



DCT Index user guide

The Dynamic Carbon Tracker (DCT) tracks Aotearoa's progress toward climate targets by using the latest dynamic data to estimate New Zealand's greenhouse gas emissions. It is the only tool that captures change in New Zealand's emissions on a daily basis nationally and by sector. DCT aligns its reports with MfE's New Zealand Greenhouse Gas Inventory (NZGGI) and uses the dominant patterns in each sector efficiently to provide a dynamic and predictive model.

Historic values of the DCT Index reported here may change from day to day. There are two primary reasons for this, namely:

1. Our methodology is subject to ongoing development. The index is currently reported at a National level. Further research and development is underway to track carbon emissions by region and report the DCT Index at both a regional and sector level. Due to this ongoing development, historic index values may vary through time.
2. As more dynamic data becomes available, our model may improve over time. Therefore, to ensure the index displays the most accurate predictions, the model will re-evaluate its predictions throughout time, similar to a weather forecast.

EMISSIONS ESTIMATES

We estimate the NZGGI only at a high level for efficiency both in gas type (by considering only CO₂-e) and in sources of emissions (by estimating sectors). This allows for more timely (low latency, high frequency) annual emissions estimates than those currently reported by the NZGGI. We currently only report on Energy and Agriculture, which made up 88-90% of Gross emissions between 1990 and 2020.

Indicators are used to build a sector model. Each indicator measures a certain natural variable, and it is constructed in terms of an underlying activity having an implicit emissions intensity (e.g. kgCO₂-e per km of registered vehicles). Intensity helps to account for the dissociation of the emissions themselves from the productivity behind the emissions.



CALCULATING THE INDEX

Our sector emissions estimates provide sector-specific insights expressed in terms of kilotonnes of carbon dioxide equivalents (ktCO₂e). The DCT Index is designed to give a unified insight expressed in a way that is relevant to our emissions reductions targets. To that end, the Index is equal to net emissions divided by its value for 1990 (a common reference year for targets) and converted to a percentage. This leads to the following interpretation:

The Index on a given day is the estimated net emissions in the year ending that day as a percentage of 1990.

Practically speaking, this means that, for example, an Index value of 125 today would mean that net emissions in the year ending today are estimated to be 125% of 1990's levels.

The sector emissions estimates have a latency of no greater than 3 months. Since the Index is calculated from these estimates, it would have the same latency. In order for the Index to provide a more recent insight, the Index is extended using national spending data. Therefore, the resulting 'daily' DCT Index has a 3 day latency. This process uses a regression model between the Index and many categories of national spending data. The performance of the model is measured using cross validation.

LIMITATIONS OF THE DCT INDEX

The DCT models emissions using broad indicators as opposed to an account of emissions by sources like the NZGGI. This means that shocks are often difficult to predict since they cause unprecedented trends that may no longer be captured by existing indicators.

The values of the Index represent year-long periods. For example, an Index value of 125 today would mean that net emissions in the year ending today are estimated to be 125% of 1990's levels. An impact of this is that *big* changes from one day to the next have a *small* impact on the Index. In other words, the Index tells us about long term change not short term change. For example, the Index is expected to capture the effect of emissions reductions programmes spanning many months, but is not expected to capture the first day of a COVID-19 lockdown at the time it occurs.



The extra layer of modeling using national spending data introduces more room for error in our estimates. To mitigate this limitation, we aim to minimise the period of time that needs this spending-based extension. This involves finding new data sets to use in the model producing the sector emissions estimates. Collaborations and connections leading to a more dynamic data-driven product are welcomed.

For further detail on the methodology please contact hello@dotlovesdata.com. The methodology behind the DCT is currently being prepared for submission for peer-review and when published can be provided as a reference.