and 29 percent is susceptible to river flooding.[53] More than half of the population and two-thirds of economic activity can be potentially affected by coastal and river floods (OECD, 2014). However, the

[53] Source: PBL, available at https://www.pbl.nl/correctie-formulering-over-overstromingsrisico .

country is uniquely prepared to deal with these challenges. Flood hazards are effectively and efficiently reduced to tolerable risk levels thanks to strong institutions, financial resources, centuries of experience, and strong cooperation between all levels of government. The existential threat from floods has shaped institutions and the very core of Dutch society.

Box 2. The Delta Programme

Following the disastrous floods in the south-western part of the Netherlands in 1953, a Delta commission was established to improve the system of flood defenses with a vast program of construction and land management – the Delta Works.

The continuous monitoring, maintenance, and upgrade of existing protection as well as the management of freshwater supply is managed by the central government, provincial and municipal authorities through the Delta Programme, overseen by a dedicated government official, the Delta Commissioner.

The Delta Programme is embedded in the legal framework and administrative functions of the central government, water authorities, and provincial and municipal authorities. The Delta Programme receives funding from the Ministry of Infrastructure and Water Management, and it is in conjunction with investment projects funded by other authorities.[1/] Its areas of investment include resilient infrastructure, including dike upgrading, and improved water discharge and storage facilities.

The total estimated annual budget of the Delta Programme is on average EUR 1.5 billion between 2023 and 2036, 55 percent of which are dedicated to new investment and the rest for maintenance, upkeep, and management, according to The Delta Fund.[2/]

The Netherlands' effort to contain risks from flooding has multiple building blocks and follows a holistic and adaptive approach to management decision making under uncertainty. Adaptation actions are planned in both mid- and long-term horizons. The major building blocks are flood protection, coastline preservation, river water management, and sustainable freshwater supply.

[1/]The Delta Programme 2023 states that water authorities expect to invest on average EUR 2 billion per year, of which EUR 915 million on flood defenses. For 2021, the Delta Programme estimated that the national government, water authorities, provincial and municipal authorities and drinking water companies together have spent EUR 1.7 billion on flood defenses, sewage purification, water systems, water quality, and sustainable freshwater supply.
[2/]Sources: the Delta Programme https://www.government.nl/topics/delta-programme/delta-programme-flood-safety-freshwater-and-spatial-adaptation (access: Feb.2023)

59. The planned level of protection is adequate to deal with expected flood risks at least until 2050 but the country needs to plan carefully to upgrade the protection to address the evolving risks from climate change. A sophisticated level of governance and substantial investments have contributed to the highest standards of protection for a low-lying delta country like the Netherlands and to the adequate management of freshwater resources (Box 2). However, key investments and planning are needed to upgrade the defense system by 2050 to ensure that the minimal levels of protection are extended to the whole population, to deal with continued soil subsidence, and to face increasing risks from climate change. Addressing observed trends in sea-level rise (SLR), as well as pluvial and riverine flood risks, requires additional measures. If planned

upgrades are delayed, flood damages in urban areas until 2050 can increase to between EUR 33 bln and 87 bln with continuation of present climate trends, and to between EUR 55 bln and EUR 124 bln if climate change intensifies (The Delta programme, 2021; p.18).

60. Sea-level rise (SLR) and intensification of conditions that can lead to pluvial and riverine floods should be closely monitored. Faster than expected SLR can potentially lead to more flooding, saltwater intrusion, coastal deterioration, and loss of habitats than what predicted. While the current protection strategy is expected to minimize these losses, the risks keep evolving. If the SLR trend intensifies, more drastic and costly interventions would likely to be required. While the difference between high and low SLR scenarios is projected to be small until 2050 (KNMI'14 estimates range between 15 and 30 centimeters in a moderate warming scenario and between 20 to 40 centimeters in a fast-warming scenario)[54], in the second half of the century high warming scenarios diverge substantially from observed trends (KNMI'14 projects 30 to 60 cm in the moderate scenario and between 45 and 75 cm in the fast-warming scenario in 2085). Extreme scenarios with SLR of 100 centimeters or more cannot be excluded if melting of Greenland and Antarctica will be faster than predicted. While the country is well-prepared to address SLR as the current trend continues up till 2050, an acceleration of sea-level rise in the second part of the century requires contingency plans.

61. The long-standing tradition of using cost-benefit analysis (CBA) for flood risk management and water governance should be continued and possibly reinforced. This tradition started in 1954 with the pioneering work cost-benefit analysis of the Delta Works by Tinbergen (1954) and continues to this day (CPB, 2017). Standard good practice in CBA should be applied consistently across studies:

- A range of policy/investment alternatives should be assessed against each other, including the no incremental protection case (business-as-usual).
- The cost of adapting to rising sea levels under a range of SLR scenarios should be calculated against a counterfactual with no SLR.
- Whenever possible, regional interdependencies (positive and negative spillovers) should be considered and different combinations of protection options in different parts of the country should be assessed.
- Non-market impacts should be monetized using the best-available evidence while being cognizant of inherent uncertainties. Loss of life should be monetized using the Value of Statistical Life, consistently with national CBA standards. Disutility losses in case of relocation should also be monetized.

[54] With respect to the period 1986–2005. Source: KNMI'14, p. 49. SLR in the moderate warming scenario is similar to what estimated by the SSP2–4.5 scenario and SLR in the fast-warming scenario is similar to what estimated with the SSP5–8.5 scenario by the IPCC (Fox-Kemper and others (2021, Table 9.9).

- The flood protection strategy envisioned until 2050 is based on implementing the Local Individual Risk (LIR) (the probability per year to die at a certain location due to flooding, taking into account evacuation possibilities) defined in part by a motion of parliament and in part using CBA (van der Most et al 2014). CBA can contribute to assess if the application of this standard across the country is efficient and could be used to determine the optimal local safety standard.

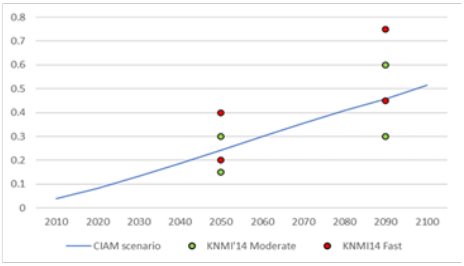
62. Utilizing the CIAM model (Diaz, 2016–Box 3), IMF staff conducted a stylized CBA of alternative protection strategies. The model-based estimation suggests that implementing an efficient protection strategy can significantly reduce the overall protection costs while minimizing the residual damage. This finding aligns with national studies. Model output allows comparing the full protection (zero permanent inundation in any part of the country) and the "optimal" protection strategies (where the total costs of SLR are minimized, including the protection costs, residual damage, and the non-market value loss of wetlands due to the protection). The "optimal" protection level entails slightly elevated risks of inundation but much lower total costs than the full protection. The numerical findings of the model should however be taken with caution since it potentially underestimates climate change damages by excluding the risks of riverine flood and potentially overestimates adaptation costs since it assumes no protection against SLR in the baseline scenario (no protection scenario). Nevertheless, the model allows comparing trade-offs between costs and benefits of protection under alternative protection strategies. More accurate national models should allow similar CBAs to facilitate efficient protection strategies.

