



TE TAI ŌHANGA
THE TREASURY

Ngā Kōrero Āhuarangi me te Ōhanga

Climate Economic and Fiscal Assessment (CEFA)

Technical Appendix 1: Emissions Trading Scheme
fiscal forecasting

September 2023

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About this document

This document sets out the technical details and processes underpinning the calculations in *Ngā Kōrero Āhuarangi me te Ōhanga* Climate Economic and Fiscal Assessment (referred to as the CEFA).

This is one of three technical appendix documents:

- **Appendix 1: ETS fiscal forecasting** (this document) to support section 6.4 *Fiscal Impacts of the NZ ETS* in the CEFA.
- **Appendix 2: Methodology for scenario analysis of fiscal risk from offshore mitigation** to support Section 7 *New Zealand's first Nationally Determined Contribution – scenario analysis of fiscal risk from offshore mitigation*.
- **Appendix 3: Greenhouse gas emissions projections** to support Section 7 *New Zealand's first Nationally Determined Contribution – scenario analysis of fiscal risk from offshore mitigation*. Appendix 3 was led by MFE and supported by MPI, MBIE and MoT.

Introduction

The New Zealand Emissions Trading Scheme (ETS) has fiscal implications for the Crown. To capture these implications, the Treasury publishes ETS forecasts at each Economic and Fiscal Update. Stocks and flows of New Zealand Units (NZUs)¹ are valued using prevailing prices in the secondary market for NZUs.

In reality, NZU prices are highly volatile and may differ from assumed forecast prices. This report analyses scenarios where these prices are higher or lower than the current secondary market spot price, focusing on the fiscal implications for:

- Cash proceeds from ETS unit auctions
- Revenue from ETS unit surrenders, and
- Expenses from ETS unit allocations.

This appendix explains the modelling approach for this scenario analysis. It does not consider the impact of variations in the volume of NZU flows.

The scenarios for ETS fiscal impacts included in the CEFA were based on regulated ETS settings at the time of publication, which were the settings as at December 2022. The Government has since updated the ETS unit and price settings. Updates to settings will be reflected in any future updates of this analysis.

¹ Emissions credits within the ETS.

Overview of ETS fiscal impacts

Overall, the ETS is fiscally positive, generating Crown revenue and decreasing net debt. However, events can impact Crown revenue, expenses, net debt and net worth differently. In summary:

Table 1: Fiscal impacts of events within the ETS

Event	Description of Fiscal Impact
NZUs auctioned	<i>Cash Inflow</i> ETS auctions produce a cash inflow for the Crown. In 2022, actual ETS cash receipts were \$2.096 billion. ²
NZUs surrendered	<i>Revenue</i> ETS participants have an obligation to surrender NZUs when they produce emissions. The settlement of this obligation when units are surrendered is reported as sovereign revenue, with the revenue amount depending on secondary market NZU prices at the time of surrender. For example, as at 16 February 2023, the secondary market spot price was \$71.80 per NZU.
NZUs allocated to participants	<i>Expense</i> The ETS results in Crown expenses when ETS participants are allocated NZUs at no cost. These allocations are primarily to forestry participants who earn NZUs as their forests grow and sequester carbon, and industrial participants who receive allocations to mitigate adverse economic impacts from the ETS. As with revenue, the amount of this expense is determined by secondary market spot prices at the time of issue.
NZUs held by participants	<i>Liability</i> The large supply of NZUs held by ETS participants, known as the 'stockpile', is a <i>liability</i> for the Crown because the Crown has an obligation to accept NZUs in consideration for ETS participants' emission responsibilities. ³ As of the 2022 Half Year Economic and Fiscal Update, there were around 133 million NZUs in the stockpile valued at around \$11.3 billion, based on the secondary market price at 31 October 2022. ⁴ The value of this liability varies with the price of NZUs. While gains and losses from price swings could be significant to Crown net worth, the stockpile has no direct cash impact and is not counted in net debt.

² https://www.treasury.govt.nz/sites/default/files/2022-12/hyefu22_2.pdf#page=128

³ Under Generally Accepted Accounting Practice, a liability is defined as a present obligation to provide a future benefit to some other entity.

