Canterbury Maps – the importance of a regional mapping service during the Kaikōura earthquake

Iain Campion, Environment Canterbury Team Leader Data & GIS

A 7.8 magnitude earthquake struck northeast of Culverden, in Canterbury, on 14 November 2016. The initial earthquake, and its subsequent aftershocks, caused significant damage to land, coastal areas, buildings, and infrastructure.

The initial effort by various agencies was focused on saving and preserving lives, and starting to understand the magnitude of the situation. Vital to this was understanding what had happened to the environment; there were rumours of several destroyed houses, a lifted seabed, slips cutting off the highway north and south of Kaikōura and broken sewerage pipes leaking.

Very quickly, Civil Defence identified geospatial support would be of high importance to help provide the insights and overview of the efforts happening on the ground. Canterbury Maps' partner councils realised they needed to work together to provide the required geospatial support for the direct response and continued support during the recovery phase.

What is Canterbury Maps?

It is a joint data-sharing initiative by Canterbury's regional and local territorial authorities.

As the name suggests, Canterbury Maps is a repository of maps, applications and data from the local government councils in the Canterbury region.

Interactive map resources include, but are not limited to; Canterbury's air and water quality, recreation and parks, planning zones, resource consents, transport links, local attractions and council services.

It has been co-ordinated by staff at Environment Canterbury Regional Council working with: Kaikōura District Council, Hurunui District Council, Waimakariri District Council, Christchurch City Council, Selwyn District Council, Ashburton District Council, Waimate District Council, Mackenzie District Council, Timaru District Council and Waitaki District Council.

Involvement of Canterbury Maps platform

The Canterbury Maps cloud platform enabled the government, not-for-profit, and private organisations involved in the earthquake response to easily access and disseminate information, manage field data collection and work in a collaborative manner from locations all over the country.
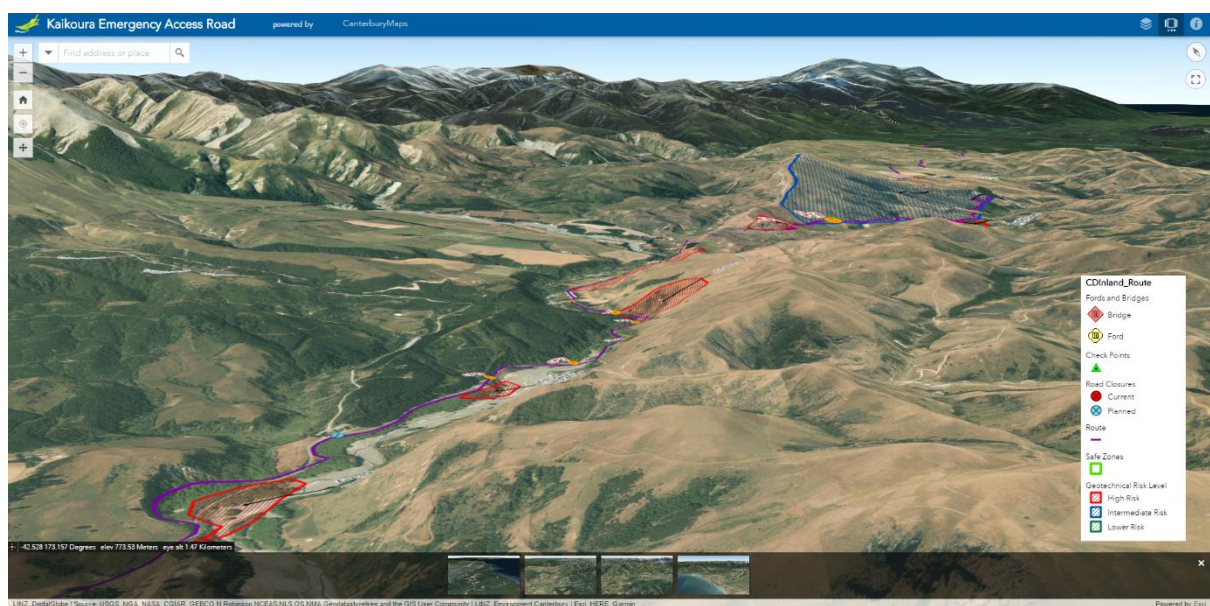
In the early stages of the response, the most affected councils, Hurunui and Kaikōura, worked directly with the Canterbury Maps' team and associated partners to get the platform configured and up and running.

Access to the platform was then granted to those who needed it; from contractors working directly with the councils involved, to staff from other councils across New Zealand and central agencies, including the New Zealand Fire Service, the Ministry for Civil Defence Emergency Management to technology partner's Eagle Technology.

By having one platform, the regional council was able to achieve an overview of the many activities occurring, and streamline processes so more than one council could re-use those same data rich applications. The data was entered in rapidly with lots of new datasets collected which all helped develop spatial and situational awareness for all three councils. It was vital to the response effort.