Box 3. A Stylized Cost-Benefit Analysis of SLR Using CIAM from 2050 to 2079

The Coastal Impact and Adaptation Model (CIAM) is a global optimization model for cost-benefit analysis of adaptation to SLR (Diaz, 2016). The coastline of the Netherlands is divided in 128 segments of varying length. To estimate costs and benefits of alternative protection strategies, the model uses segment-specific information on protection costs, geographic features, population density, and level of economic activity and capital. The model does not consider increased risks from river floods. See Annex I for details of the model.

This exercise uses the median increase of local sea-level in the Netherlands for the RCP 4.5 scenario in Kopp et al (2014). SLR in this scenario falls within the range of the KNMI'14 scenario for moderate warming. This exercise uses also the 5th and the 95th percentiles of the distribution of SLR for the RPC 4.5 scenario to illustrate uncertainty.

Sea-Level Rise in CIAM Analysis and in KNMI' 14 Scenarios
(meters)



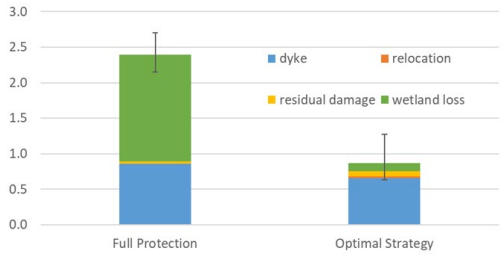
Source: CIAM scenario corresponds to the 50th percentile of local sea-level rise projections in Kopp et al. (2014), measured in meters with respect to 2000. KNMI'14 scenarios of sea-level rise for Moderate and Fast warming scenarios from KNMI (2014), measured with respect to 1985–2005.

Two adaptation strategies are simulated: protection (by building dikes, flood barriers, reinforcing coastal dunes, etc.) and retreat (by progressively relocating population and assets). Utilizing the model, IMF staff estimates suggest that full protection, which although eliminates the permanent inundation risks from sea level rise entails higher total costs, whereas a policy combination of protection and retreat is the most cost-effective.

In the full protection scenario, the model indicates that EUR 862 million are needed annually between 2050 and 2079 to eliminate contemporaneous and future inundation risks from SLR, or a total of EUR 25.9 billion. This strategy is cost-effective because damages from inaction are estimated to be much higher.

In the optimal protection scenario, accepting inundation in some areas leads to lower investment needs in protection and to lower losses of ecosystem services. Pro-active land use management minimizes costs to the population and loss of infrastructure. This strategy allows to reduce investment needs in protection to EUR 656 million annually, or EUR 19.7 billion in total. Land and capital losses due to inundation are kept at a modest level, around at EUR 2.31 billion cumulatively during the same period.

Annual Adaptation Cost to Sea-level Rise and Residual Damages with Alternative Strategies, 2050–2079
(Billion EUR/year)



Sources: IMF staff calculation, utilizing modeling tool from the Coastal Impact and Adaptation Model (Diaz, 2016).
Notes: the bar chart shows the breakdown costs of SLR, taking the median level of local SLR under RCP 4.5 rom Kopp et al (2014). The confidence interval shows costs using the 5th and 95th percentiles of SLR.

Due to the coarse nature of the model, and to large uncertainties in costs of protection and avoided damages, these scenarios should not be interpreted as exact estimates of investment needs. However, they clearly indicate that protection is highly effective at reducing potential damages from SLR, and that comparing alternatives that entail different mixes of protection and planned inundation while including monetary and non-monetary costs and benefits is an essential component of CBA.

D. Summary of Policy Recommendations

Mitigation

- Replace temporary energy tax reductions and price freezes in response to the energy price surge with further targeted assistance, unrelated to energy consumption
- Convert the CO_2 levy for industry into a feebate
- Convert the CO_2 levy for power into a feebate and harmonize emissions prices across the power and industry schemes
- Consider integrating a CO_2 charge into residential natural gas prices aligned with CO_2 prices in the EU ETS combined with compensation for vulnerable households, unrelated to energy consumption
- Consider a target rate of at least 8 cents per kilometer for the planned transportation tax on driving to align it with estimates of congestion costs
- Promote local congestion pricing pilot schemes with a long-term view to linking kilometer-based fees to congestion
- Complement the shift to kilometer-based taxation in transport with incentives for a market-driven transition to pay-as-you-drive auto insurance
- Link the air travel departure tax to a proxy for CO_2 emissions per passenger trip

Adaptation

The Netherlands represents a good practice for climate change adaptation, particularly to sea-level rise. The estimates of climate change impacts on the Dutch economy are likely to be modest by mid-century, although subject to high uncertainty. The country has put in place a comprehensive legislative and policy framework for adaptation, implemented through a coordination mechanism at national and subnational level.

- Climate adaptation could be further strengthened by holistically integrating it into long-term planning frameworks of the government.
- Government action could further focus on adaptation with large positive externalities, removing barriers to private adaptation, and dealing with equity issues.
- The National Adaptation Plan could also benefit from highlighting the cost of market distortions for adaptation.

Annex I. The Coastal Impacts and Adaptation Model[1]

1. The Coastal Impact and Adaptation Model (CIAM) is a global optimization model for cost-benefit analysis of adaptation to SLR (Diaz, 2016). The model starts from coastal characteristics on 12,000 coastal segments covering the entire global coastline from the Dynamic Integrated Vulnerability Assessment model (DIVA), a tool to assess the biophysical and socioeconomic impacts of SLR. The DIVA tool estimates the SLR impacts by considering coastal erosion, coastal flooding, wetland change and saltwater intrusion (DIVA Modeling Framework). For each coastal segment, CIAM develops economic, population, and SLR scenarios. The SLR scenarios are from Kopp et al (2014). On top of SLR, the model considers the expected value of storm surges to include rare but potentially high-impact events.

2. Using costs of alternative coastal protections, CIAM determines costs and benefits of alternative adaptation strategies (including no adaptation) for each coastal segment. The efficient level of coastal protection is selected by maximizing the net present value of each strategy. Protection can be full – excluding any inundation also under extreme storm surges – or can be partial – accepting storm costs.

