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Impact of the Canterbury earthquakes on New Zealand's gross domestic product



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1 Summary

This paper discusses the impact of the February 2011 Canterbury earthquakes and examines the adequacy of the normal indicators used to measure components of gross domestic product (GDP).

- In the wake of the devastating 22 February 2011 earthquake, Statistics New Zealand evaluated the normal GDP sources and methods to ensure that they adequately measured GDP and captured any significant earthquake-related events.
- The earthquakes were considered exceptional events for insurance purposes and resulted in significant capital stock losses.
- We investigated and analysed alternative data sources for some components of GDP for the March 2011 quarter. However, we found that the usual indicators for GDP sufficiently captured the effects of the earthquake.
- We contacted Christchurch businesses to provide an estimated value of stock lost due to the February 2011 earthquake. We used the information collected to more accurately calculate the change in inventories for the New Zealand economy.
- It is important to note that while we are confident that the effects of the earthquakes were captured through the indicators that feed into GDP, it is not possible to isolate the impact of the earthquakes.

2 Introduction to GDP

Several earthquakes have struck the Canterbury region since the first major one on 4 September 2010.

This paper focuses on possible GDP measurement issues that may have arisen due to the 22 February 2011 earthquake in the March 2011 quarter. The impact of the 4 September earthquake was discussed in the commentary of the September 2010 and December 2010 quarter GDP releases.

GDP is New Zealand's official measure of economic growth. The headline measure of GDP is a seasonally adjusted volume measure. Seasonal adjustment removes seasonal influences such as Christmas sales and the milking season, while the volume measure means that price effects have been removed (an increase in prices does not mean there has been an increase in GDP).

Statistics NZ publishes two measures of GDP on a quarterly basis, the production measure (GDP) and the expenditure measure of GDP (GDE). Conceptually these two measures are equal. The value added of goods and services produced in an economy (GDP) in a given time period must match the value of final expenditure on those goods and services (GDE).

Several different data sources are used to compile GDP. The framework used to compile GDP is the System of National Accounts 1993 (SNA93).

3 Gross domestic product (GDP)

The production measure of GDP measures the value added to the economy by each industry.

Value added is the difference between the gross output of an industry (sales) less the intermediate consumption (goods and services produced by other industries) of the industry. The value added concept avoids double counting of production, as the output of one industry can be the intermediate consumption of another. For example, one output from agriculture is milk fat, which is used as an input into dairy manufacturing.

The current industry classification used to compile GDP is the Australia and New Zealand Standard Industrial Classification 1996 (ANZSIC96).

The 22 February 2011 earthquake was centred 10 kilometres southeast of the centre of Christchurch. It caused widespread damage to Christchurch, especially in the central business district and the eastern and hill suburbs. While many businesses suffered major damage and remain closed, others were either unaffected or were able to resume business (on a reduced scale or from different premises) soon after the earthquake. Most businesses in the region will have been affected by the earthquake, but the size and duration of this effect will vary considerably.

The table below summarises the components of GDP and whether a change in method was investigated for the March 2011 quarter. More information on the issues follows the table.

Earthquake impact on components of GDP

Component	Earthquake impact	Comment on method
Agriculture, fishing, forestry, and logging	No noticeable impact.	No change in method.
Manufacturing	Some Canterbury manufacturers reported lower sales. However analysis of response rates and imputation rates showed the national estimates are robust.	No change in method.
Electricity, gas, and water	Disruption of power supply occurred after the earthquake. The source data captures the fall in supply.	No change in method.
Construction	Residential and non-residential building declined in the Canterbury region and nationally. Analysis has shown that national estimates are robust.	Several alternative indicators were investigated for construction trade services – see section below.

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Component	Earthquake impact	Comment on method
Retail and accommodation	Some disruption in Canterbury due to damaged shops. Evidence that spending occurred elsewhere.	No change in method.
Transport and storage	Some disruption to transport services after the 22 February earthquake, but this is not noticeable at the national level.	No change in method.
Communications	Some disruption to communications following the earthquake.	No change in method. Method captures volumes of telecommunication activity.
Finance and insurance	Insurance companies stopped taking on extra policies after the 22 February earthquake.	No change in method. The underlying insurance service is not affected by large claims as a result of the earthquake, as claims are considered a transfer.
Real estate and business services	Business services include architectural and engineering services. Insurance assessors and inspectors will be captured in this category.	The impact of the loss of commercial property in Christchurch was investigated – see section below.
Ownership of owner-occupied dwellings	Thousand of houses in Canterbury were badly damaged or destroyed in the 22 February earthquake.	Scenario testing was investigated for the loss of housing in Christchurch – see section below.
Central government administration and defence	Civil Defence and emergency management is included in central government activity.	EOC was added to the 36 government units whose activity is measured quarterly.