⁴ https://www.treasury.govt.nz/sites/default/files/2022-12/hyefu22_2.pdf#page=136

Assumptions used for ETS fiscal scenarios

Price assumptions

Three modelled scenarios are considered in this report, based on different assumptions of future NZU prices using the Government's previous ETS auction price control settings for 2023 – 2026.⁵ It is assumed that secondary market prices and auction prices are always equivalent.

The three modelled scenarios in this report are as follows (also illustrated in Figure 1 and Table 2 below):

1. *“Relatively high NZU price” scenario*

In this scenario, NZU prices in each year align with the auction price 'ceiling' as defined in recent ETS regulations. The price 'ceiling' is a reserve of NZUs (the 'Cost Containment Reserve') available for sale if a trigger price is reached at auction; generating additional supply of NZUs available at auction eases prices. While this price 'ceiling' does not prevent secondary market trading at a higher price, it reflects an upper bound on prices the Government considers 'acceptable'.

2. *“Central NZU price” scenario*

In this scenario, NZU prices in each year align with the mid-point between the regulated auction price 'floor' and price 'ceiling'. The price 'floor' is the regulated minimum price at which NZUs will be auctioned.

3. *“Relatively low NZU price” scenario*

In this scenario, NZU prices in each year align with the price 'floor' as defined in recent ETS regulations. As with the price 'ceiling', the regulated price 'floor' does not prevent secondary market trading at a lower price.

⁵ Our analysis was based on ETS auction price control settings decisions in December 2022. The Government has since updated the ETS auction price controls. See <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/nz-ets-market/annual-updates-to-emission-unit-limits-and-price-control-settings/> for more information.

Figure 1: ETS price scenarios

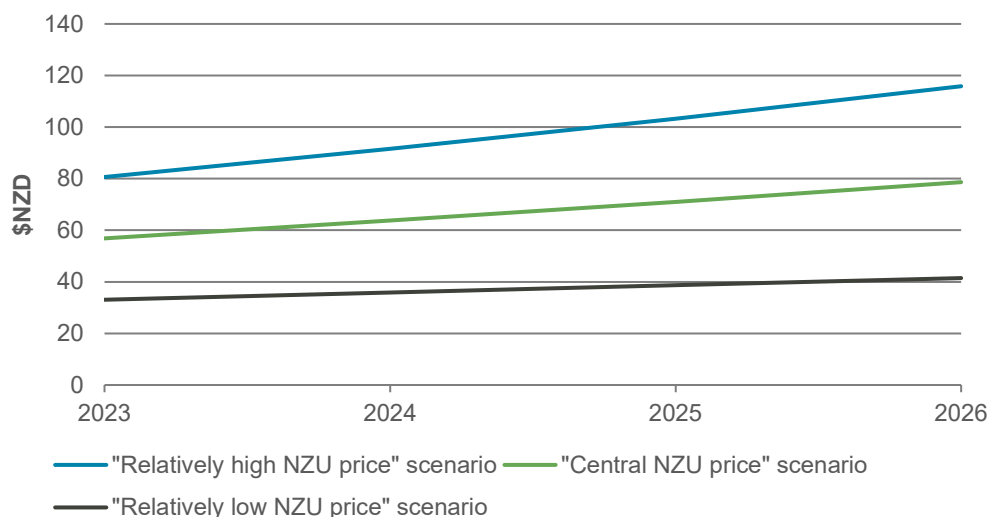


Table 2: ETS price scenarios

Price (\$):	2023	2024	2025	2026
"Relatively high NZU price" scenario	80.64	91.61	103.24	115.84
"Central NZU price" scenario	56.85	63.76	70.96	78.65
"Relatively low NZU price" scenario	33.06	35.90	38.67	41.45

These three price scenarios are used for the modelled fiscal flows below.

Volume assumptions

The volume assumption for each fiscal flow is constant across each price scenario considered. Auction volumes are drawn from announced auction volumes in recent ETS regulations, while surrender and allocation volumes are based on projections provided by the Ministry for the Environment. More detail on these volume assumptions is provided below.