3. The model can be used to develop insights on different costs from SLR and different protection strategies (Table A1) in each coastal segment or at different level of aggregation. This SIP aggregates all coastal segments in the Netherlands.

Annex I. Table 1. The Netherlands: Cost Specification in the CIAM

Category	Explanation of the Costs	Measurement of Cost [1]
Protection Cost	Constructing and maintaining protection (generalized as sea walls) to shield the land behind the sea walls from the SLR-caused inundation	A function of the coastline length, the height of the sea walls, and the value of the land occupied by the sea walls
Retreat Cost	Relocation of population and assets from the affected areas, including the forced emigration and the planned retreat	The cost of relocating population and mobile capital in the incremental area of retreat, as well as the cost of demolishing the immobile capital
Inundation Cost	The loss of land and assets due to the SLR-caused inundation	The cost is based on the extent of land endowment lost and the associated value of the land and the capital stock

[1]Measurement of the cost per period. The model optimizes the adaptation strategies over 20 periods

[1] The detailed description of the model can be found in Diaz (2016) and the documentation of the model (https://github.com/delavane/CIAM/blob/master/CIAM%20Documentation.pdf)

Annex I. Table 1. The Netherlands: Cost Specification in the CIAM (Concluded)		
Category	**Explanation of the Costs**	**Measurement of Cost [2]**
Wetland Cost	The loss of wetland due to the inability to migrate inland naturally, constrained by the rate of SLR and the lack of space	The wetland losses take two forms, (1) the total service value of the wetland occupied by the sea walls; (2) the service value of the wetland lost related to the rate of SLR
Flood Cost	The damage to population and asset due to extreme surge	The expected damage associated with the risk of the extreme surge. The likelihood of the extreme events follows the generalized extreme value distribution by using the local surge frequency data from the DIVA tool, while the total land affected by the extreme surge depends on the elevation exposed to a given flood water height.

[2]Measurement of the cost per period. The model optimizes the adaptation strategies over 20 periods

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HOUSING SUPPLY IN THE NETHERLANDS: THE ROAD TO MORE AFFORDABLE LIVING[1]

With the supply of residential dwellings in the Netherlands having failed to live up to demand over the last decade, apprehension among the population about the availability of affordable housing has risen. Particularly spatial, regulatory, planning, environmental and supply chain constraints have kept a lid on construction. Recognizing the socio-economic challenges posed by inadequate housing supply, the government has embarked on an ambitious agenda with promising steps to boost the availability of affordable properties. To strengthen the traction of housing policies to reach its intended goals, a larger role for economic incentives and private sector involvement should be evaluated.

A. Introduction

1. Following an extended phase of contraction after the global financial crisis, the Dutch housing market has experienced a prolonged period of remarkable price increases. After reaching a trough in mid-2013, house prices have nearly doubled, thereby also surpassing their previous peak seen on the eve of the global financial crisis by more than half. Demand was supported by a decline of mortgage interest rates towards historic lows, advantageous borrowing conditions, e.g., in the form of rather generous loan-to-value limits or the existence of interest-only mortgages, and a tax system strongly favoring the ownership of homes. In addition, net migration as well as the formation of new—and smaller—households have grown at relatively robust rates over the past decade, further contributing to sustained demand for living space. As a result, housing valuations in the Netherlands are among the highest in the euro area with model-based estimates indicating an overvaluation of 14 percent in 2022:Q2.[2] At the same time, residential properties are the least affordable when measured on the basis of price-to-income ratios which have risen by more than 50 percent since 2015.

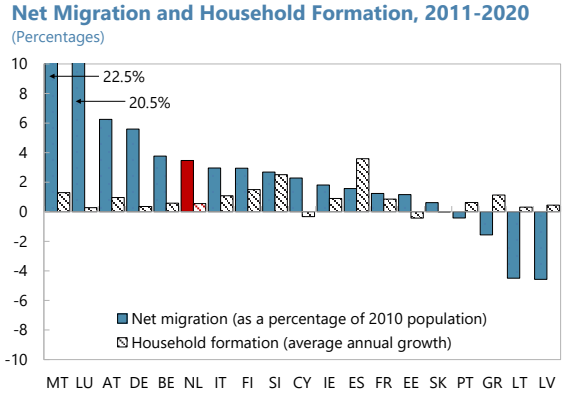
2. Aware of possible macro-financial and social-economic consequences of expensive and richly valued housing, various polices have been adopted to attenuate imbalances. Since January 1, 2013, the authorities established legally binding rules that only up to half of a property's market value can be financed with interest only mortgages. In addition, it was decided to progressively tighten loan-to-value ratios to a 100 percent maximum by 2018 and introduce a framework for evaluating the debt-service-to-income burden of households. In January 2022, the Dutch central bank introduced minimum risk weights for mortgage loans. While these measures have primarily targeted the mitigation of macro-financial risks by preventing a further rise in elevated household indebtedness, they may have also contributed to dampening price increases by putting limits on the size and availability of mortgages. Moreover, taxation has been repeatedly

[1] Prepared by André Geis (EUR). The analysis benefitted from excellent research assistance by Yushu Chen (EUR) as well as helpful comments and suggestions by Bernardin Akitoby (EUR).

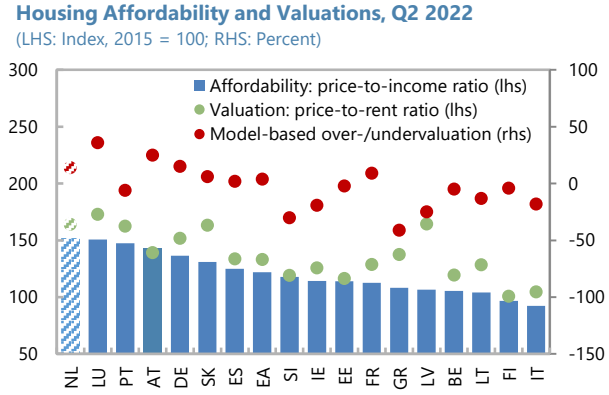
[2] For details about the methodology employed to estimate the model-based housing valuations presented in the chart, see ECB (2011) and ECB (2015).

modified from January 2013, including by limiting mortgage interest tax deductibility to amortizing contracts of up to a 30-year maturity and gradually lowering of the applicable rate for higher income households.[3] By reducing the attractiveness of the (debt-financed) acquisition of owner-occupied housing, such adjustments to the tax code may have helped to curb demand and prices. More recent tax changes, however, may have the opposite effect, such as the differentiation since 2021 of taxes for real estate transactions between individuals buying their first owner-occupied property, acquirers of their second or following home and investors in buy-to-let residential real estate, or gift tax exemptions in place since 2022 for the purchase of the beneficiary's own home. Lastly, the Netherlands maintains a large social housing stock and an extensive system of rent control, aiming to contain the rental expenses of households unable or unwilling to purchase a home.