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Component	Earthquake impact	Comment on method
Local government administration	Local government expenditure increased in GDE, due to an increase in purchases of services related to the earthquake clean up. But the activity measure of local government in GDP does not include this spending.	No change in method.
Personal and community services	Education activity was not adjusted for the loss in school days after the 22 February earthquake. Sports and recreation facilities were damaged in Canterbury, but there was no noticeable impact at the national level.	Adjustments to both health and education were investigated but deemed not significant.

Construction

The construction component in GDP consists of residential building construction, non-residential building construction, non-building construction, and construction trade services.

The indicators used for **residential and non-residential building** come from the Value of Building Work Put in Place Survey. Indicators for **non-building construction** (which includes infrastructure construction on roads, bridges, and drainage) come from specific data requests to enterprises involved in infrastructure activity.

Construction trade services include services such as site preparation, building repairs, electrical, plumbing, roofing, and painting. The quarterly indicator for construction trade services is a weighted movement of residential and non-residential building construction. Therefore, the quarterly movement in construction trade services relies heavily on whether building construction has taken place. If residential and non-residential building goes up, then it is assumed that trade services will also increase, and if building goes down trade services also declines.

In normal circumstances, this is a reasonable assumption. However, since the Canterbury earthquakes, we know that this relationship no longer holds for the Canterbury region for some aspects of construction trade services. We know that building construction in Canterbury has slowed, but other construction-related activity – such as demolition and building repairs – has increased.

Statistics NZ investigated alternative data sources to see whether demolition activity had increased.

Tax return data from Inland Revenue is collected each month and loaded onto the Statistics NZ Business Frame. The Business Frame provides a comprehensive picture of businesses in New Zealand and is the primary population source for all business surveys. Inland Revenue data is loaded on to the frame monthly to update information, including GST sales and employee earnings.

GST and employee earnings data for businesses in the construction trade services sub-industry were compared with the usual indicators for this component. While there were increases in some parts of the industry (such as site preparation services) this was offset by decreases in other parts.

For the March 2011 quarter, there was not a significant enough difference between the usual method for measuring construction trade services and the other methods investigated. Therefore, no adjustment was made to construction in the March 2011 quarter. We will investigate the alternative indicators again in the June 2011 quarter, where more of the demolition work related to the February 2011 earthquake is likely to have occurred.

Manufacturing

Data for the manufacturing component in GDP is sourced from direct data requests to large manufacturers and from the Economic Survey of Manufacturing (ESM). We analysed ESM data and while the sales of some manufacturers were adversely affected by the earthquakes the quality of national estimates is sound.

For more information about the 22 February earthquake's impact on the ESM see the [Economic Survey of Manufacturing: March 2010 quarter](#) information release.

Wholesale trade

Wholesale trade data in the national accounts is sourced mainly from the Wholesale Trade Survey (WTS). We analysed the WTS and while the sales of some wholesalers were adversely affected, the quality of the national estimates is sound.

For more information about the 22 February earthquake's impact on the WTS see the [Wholesale Trade Survey: March 2011 quarter](#) information release.

Retail trade

Retail trade data in the national accounts are sourced from the Retail Trade Survey (RTS). The RTS is a sample survey of businesses, designed to produce accurate estimates at the national level. Response rates from Canterbury respondents were only slightly lower than normal for the March 2011 quarter. We investigated an adjustment to sales due to shops closing but this was deemed not statistically sound. This is because of evidence that decreases in spending in affected areas was offset by spending elsewhere.

The RTS is also used as an indicator for some parts of household consumption expenditure in GDE.

More information on the investigations into the RTS is in the paper [Impact of the 22 February earthquake on the Retail Trade Survey](#).

Real estate and business services

Real estate and business services includes commercial property services, which are the services provided by leasing office space to businesses.

The impact of the earthquake on commercial property services is unclear. A destroyed or demolished building is clearly no longer providing a service. But the treatment is less clear for buildings that are undamaged, but inaccessible due to being in a restricted zone. The question arises are these buildings still providing a service? To further complicate matters, many firms that could no longer access their buildings rented alternative accommodation. Therefore, it is possible that the earthquake could have increased commercial property services.