Auction proceeds

The Government auctions some NZUs directly to the market. The total cash inflow equals:⁶

$$ETS \text{ auction cash proceeds} = \text{volume sold} \times \text{auction clearing price}$$

Assumptions about future auction volumes and prices are therefore critical for producing a scenario analysis of auction proceeds over time. The analysis presented in this report relies on the below assumptions.

⁶ All auctioned units are sold at the clearing price; this is the price of the lowest successful bid.

Auction volume assumptions

Our analysis uses auction volumes for 2023 – 2026 derived from recently updated ETS regulations. This analysis assumes that no additional NZUs are released from the Cost Containment Reserve (CCR).⁷ Table 3 below provides these figures, as published by the Ministry for the Environment:⁸

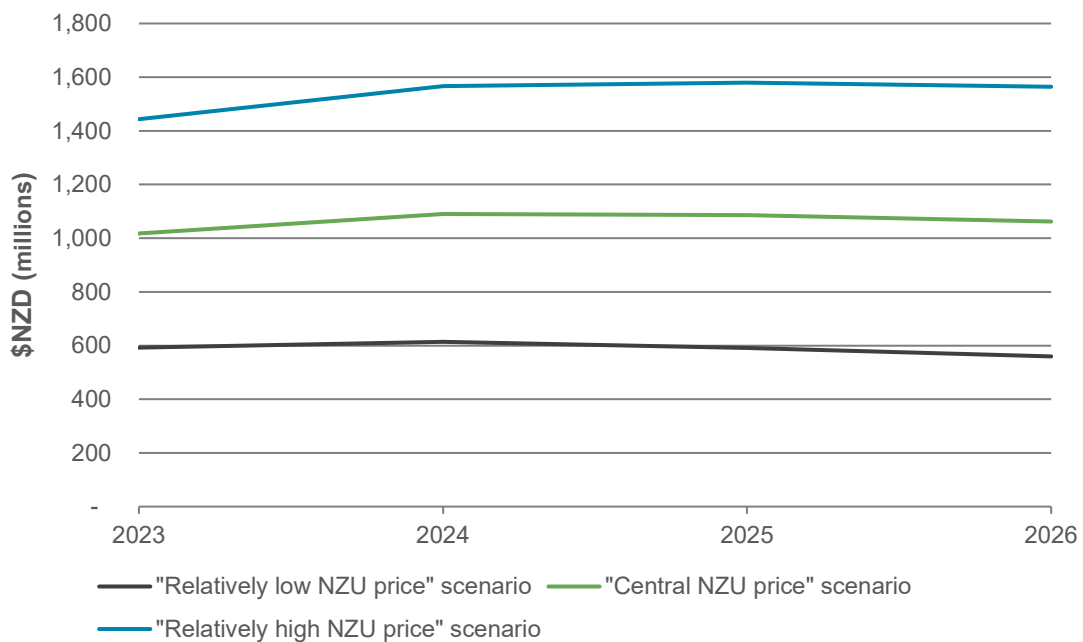
Table 3: Regulated auction volumes, excluding CCR volumes
(Source: Ministry for the Environment)

NZUs (millions)	2023	2024	2025	2026
Auction volume	17.9	17.1	15.3	13.5

Modelled cash proceeds

Using the volume and price assumptions described above, the modelled auction proceeds under each scenario are illustrated in Figure 2 below:

Figure 2: Modelled ETS auction proceeds under different price scenarios



These results illustrate that, assuming decreasing auction volumes (as per the latest regulations), auction proceeds are anticipated to be relatively stable due to the offsetting assumption of increasing NZU prices over time.

⁷ In reality, auction prices could be high enough to trigger the CCR. The overall impact on cash proceeds would depend on the price at which the auction then cleared.

⁸ <https://web.archive.org/web/20230205080417/https://environment.govt.nz/news/government-announces-updated-nz-ets-auction-settings/>

Modelled revenue from surrenders

Mandatory ETS participants must surrender NZUs to the Government annually to settle obligations arising from emissions in the previous calendar year. Under Generally Accepted Accounting Practice (GAAP), this constitutes revenue for the Crown as its NZU stockpile liability decreases. Revenue is equivalent to the dollar amount by which the Crown's stockpile liability has decreased due to the NZU surrenders:

$$ETS \text{ surrender revenue} = \text{surrender volume} \times \text{secondary market spot price}$$

Price assumptions

The assumed secondary market prices in each scenario are outlined in Table 2 above. As noted above, for comparability all scenarios assume that the auction price and secondary market price are equivalent in any given calendar year.