Figure 1. Demographic Trends and Housing Valuations



Sources: Eurostat and IMF staff calculations.



Sources: OECD and ECB.

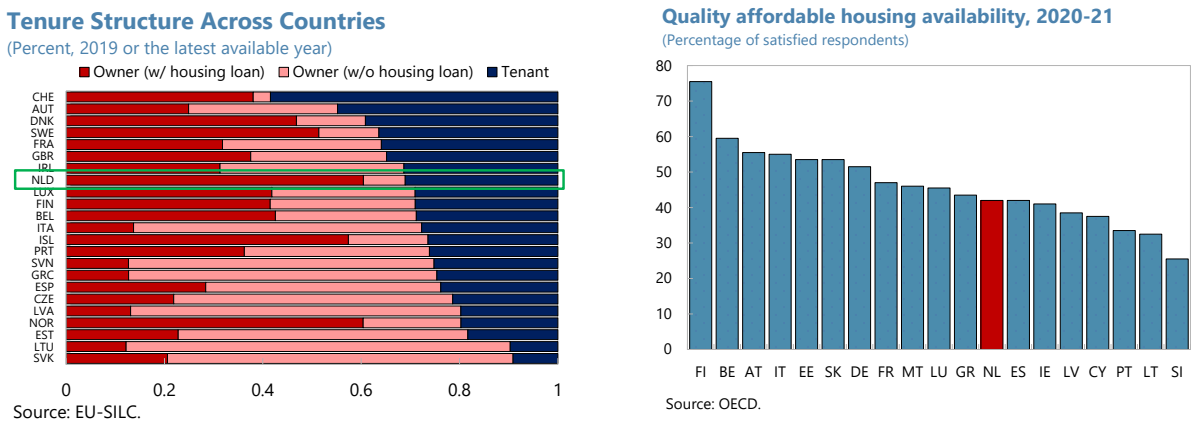
3. Despite a tight residential property market, supply has lagged, heightening concerns about the availability of quality affordable housing. A large majority of Dutch households are living in rental accommodation or in a mortgaged home, reflecting the widespread accessibility of dwellings at below-market rents and tax incentives favoring an owner-occupied property carrying debt. At the same time, survey-based evidence is pointing towards apprehension about the affordability of homes of satisfactory quality among households, indicating perceived weaknesses regarding the functioning of the housing market. Indeed, the unresponsiveness of supply to price signals has been a long-standing characteristic of the housing market in the Netherlands, with the failure of many construction companies during the 2009–2013 downturn in house prices further hampering the provision of homes.[4] Against this background, the following analysis provides an overview of government polices meant to help renters and buyers of residential property to obtain a home and sketches some of their socio-economic implications. It then recaps medium-term

[3] Non-amortizing mortgages originated before 2013 remain eligible for mortgage interest tax deductibility.

[4] Various cross-country studies are putting the supply elasticity of housing in the Netherlands at the lower end of estimates. See, for instance Caldera and Johansson (2013) or, more recently, Inchauste et al. (2018) and Cavalleri et al. (2019).

developments in Dutch housing supply and some of the obstacles in the way of bolstering more construction. Lastly, it highlights the key policy proposals adopted by the government in office since January 2022 before developing some recommendations to deal with the challenges of an unbalanced housing market.

Figure 2. Tenant Structure and Housing Affordability



B. Existing Government Housing Policies and Socio-Economic Implications

4. Rent controls and social housing are one of the planks with which the authorities strive to ensure the availability of affordable living. Rental dwellings in the Netherlands are classified with the help of an elaborate points system, ranking properties according to their market value as well as characteristics such as size, amenities or energy efficiency.[5] Homes falling below a certain point threshold are attributed to the rent-controlled (social) sector with monthly rents capped at a maximum amount and annual rent increases limited to wage growth agreed in collective labor agreements minus 0.5 percent.[6] Free market rentals above the threshold are subject to the same strictures for existing tenants but can be offered to new occupants without constraints.[7] Regulated rentals are constituting about three quarters of all rental properties in the Netherlands.[8] Non-profit housing associations are accounting for nearly four fifths of the supply of rent-controlled dwellings with eligibility primarily determined by household income.[9] Housing associations are

[5] For the current calibration of the framework, see https://wetten.overheid.nl/BWBR0003237/2022-07-01.

[6] For 2023, the maximum monthly rent in the rent-controlled sector was set at €808.06.

[7] From May 1, 2021 to May 1, 2024, however, the government has also imposed restrictions on permissible rent increases for free market rentals, first following the inflation plus 1 percent rule applicable to rent-controlled housing yet replacing it with a wage increase plus 1 percent approach from 2023 if wage developments remain below inflation.

[8] With the recent announcement of plans by the government to broaden the scope of the points system, about 96 percent of rental properties will be subject to rent control.

[9] In 2023, housing associations will have to allocate at least 92.5 percent of their rental property supply to households with an annual income of less than € 44,035 (single-person household) and € 48,625 (multi-person household). The remainder could be allocated to households above these thresholds.

subject to a public service mandate, obliging them to offer affordable homes, including for priority groups such as the elderly, and to contribute to livable neighborhoods. In turn, they benefit from a state guarantee on their borrowing and municipalities may give them preferential access to land at below-market prices. The remaining fifth of rent-controlled dwellings is provided by for-profit and individual parties, chiefly because the points attributed to their properties fall below the eligibility threshold for the free market, due to, for instance, the small size of single-occupant offerings. For low-income tenants with limited assets, a monthly allowance to subsidize rental payments is available.[10]

5. Generous tax subsidies and borrower-friendly mortgage market characteristics favor owner-occupied dwellings. Although the taxation of owner-occupied housing has been tightened in recent years, its tax status remains favorable. Housing continues to be subject to taxation in Box 1 of the Dutch income tax code where taxes paid on a comparatively low level of imputed rent are more than compensated for by tax expenses claimed for mortgage interest, leaving housing (wealth) much more advantageously taxed than other forms of savings or investment that are subject to taxation in Box 3.[11] While reducing the rate at which mortgage interest can be deducted from 52 percent in 2018 to 37 percent by 2023 is diminishing the benefits accruing to home owners, they are at least partly offset by the parallel decline of the share imputed rents constitute of a property's value, from 0.70 to 0.35 percent, as price increases in houses have outpaced corresponding rises in rents over the same period.[12] In addition, the government waves the 2 percent transaction tax for first-time buyers of a home with a value of up to €400,000 who are aged between 18 and 35 years and maintains a tax exemption for gifts up to €106,671 for recipients aged between 18 and 40 years if the proceeds are used for the purchase or renovation of an owner-occupied home.[13] Likewise, loan-to-value limits on mortgage lending, at 100 percent, are among the highest in the euro area which, particularly in combination with still generous mortgage interest tax deductibility, makes borrowing against housing collateral an attractive proposition. Moreover, half of a home loan can be financed with an interest-only mortgage, requiring no amortization, although tax advantages for such funding arrangements have been abolished in 2013.