Data on the capital value and floor space of buildings set for demolition was obtained from QV. This data was then used to calculate a proportion of commercial buildings in New Zealand affected by the earthquake.

The proportion of commercial property demolished or partly demolished in Christchurch was less than 1 percent (in capital value and floor area) of total commercial property in New Zealand. While the value of commercial property lost due to the earthquake is significant from an insurance point of view, it has a less significant impact on economic production.

Given the low proportion of commercial property demolished, compared with the national total, we decided that the usual indicators for commercial property in GDP were sufficient.

Ownership of owner-occupied dwellings

Ownership of owner-occupied dwellings (OOOD) measures the imputed service from owning a house instead of renting one. Only occupied houses are included in OOOD; permanently unoccupied dwellings are not included. Imputed rent is included in GDP is so that comparisons between countries are not distorted by different home-ownership rates. The OOOD component accounts for around 6.7 percent of GDP in volume terms.

The quarterly indicator for OOOD in GDP is the number of owner-occupied dwellings in New Zealand. This information comes from the dwelling projections, which are benchmarked against the latest Census of Population and Dwellings data. In New Zealand, no adjustment is made for the quality of the dwelling on a quarterly basis.

At 31 March 2011, the estimated number of houses (private dwellings) in New Zealand was 1.644 million, 1.099 million of which were owner-occupied.

The dwelling estimates were not adjusted for the September 2010 or February 2011 earthquakes. Insufficient information was available to make an accurate adjustment. While a decrease in the number of permanent private dwellings was expected, there was also an increase in temporary dwellings (caravans, cabins, tents, and other makeshift dwellings). In order to make the adjustment to OOOD, we also require information on whether the dwelling was owned or rented.

Statistics NZ tested a number of scenarios to illustrate the impact that adjusting OOOD for damaged houses would have on the overall measure of GDP. We tested the impact of removing different numbers of houses on the OOOD estimates. In June 2011, the Government announced that 5,100 houses in Christchurch are in the 'red zone', where rebuilding is not feasible due to remedial work required to the land. As well, an estimated 10,000 houses are in the 'orange zone' where further assessment is required. If these homes are still in use then they are providing a service to the owner.

The results of the scenario testing are shown below. For the scenario testing, a home-ownership rate is applied so that one-third of homes are rented and two-thirds owner-occupied. So, for the 5,100 houses example, the number of owner-occupied dwellings reduces to approximately 3,400.

Scenario testing for ownership of owner-occupied dwellings

	OOOD value added chain volume 1995/96 prices (\$million)	OOOD percent change from previous quarter	Service industries percent change from previous quarter	GDP percent change from previous quarter
No adjustment	2,296	0.2	0.5	0.8
5,100 dwellings	2,292	0.1	0.5	0.8
10,000 dwellings	2,289	-0.1	0.5	0.8
15,000 dwellings	2,285	-0.2	0.5	0.8
20,000 dwellings	2,282	-0.4	0.5	0.8

Making an adjustment to OOOD to take into account lost housing in Canterbury does not have a significant impact on GDP. Therefore there was no change in method for the March 2011 quarter.

Personal and community services

The **education** component of GDP measures the output of primary, secondary, and tertiary education and is based on the number of student days, which is updated annually. The education component is not published separately on a quarterly basis, but annually it is around 3.4 percent of GDP in volume terms.

We investigated the impact of school closures on the education component of GDP and obtained additional data from the Ministry of Education.

The number of primary and secondary school students in New Zealand is approximately 760,000. The total number of primary and secondary students in the Canterbury region is approximately 73,000 – just under 10 percent of the national total. According to Ministry of Education data, Canterbury students had an average 10.5 days of disruption after the 22 February earthquake.

Some schools have reported that they will be catching up on lost schooling, while other schools are sharing classrooms, with reduced hours.

The University of Canterbury was closed for three weeks following the earthquake. The University of Canterbury has around 5 percent of New Zealand's tertiary students.

No amendment was made for education services, due to the low impact on GDP.

Health services measures activity in both public and private health. Public health data comes from the Ministry of Health. The indicator for private health is the Quarterly Employment Survey.

We investigated alternative data sources, including Inland Revenue data that is loaded to the Statistics NZ Business Frame. Data from this alternative source was not sufficiently different from our usual indicators, so no adjustment was made to health services in GDP.

4 Expenditure on gross domestic product (GDE)

The expenditure measure of GDP (GDE) measures the final expenditures in the economy.