In its simplest form, the data provided points of reference on roads, pipes, contours, titles and addresses. Ultimately though, this data meant responders could quickly ascertain the status of local roads, where slips were, whether bridges could be used and the state of houses. The spatial view was vital to this as it helped provide the 'picture' of the emerging situation.

Aerial imagery also helps councils by providing data for future information. Canterbury Maps hosts historic aerial imagery that can be used to compare the current to the then. This was particularly important after the Canterbury earthquakes when identifying past historical land uses.

Example of 3D application used in emergency response - Kaikōura Inland Route Hazard Assessments

The new 'map': the future of data

In the response and recovery phases of natural disasters there is a large drive, and hunger, for spatial data.

Every activity, or condition of assets on the ground, can be related back to a number of spatial datasets and is better represented as a 'map'. For example, when rivers are flooding, dams are forming, when properties are damaged, when water pipes are leaking and when roads are damaged, this information would usually be displayed on static printed maps, but technology has moved on from paper maps. The Canterbury Maps platform offers live 2D or 3D maps that let the user move / pan around the region zooming in and out at different scale levels, it shows live data streaming onto the page and typically an aerial picture of the location. For example, some of the first earthquake response aerial photos helped build up a picture of the various slips which went on to the website for anyone to look at if they zoomed in to that scale.

During, and after, the event there are a large number of new datasets acquired. Typically these are used and acquired for purposes directly related to the local or regional council activities.

Technology has evolved rapidly which increases the capability of the platform to host more information. Typical technology used now ranges from multispectral imagery, 4 band aerial imagery, LiDAR, use of drones and a simple use of taking video and pictures shot on an iPhone from helicopters. All these sources are used to develop situational awareness maps, 3D scenes, site maps and building inspection applications to gather and distribute critical information to stakeholders.

In the regional council case, this work is critical for coastal hazards analysis, dam landslide assessment, river engineering assessment and flood assessment. The geospatial products needed for these activities are, and can be re-used, for other activities that the spatial industry is involved in. Therefore, it is important that local government acquire data in an open and re-useable license so that the region doesn't have to pay the cost of the data over again. This is the case on the Canterbury Maps service with more than 400 datasets available to be downloaded and re-used by spatial professionals free of charge.

The importance of a regional mapping service

Regional mapping services, like Canterbury Maps, are important to collate the various regions' data to a common dataset and disseminate the data through public download services.

Datasets acquired for local authorities have many other uses, not just the primary function intended for the council. Councils gaining an understanding of what datasets are important to their stakeholders can then take this into consideration when curating datasets within the region.

This leads to businesses being more efficient and hence eliminating wasteful cost and time out of the region's economy. These datasets are then re-used by various industries and companies in their own business activities to solve real world problems. For example, Aurecon's geospatial services team use the historical aerial photography web service to show site usage through time, which is particularly useful for its land development team and geotechnical engineers, as well as its clients when assessing the suitability of a site for future development.

Datasets regularly used are aerial photography, permitted activities data (such as consent records), wells data, planning data, infrastructure data and elevation data.

Lessons and challenges

During disasters like the Kaikōura event, challenges with spatial data are uncovered or highlighted again. When there is a hive of activity in an area collecting data on various reference objects, issues can arise of sharing a common understanding of that reference object.

Problems highlighted in the Christchurch earthquake were still evident in this event. Assessing and capturing dwellings can be challenging to record when New Zealand still is behind other countries in terms of reference data relating to property. What does the word property mean to you? It means many things to many people and has many datasets associated to it. The most common dataset that hangs off all these is the common street address. But, our street address datasets are not in a form to link 100 per cent to the right dwelling(s), parcel(s) and title(s) in all cases.

For example, data was captured against a school which has one address but multiple dwellings in various states. This caused the issue of determining which dwelling needs to be demolished and which dwellings are safe? Practical measures take over in the latter case with pieces of paper taped to the windows.

Example of collected building assessment data and the challenges with realting this to existing property information

You would be surprised how much time was spent during the event geo coding and correcting data flowing into and out the councils because the common data element was only a non-validated street address. In rural areas, such as Kaikōura and Hurunui, this problem is different again, with a common understanding from a person that property is of the farm area, not the simple intersection of the street address with the first parcel.

Although these issues still exist after the Christchurch earthquake, there is light at the end of the tunnel as Land Information New Zealand are actively working on solutions to link all these datasets together through initiatives like the integrated property framework.

The biggest learning overall, which underpins everything we're trying to achieve, is that natural disasters don't discriminate between regions, meaning collaboration is more

important than ever for quick reliable data-gathering to inform response and recovery decisions both for councils, contractors, businesses and the community.