6. Housing market polices of the government to make access to rental or owner-occupied properties more equitable and affordable seem to fall short of their desired goals. Indeed, the share of disposable income Dutch households need to allocate to housing is

[10] For current eligibility requirements, see https://wetten.overheid.nl/BWBR0008659/2023-01-01.

[11] For an overview of the Dutch capital income tax system, see, for example, Klemm et al. (2021). For a particular focus on the taxation of housing in the Netherlands, also in comparison to other countries, see Geis and Luca (2021).

[12] See OECD (2021b).

[13] On January 1, 2023, the home value for which the transfer tax exemption applies was raised to €440,000. At the same time, the transfer tax for purchasers of owner-occupied properties who are not first-time buyers remained at 2 percent while it increased from 8 percent to 10.4 percent for acquirers of buy-to-let housing. After an evaluation of the scheme, the gift tax exemption was lowered to €28,947 on January 1, 2023 and will be abolished from January 1, 2024.

comparatively high. Particularly renters face much steeper costs than the euro area median while the burden for owners with a mortgage has closely followed the trend decline seen in the median euro area country. Moreover, rental expenditure as a share of total household consumption is elevated in a euro area context, driven by both actual rentals (third highest share) and, to a lesser extent, imputed rentals (seventh highest share). Such discrepancies between owners and renters also bear on distributional equity. For owners whose home serves as collateral for a mortgage, housing cost burdens ranged from 15 percent of disposable income for the top quintile of households to 24 percent for the bottom quintile in 2010 but had gotten compressed to a 12–15 percent span by 2020. By contrast, renters spent between 17 percent (top quintile) and 36 percent (bottom quintile) in 2020 against 14–32 percent in 2010, signaling worsening inequality between owners and renters as well as among renters over time, further aggravated by multi-year waiting periods for admission to rent-controlled social housing.[14] In addition, home ownership rates in the bottom two income quintiles are far below the median country in the euro area and have not improved since 2010, suggesting that most of the tax benefits of owning a property are accruing to better situated households.

7. Government policies to support tenants and owners involve sizeable budgetary costs, heighten financial vulnerabilities and aggravate housing market distortions. According to OECD figures, foregone revenues due to mortgage interest tax relief amounted to 1.3 percent of GDP in 2019 with spending on housing allowances requiring outlays of 0.5 percent of GDP in 2020.[15] Furthermore, the tax-advantaged status of owner-occupied housing incentivizes households not only to acquire their home but also to leverage their investment to the maximum extent possible to make full use of the benefits implied by mortgage interest tax deductibility. As a result, the debt burden of Dutch households is among the highest in the euro area with about two fifths of the outstanding mortgage stock accounted for by interest-only products, raising risks for macro-financial stability in the event of a housing market downturn. Lastly, the subsidization of social and owner-occupied housing has contributed to a crowding out of the private rental market since the end of the World War II even though there have been some signs of a reversal in recent years.[16] Such limited availability of private rental offerings is burdening tenants who are ineligible for social housing and unable or unwilling to buy a home with hard-to-find and pricey accommodation.

C. Challenges to Revive a Flagging Housing Supply

8. Residential investment has trailed the euro area average, particularly in the years since the global financial crisis and the 2009–2013 bust in the Dutch housing market. While real

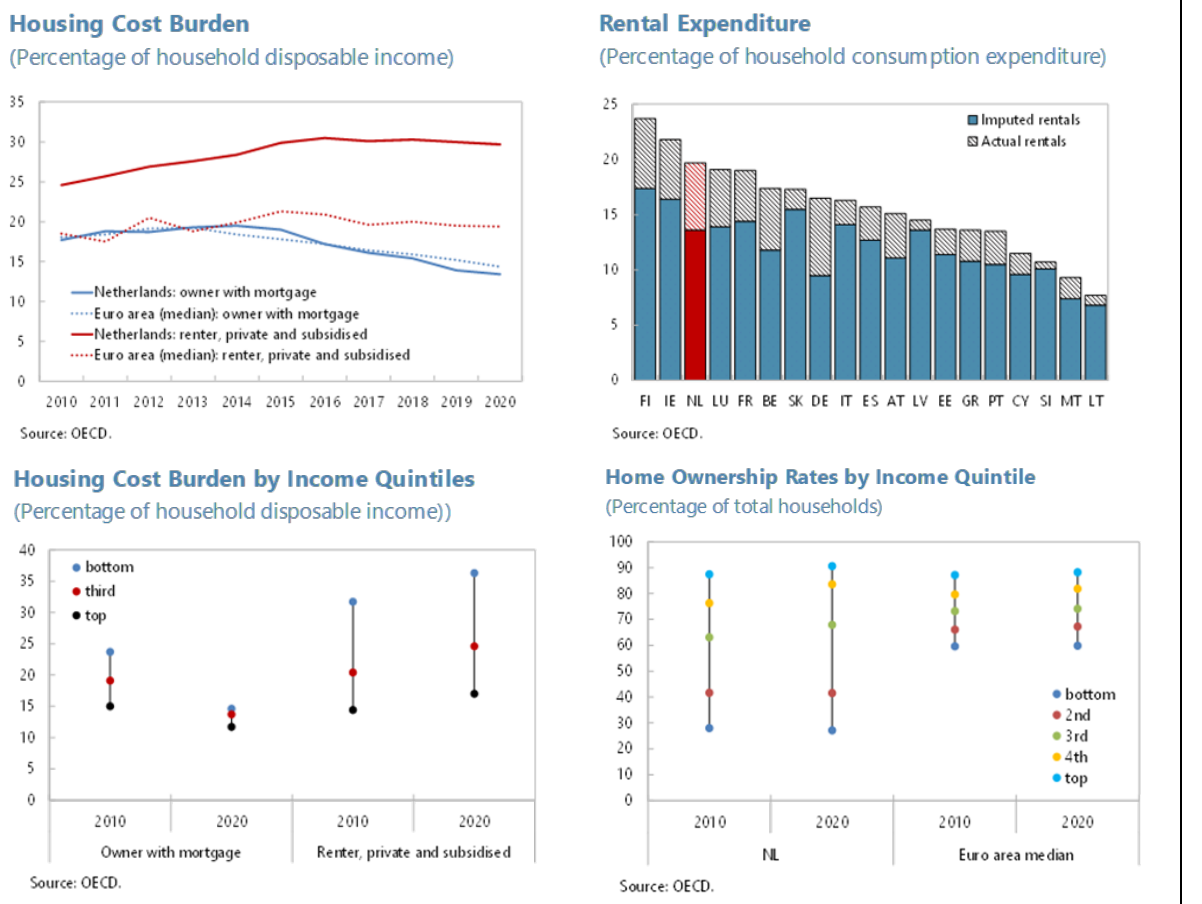
[14] Kromhout and Wittkämper (2019) show that, depending on the region, waiting periods for social housing can last from 2.0 to 13.7 years.