The main components are:

- Private final consumption expenditure
- Government final consumption expenditure
- Change in inventories
- Gross fixed capital formation
- Exports of goods and services
- Imports of goods and services.

The table below summarises the components of GDE and whether a change in method was investigated. More information on the issues follows the table.

Earthquake impact on components of GDE

Component	Earthquake impact	Comment on method
Household consumption expenditure	The Retail Trade Survey, one of the main indicators for household consumption, was analysed and national estimates deemed to be robust.	No change in method.
Private non-profit organisations	This component is less than 2 percent of GDE.	No change in method.
Central government final consumption expenditure	Central government expenditure includes the Department of Internal Affairs, which includes Civil Defence. The Earthquake Commission (EQC) was added to the population of quarterly indicators.	EQC was added to the 36 government units whose activity is measured quarterly.
Local government final consumption expenditure	Local government expenditure had increased in the December 2010 quarter, partly due to clean up after the 4 September earthquake. Local government expenditure increased again this quarter, partly due to clean up after the 22 February earthquake.	No change in method.

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Component	Earthquake impact	Comment on method
Change in inventories	Widespread reports of lost and damaged stock after 22 February earthquake.	Additional data was collected from Canterbury respondents in the EMS, WTS, and RTS. This was used to adjust the change in inventories series to account for catastrophic stock losses.
Gross fixed capital formation (GFKF)	The other construction component in GFKF includes investment in infrastructure, such as roads and bridges. Residential and non-residential building decreased after the 22 February earthquake.	No change in method.
Exports of goods	Some disruption to exports did occur after the 22 February earthquake. However, the impact is not noticeable at the national level.	No change in method.
Exports of services	Includes spending by overseas visitors to New Zealand, which is measured when visitors depart New Zealand. While visitor arrivals fell after the February 22 earthquake, this fall may not show in exports of services until the June 2011 quarter.	No change in method.
Imports of goods	No noticeable impact at the national level.	No change in method.
Imports of services	There was an increase in technical services due to overseas inspectors.	No change in method.

Private final consumption expenditure measures the spending by New Zealand resident households (household consumption expenditure) and the spending by private non-profit organisations (such as churches, charities, and sports clubs).

Spending by New Zealand-resident households (HCE) represents around 60 percent of total GDE, so it is a very important part of the economy. The 98 variables used to calculate quarterly household spending are categorised into non-durable goods (such as food and beverages), durable goods (clothing, furniture and appliances, motor vehicles), and services (such as haircuts, medical visits, and entertainment).

One of the main data sources for HCE is the Retail Trade Survey (RTS). No adjustments were made to retail sales to take into account any earthquake impact. We investigated the validity of making such an adjustment, and deemed it was not statistically sound to adjust. While many retailers were closed after the 22 February earthquake, there is evidence that sales picked up in other areas.

For more information on the RTS investigations see [Impact of the 22 February earthquake on the Retail Trade Survey](#).

Government final consumption expenditure (GFCE) measures the volume of spending by both central and local government.

Central government expenditure measures the spending by central government on salary and wages, the purchase of goods and services, and social assistance benefits in kind.

Data for central government expenditure comes from the Crown Financial Information System. In the national accounts, the quarterly estimates for government expenditure use detailed financial data from 34 core crown units and two crown entities. Any additional expenditure occurred by any of these entities will be captured in our quarterly indicators.

The Earthquake Commission (EQC) is also a crown entity, but it was not historically included in the quarterly indicators for GDP. It has always been included in the annual indicators for government. Since the September 2010 earthquakes, the EQC has grown in size and significance. Before the September 2010 earthquake EQC had 21 staff. At 31 March 2011, EQC had 1,064 personnel including adjusters and estimators.

EQC was included in the quarterly central government estimates from the March 2011 quarter, with data back to the September 2010 quarter also now included.

Local government expenditure includes spending by local authorities on salary and wages and the purchase of goods and services.

In the December 2010 quarter, there was an increase in purchases of services by local government. Part of this increase was due to earthquake clean up in Canterbury after the September 2010 earthquake. In the March 2011 quarter, purchases of services by local government went up again, and this was partly due to increased spending in Christchurch.

The **change in inventories** is an important component to reconcile the production of goods and services to the final expenditures on those goods and services in the economy. Timing differences can occur between when something is produced, and when it is sold. The change in inventories accounts for this. If more goods are manufactured in a quarter than are sold to households or exported, there will be a build-up in inventories. Conversely, if a manufacturer sells more goods than they have manufactured, they run down their inventories to meet that demand.