Volume assumptions

The volume of units anticipated to be surrendered is based on projections compiled by the Ministry for the Environment. These projections are based on the emissions profile in each sector covered resulting from forecast output growth, deforestation, and forestry harvesting. These projected emissions indicate anticipated surrender volumes since firms with surrender obligations must surrender one NZU for every tonne of CO₂e they emit. Table 4 below presents the assumed surrender volumes for all modelled scenarios.

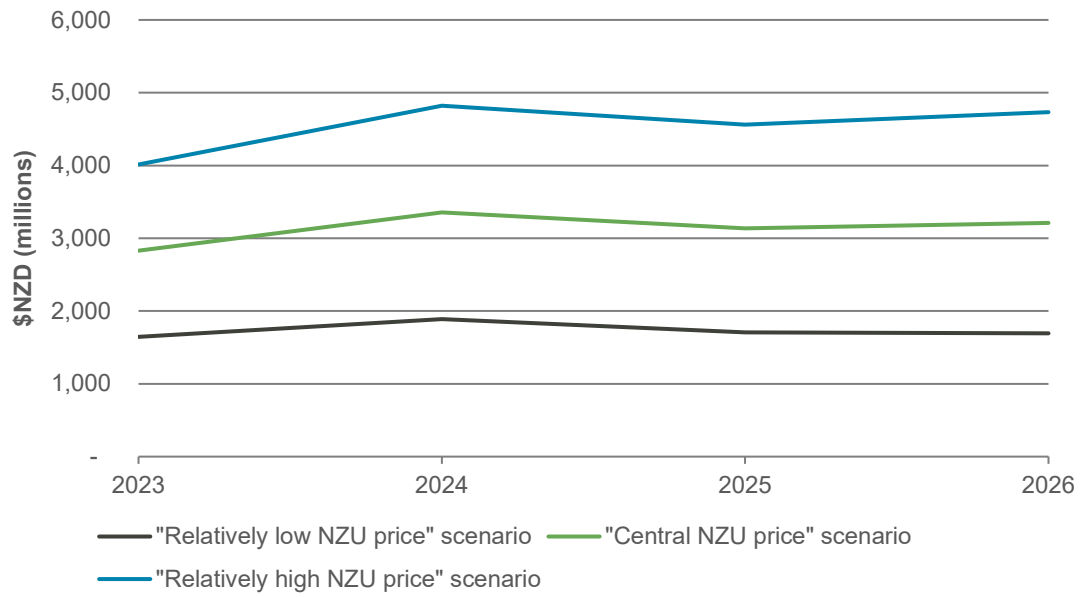
Table 4: Assumed surrender volumes – applicable to all scenarios modelled
(Source: Ministry for the Environment, October Baseline Update)

NZUs (millions)	2023	2024	2025	2026
Surrender volume	49.8	52.6	44.2	40.8

Modelled ETS revenue

Using the volume and price assumptions described above, the modelled ETS revenue paths under each scenario are illustrated in Figure 3 below.

Figure 3: Modelled ETS surrender revenue under different price scenarios



These results illustrate that if NZU prices rise at the assumed rates under each scenario, surrender revenue would increase moderately over the period. This is driven by the assumed increases in NZU price over time outweighing the assumed decline in surrender volumes over the same period.

Modelled expenses from unit allocation

Allocating units to ETS participants at zero cost represents an expense for the Crown as this increases the liability from the NZU stockpile without the Crown receiving anything of value in return. The two main activities within the ETS which drive the aggregate amount of NZU allocations are:

- **Forestry**

Forestry participants earn NZUs as their forests grow, reflecting the amount of carbon dioxide their trees sequester over time.

- **Industrial Allocation**

The Government provides an annual amount of NZUs to emission-intensive, trade-exposed industries at no cost to mitigate the impacts of the ETS, including the risk of firms shifting operations offshore or losing market share to nations without equivalent emissions mitigation policies.