[15] See OECD Questionnaire on Affordable and Social Housing, various vintages (https://www.oecd.org/housing/data/affordable-housing-database/).

[16] See Scherpenisse and Schilder (2018).

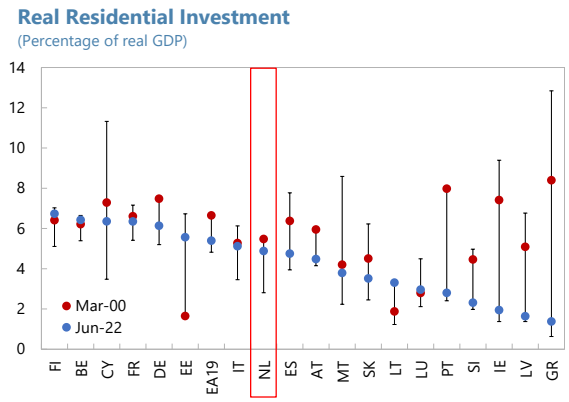
investment in homes as a share of real GDP has recovered from its late 2013/early 2014 trough, it remains some way off the euro area average and noticeably below the level in neighboring economies, such as Belgium, France, or Germany. Likewise, residential building permits have yet to return to the numbers prevailing in the decade before the global financial crisis. As a result, the rise in the Dutch housing stock per head has stayed among the lowest in the euro area, falling short of demographic requirements, both from a national and an intra-regional perspective.[17]

Figure 3. Housing Cost Burdens and Distributional Equity Implications

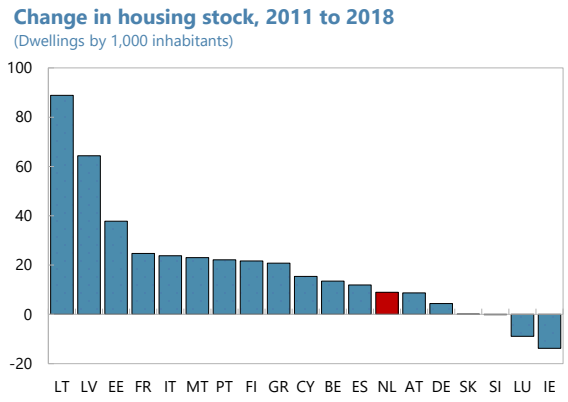


[17] Öztürk et al. (2019) find that house prices in the Netherlands show a much higher sensitivity to income shocks in municipalities with strong as opposed to weaker supply constraints, pointing towards notable heterogeneity of the Dutch housing market and the important role played by supply constraints for the development of house prices.

Figure 4. Housing Investment



Sources: Eurostat and IMF staff calculations.



Source: OECD.

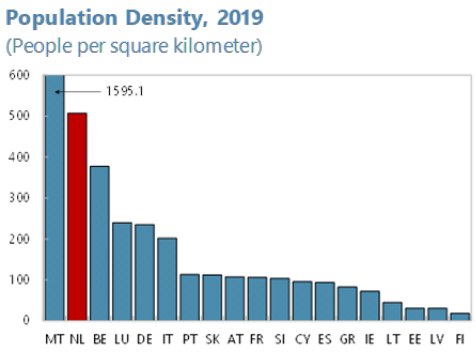
9. Improving the supply of housing in the Netherlands is confronting a confluence of challenges, including spatial, regulatory, planning, environmental and supply chain constraints. After Malta, the Netherlands are the most densely populated country in the euro area, limiting the scope for residential development and the associated infrastructure, also reflecting competition from other uses, such as agriculture, industry or commerce. Consequently, building plans, codes and regulations are striving to meet multiple desirable goals, such as ensuring a high degree of livability, environmental sustainability, a balanced social fabric and the preservation of cultural heritage. However, such considerations are also lengthening permit procedures and are increasing the complexity of construction projects, particularly when pursued in a decentralized fashion at the level of individual municipalities. They are therefore prone to raising the costs for developers with the potential to undermine incentives for the provision of housing. Moreover, the capacity for planning and executing real estate projects appears to have dwindled in the private and public sector in recent years, partly as a result of the prolonged housing market downturn in the early 2010s, including construction personnel and staff familiar with planning and land use policies.[18] More recently, labor market shortages and other supply bottlenecks have aggravated the situation, also contributing to a steep rise in construction costs. Lastly, environmental factors have gained in prominence. In particular, improving the sustainability of existing buildings will draw away resources from the provision of new housing.[19] Besides, breaching thresholds for nitrogen emissions, primarily

[18] By mid-2022, around 400,000 people were employed in the Dutch construction sector, far below the 520,000 at the end of 2008. In their extensive review of the Dutch housing market, Hekwolter of Hekhuis et al. (2017) mention a lack of planning capacity as one of the obstacles preventing a stronger response of housing supply to rising demand.

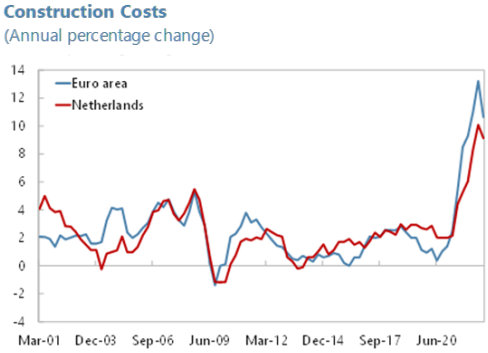
[19] As part of reaching the ambitions of its "Fit for 55" agenda, EU (2021) proposes minimum energy performance standards, requiring the worst-performing 15 percent of the building stock of each Member State to be upgraded from Energy Performance Certificate Grade G (=least efficient) to at least Grade F by 2027 for non-residential buildings and by 2030 for residential buildings. New (public) buildings must be zero-emission by 2030 (2027). In the Netherlands, about 30 percent of the building stock is ranked E or below.

by the large agricultural sector, has also affected lesser emitters, such as the building industry, thereby putting a halt to some construction projects.[20]