The change in inventories information for manufacturing and distribution industries comes from the Economic Survey of Manufacturing (ESM), the Wholesale Trade Survey (WTS), and the Retail Trade Survey (RTS). Respondents to those surveys are asked to provide their closing levels of stocks as at the end of the quarter. The difference between this level and their closing stock levels from the previous quarter, when adjusted for any price change, provides a measure of the change in inventories.

However, any stock losses or write-offs should not be included in the change in inventories but should be treated as write-offs in the balance sheet because they do not relate to any economic activity. In the latest quarter a number of respondents reported low or nil inventories. In these cases, if no adjustment was made for the loss, inventories (and GDE) would be understated.

We contacted Canterbury-based respondents in the EMS, WTS, and RTS to provide an estimate of the value of stocks lost during the 22 February earthquake. This information was invaluable in making an adjustment to inventories to reflect catastrophic stock losses and to better estimate the correct inventory change.

Gross fixed capital formation (GFKF) measures investment in fixed capital. This includes investment in items such as residential buildings, non-residential buildings, plant, machinery and equipment, transport equipment, and intangible assets.

GFKF measures the creation of new assets, including site preparation (demolition). The site preparation activity is normally included with the consent for a new building. The only maintenance activity that is included in GFKF is major repairs (including repairs that extend the life of the asset). Repairs and maintenance are not included in GFKF unless they are replacement assets.

The indicator used for both residential and non-residential building investment is from the Value of Building Work Put in Place Survey.

The method for GFKF was not changed.

Exports of goods measures the volume of commodities produced in New Zealand but consumed abroad.

No changes were required due to the 22 February earthquake.

Exports of services measures the services consumed by other countries, and includes spending by visitors while they are in New Zealand.

Imports of goods and services are excluded from the calculation of GDE, because they represent goods and services that were not produced in the economy.

Increases in **imports of goods** arising from reconstruction work in Canterbury are expected at some stage. These imports will be captured in the usual way through customs data.

Imports of services in the March 2011 quarter included payments to overseas insurance assessors, which are likely to be an ongoing feature in future quarters.

Current transfers

Transfers that are recorded in the current account of the Balance of Payments do not impact on GDP, but they impact on real gross national disposable income (RGNDI). RGNDI is a measure of the goods and services that New Zealand has command over. RGNDI takes into account the terms of trade effect and net transfers and income from the rest of the world.

Foreign aid received in cash and in kind is recorded as an inflow of current transfers. Aid in kind includes the foreign urban search and rescue teams that came to assist after the 22 February earthquake.

Earthquake support packages

Two support packages for employees were announced by Government after the 22 February earthquake. The first was a package to enable employers to keep their staff on while their businesses were closed. In the national accounts, this is recorded as a

subsidy from the government to the companies. Subsidies are recorded in the income measure of GDP, but not the production or expenditure measures.

The second support package, Earthquake Job Loss Cover, was an emergency benefit to employees who had lost their jobs as a result of the earthquake. This was available for up to eight weeks after the February earthquake. In the national accounts, this package is treated the same as the unemployment benefit.

Neither of these support packages is conceptually included in the government final consumption expenditure. Social assistance benefits in kind are included in GFCE, but not social assistance benefits in cash. The unemployment benefit is an example of a benefit in cash, while subsidised doctor's visits for households are a benefit-in-kind example.

Impact on capital stock

In the national accounts, the stock of New Zealand's capital assets is measured in the perpetual inventory model (PIM). This will need to be adjusted for the assets (buildings, machinery, and equipment) that were destroyed in the earthquakes. The PIM is also used to calculate consumption of fixed capital (depreciation) in the national accounts. The impact of both the September 2010 and February 2011 earthquakes will be shown in the *National Accounts: Year ended March 2011* information release, which is scheduled for publication in November 2011.

Thanks

Statistics NZ would like to thank respondents for continuing to provide survey data used to compile GDP. Particular thanks to the respondents in Christchurch city, and Selwyn and Waimakariri districts, who were asked for additional data on stock losses due to the earthquake.

5 Related links

[Impact of the 22 February earthquake on the Retail Trade Survey](#)

[Revised treatment of the Canterbury earthquakes' insurance claims in New Zealand's international and national accounts](#)

[Impacts of the Canterbury earthquakes on New Zealand's international accounts](#)