ETS allocation expenses are calculated as:

$$ETS \text{ allocation expenses} = \text{allocation volume} \times \text{secondary market spot price}$$

Price assumptions

The assumed secondary market prices in each scenario are outlined in Table 2 above. As noted above, for comparability all scenarios assume that the auction price and secondary market price are equivalent in any given calendar year.

Volume assumptions

The volume of units anticipated to be allocated to the activities identified above is based on projections compiled by the Ministry for the Environment, which use forecast forestry activity and anticipated industrial allocation volumes.

Table 5 below presents the assumed allocation volumes that are applied to all scenarios modelled.

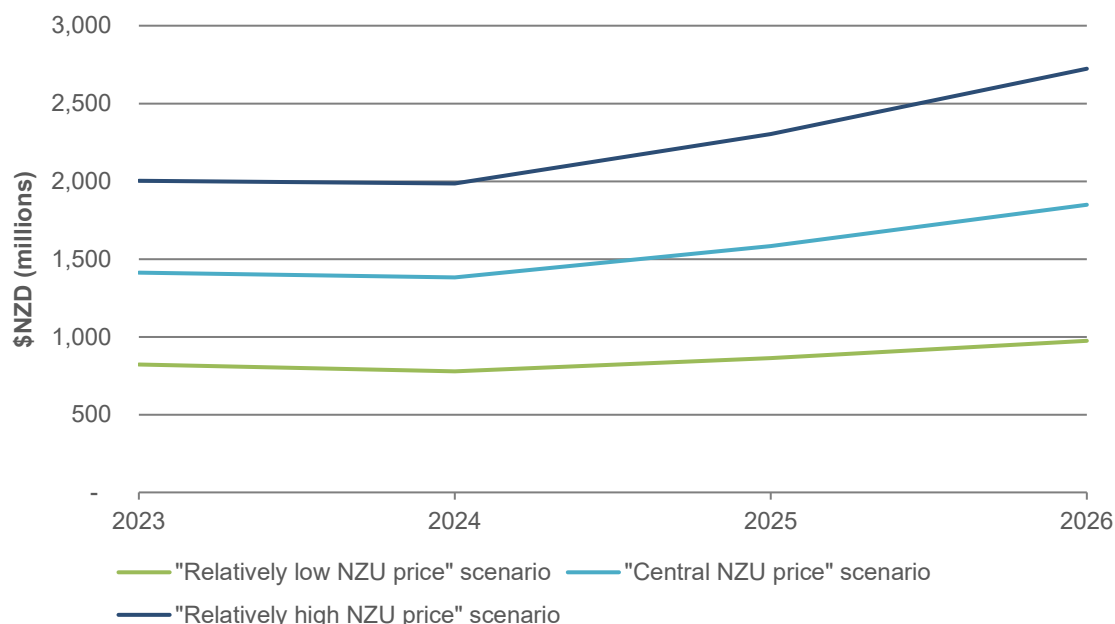
Table 5: Assumed allocation volumes – applicable to all modelled scenarios (Source: Ministry for the Environment, October Baseline Update)

NZUs (millions)	2023	2024	2025	2026
Allocation volume	24.9	21.7	22.3	23.5

Modelled ETS expenses

Using the volume and price assumptions described above, the modelled ETS revenue paths under each scenario are illustrated in Figure 4 below.

Figure 4: Modelled ETS expenses under different price scenarios



These results illustrate that variation in ETS expenses is largely driven by price. This is because the assumed volume of unit allocations across modelled scenarios is relatively flat across calendar years. Under these assumptions, modelled ETS expenses differ proportionately to the assumed price trajectories.

Non-modelled sources of variation

For comparability, the scenarios modelled for this report focus on illustrating the impacts of variation in price rather than volumes. In reality, there are many reasons why auction, surrender and allocation volumes could differ. Just as variations in price are illustrated to have implications for ETS auction proceeds, revenue, and expenses, so too will variations in volumes.

Broader sources of variation for the fiscal impacts of the ETS include the operations of large emitters, the volume and timing of forestry activity, behavioural changes, market trends, and macroeconomic conditions.

The scenarios modelled in this report are therefore only a select illustration of potential variations in ETS fiscal flows and are not comprehensive.