Figure 5. Population Density and Construction Costs



Sources: Eurostat



Sources: Eurostat and IMF calculations

D. The Way Forward: Government Proposals and Policy Recommendations

10. Acknowledging the role of inadequate housing supply, the Dutch government has embarked on an ambitious agenda to start tackling an imbalanced market. Proposals contained in its "Programma Woningbouw" foresee the building of 900,000 homes by 2030 at a pace of 100,000 units per year.[21] To achieve some of the desired upscaling of the housing stock, housing associations committed to construction targets and ensuring the sustainability of existing homes, helped by the abolishment of the landlord levy for rent-controlled properties on January 1, 2023 which had sapped funds from investment in affordable dwellings and may create space for lowering rents.[22] Furthermore, the central government's role in guiding housing policy is to be strengthened by the adoption and monitoring of enforceable performance agreements with provinces, regions and municipalities setting out construction targets aligned with national plans. In addition, lead times between conception and completion of housing projects, averaging 10 years, are to be reduced, helped by the identification of bottlenecks, the streamlining of building regulations, the shortening of legal procedures and the enhancement of relevant expertise across various government bodies. Moreover, financial support will be made available to induce municipalities to develop land for the provision of housing. As a complement to boosting the supply of housing, affordable living remains a key concern for the government. Its "Betaalbaar Wonen" program stresses expanding the scope of rental regulation, facilitating market access for acquirers of owner-occupied properties as well as better protection of tenants and buyers of homes.[23]

[20] For a detailed overview of the challenges posed by the large nitrogen emissions of the Dutch agricultural sector, see Batini et al. (2021).

[21] See Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (2022a).

[22] Since 2013, providers of rent-controlled accommodation owning more than 50 dwellings have paid a landlord levy based on the value of their buildings as determined by the Valuation of Immovable Property Act.

[23] See Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (2022b).

11. While the government's plans hold promise for alleviating housing market pressures, a larger role for economic incentives and private sector involvement could be explored. Encouragingly, a lack of supply has been recognized as one of the key factors driving imbalances in the Dutch housing market. Furthermore, working towards a greater centralization of housing development by improving co-ordination between national and sub-national government entities is welcome, as are efforts to accelerate planning and building, measures to prompt municipalities to bolster residential construction or policies to ensure the affordability of homes. However, some of the avenues pursued seem to run counter to achieving the desired objectives and could benefit from a fuller examination of the appropriate calibration of economic incentives, also to leverage private sector participation towards accomplishing the government's aims. In particular,

- The dominant position of housing associations in the Dutch residential property market and their prominent engagement foreseen in the government's program for expanding the housing stock deserves re-consideration. While such institutions have a role to play in offering affordable housing to less advantaged groups, their non-profit status and the numerous subsidies they enjoy tilts the playing field against other providers of homes. In fact, it is striking that housing associations, in conjunction with owner-occupied accommodation, have nearly completely crowded out the private rental sector in the Netherlands since the end of World War II, notwithstanding some signs of a reversal in recent years. Consequently, the benefits and costs of their activity should be carefully evaluated, especially with regard to households that are ineligible for their services but need or want to live in rental accommodation and concerning their ability to fulfill their mandate as waiting times for social housing appear disproportionally long.

- The extensive rent control system should be revisited. At present, the value and quality of a property govern whether a dwelling is subject to rent control, thereby establishing ceilings particularly for smaller properties positioned at the lower end of the market. Such ceilings, however, restrict supply as potential providers may retrench for lack of an adequate return on investment, a gap that is currently not sufficiently filled by housing associations. As a result, households who cannot gain (immediate) access to social housing due to lack of eligibility or long waiting times are forced to rely on the narrow free rental market or to buy their own home, implying considerable welfare costs from an allocative outcome that is unlikely to be pareto-optimal.[24] Indeed, recent OECD estimates are indicating that the Netherlands is one of the countries that could benefit most from the deregulation of its rental market.[25] Therefore, the scope for gradually narrowing the number of rent-controlled accommodations should be investigated to create incentives for the private sector to offer sorely needed living space, thereby complementing the efforts by housing associations to advance the government's agenda. The possible drawbacks of such a strategy, like higher rents in some segments of the

[24] Plans of the government to expand the system of rent control to encompass more properties on the free rental market may improve the supply of affordable rental dwellings for households that are ineligible for social housing. At the same time, however, they may further blunt the incentives of private providers of housing to bolster supply.

[25] See OECD (2021a).

market, could be cushioned by a more generous, yet rigorously means-tested, configuration of the existing housing allowance framework. Absent broader reform, at least some of the parameters of the prevailing rent control system should be modified. For instance, once a dwelling is assigned to the rent-controlled sector, it cannot be re-allocated to the free rental market, even if interim changes to its value or characteristics would suggest otherwise, as long as its current tenant remains in place. Where possible, such rules should be made more flexible as they create lock-in effects by inducing renters to stay in an accommodation for which they effectively underpay which also constrains the supply of properties that are suitable for lease in the free rental market.

- The eligibility criteria applied to the social housing sector should be reviewed. Currently, the income thresholds guarding access to social housing are notably above the income of the median Dutch household, opening the sector to large parts of the population. Such leniency appears only justified in the context of an undersupplied free rental market and fuels demand for an already scarce resource. Against this background, the recent announcement by the government to loosen eligibility further, complemented by an expansion of the share of dwellings subject to rent control, seems ill-advised. Rather, eligibility should be limited to groups for which the provision of housing on below-market terms is necessary out of socio-economic considerations, yet only once an adequate offer of affordable rental properties outside the social housing sector has been assured. In addition, more regular means-testing of eligibility for social housing is advisable. In the moment, income is only assessed for compliance with the thresholds for social housing at the time of rental contract signature, discounting any improvement thereafter, and household wealth is not taken into account. Although opportunities have been widened for housing associations to raise rents at a faster pace than suggested by the rule applicable to rent-controlled dwellings, such mechanisms are hardly used and could be strengthened to entice better situated tenants to transition to the free rental market.

- The scope for complementing housing-related performance agreements between government entities with additional pecuniary incentives for municipalities, landowners and real estate developers should be explored. As highlighted in the government's "Programma Woningbouw", municipalities do insufficiently benefit from new construction while bearing a large part of its economic and political costs, e.g., by having to provide the needed infrastructure or confronting entrenched interests against additional building. As a remedy, options for municipalities should be contemplated to capture a larger share of the extra tax revenue created by more populous communities or to seize some of the increase in value once publicly owned land gets authorized for development.[26] Likewise, privately owned land that is designated for residential construction yet is left to lie idle could be subjected to more onerous land value taxes to encourage productive use.[27] Finally, the transaction tax hike introduced for acquirers of existing, not owner-

[26] See Bani et al. (2022) for a proposal.

[27] See Frayne et al. (2022) for a suggestion.

occupied properties from January 1, 2023 could be usefully accompanied by tax incentives for developers of new housing.

12. In addition to measures tailored towards the supply of affordable rental dwellings, policy levers to steer the owner-occupied housing market should be forcefully deployed. The subsidization of owner-occupied properties via generous mortgage interest tax deductibility, favorable transaction taxes and liberal mortgage borrowing constraints are costly and distort the market. Specifically,

- Efforts to phase out the subsidization of owner-occupied housing should continue, preferably at an accelerated clip. Ideally, housing should be moved to Box 3 of the Dutch income tax code, to ensure taxation in line with other forms of investment while recording an appropriate level of imputed rent as income. The reform of Box 3 taxation demanded by the Dutch Supreme Court in December 2021 appears to open a window of opportunity in this regard. In the event of an unchanged tax treatment in Box 1, phasing out mortgage interest deductibility at a faster pace than currently intended while lifting imputed rent to a more realistic level should take priority. The fiscal outlays implied by the present framework of subsidization are large and could be better used to address shortcomings in other parts of the housing market, particularly since they benefit better off households to a substantial degree. According to OECD estimates, eliminating mortgage interest rate deductibility could reap considerable rewards in terms of affordability.[28]

- Macroprudential regulation of mortgage borrowing should tighten. Employing relatively loose settings of loan-to-value ratios and availing the use of interest only debt to facilitate housing affordability appears second best as it enables buyers of owner-occupied properties to outbid each other in a supply-constrained market, raising prices and heightening macro-financial vulnerabilities. Therefore, loan-to-value ratios of 100 percent should be reduced to levels more in line with international practice[29], the possibility to allow for a 50 percent interest only component in mortgage lending should be curtailed and the setting of debt-service-to-income ratios could be made more sensitive to financial stability considerations.

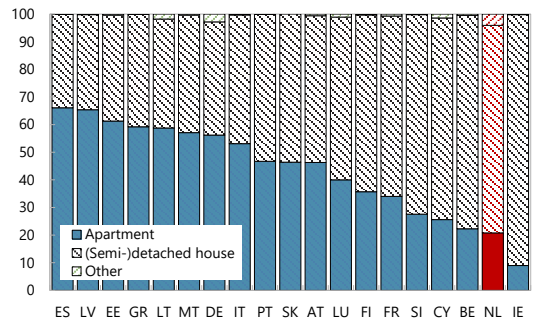
13. Lastly, possibilities to streamline land use policies and building regulations should be examined, jointly with the continued pursuit of innovative ways to create more living space. The largely decentralized model followed by The Netherlands puts responsibility for the development of housing primarily with municipalities, leading to local considerations taking precedence over national priorities in the provision of dwellings and a fragmentation of building codes. Thus, the performance agreements between different echelons of government foreseen in the "Programma Woningbouw" are a step in the right direction to ensure that long-term housing

[28] See again OECD (2021a).

[29] Alessie et al. (2022) find only limited adverse effects from a lowering of loan-to-value ratios for first-time buyers of homes, thereby weaking an argument frequently made against their reduction.

supply is aligned with demand at the country level. In addition, a stronger focus on the harmonization and simplification of frameworks applying to land use and the construction of residential properties may help to shorten permitting procedures and imply economies of scale for developers of housing. Besides, untapped potential for residential densification warrants study. Compared to other euro area countries, the current composition of the Dutch housing stock seems to reveal a preference for living in (semi-)detached houses rather than apartments, despite a very high population density. Therefore, strengthening efforts to split existing residences into smaller units or to entice households to move to properties more appropriate for their size may help alleviate some availability and affordability constraints. Finally, advancing construction in areas further away from difficult to develop urban centers may also contribute to lessen housing shortages if combined with efficient transport infrastructure to exploit desirable job and leisure opportunities.

Residential Dwelling Stock by Type
(Percentages)



Source: OECD.

14. To maintain political and public support for interventions in the housing market, policies need to be appropriately phased and carefully calibrated. The Dutch housing market is characterized by substantial complexity and extensive regulation. Consequently, modifying policies will create winners as well as losers, requiring the strategic adjustment of measures, conscientious timing and clear communication. For example, eliminating rent controls and tightening eligibility criteria for social housing appears inconceivable in a market where an alternative supply of affordable rental accommodation is hardly available. Therefore, the government's overarching focus on measures to boost supply in its agenda for the housing market is welcome. Still, an eye should be kept on gradually removing market-distorting policy settings over time that impose non-negligible welfare costs on Dutch households and the economy.

E. Conclusions

15. The Dutch housing market is characterized by persistent imbalances with long-standing supply constraints one of the key determining factors. Despite a range of policies adopted over the last decade, primarily to reduce debt-financed demand for owner-occupied properties, housing valuations have risen while affordability and availability have declined as supply has not kept pace. Spatial, regulatory, planning, environmental and supply chain constraints have kept a lid on the construction of dwellings following the housing market downturn in the early 2010s.

16. Recognizing the socio-economic challenges posed by inadequate housing supply, the government has embarked on an ambitious agenda to provide more affordable living. Whereas the very gradual phase-out of the generous tax treatment of owner-occupied properties begun in 2018 is set to continue, leaving substantial parts of the population eligible for rent-controlled social housing remains one of the planks of government policy. Additional efforts are

centered on the construction of new homes by improving the co-ordination of housing development at the national and sub-national level, facilitating building-related regulations and procedures, enhancing public sector capacity to plan and execute projects, and offering financial support to municipalities to foster the supply of dwellings.

17. The scope for economic incentives and private sector involvement to strengthen the traction of government housing policies should be evaluated. Specifically, the substantial role attributed to housing associations in the residential property market could profit from a full-fledged cost-benefit analysis. Likewise, an in-depth assessment of the impact of liberal eligibility criteria for social housing and extensive rent control on economic welfare seems warranted as prevailing imbalances and market distortions suggest substantial room for improvement. Indeed, relaxing rental regulation and narrowing access to social housing in conjunction with ascertaining a better supply of properties on the free rental market, also by setting appropriate incentives for municipalities, landowners and developers, should be contemplated. Furthermore, the phase-out of generous taxation and borrowing arrangements favoring owner-occupied dwellings should be accelerated due to considerations of social equity and financial stability. Lastly, possibilities to harmonize, streamline and simplify provisions guiding construction as well as the use of land and buildings should be exploited to a maximum extent to facilitate the creation of sufficient and affordable living space for a growing number of households.

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