Towards near real-time indicators of exposure to disaster risk

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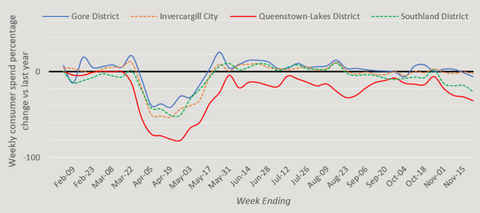
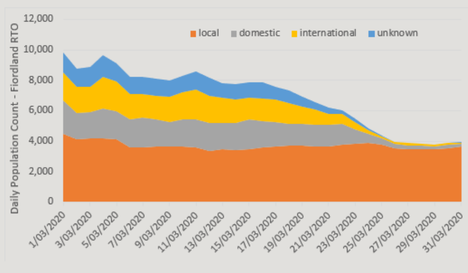
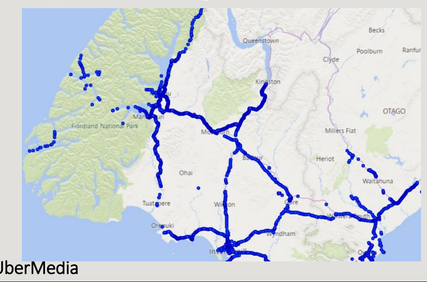
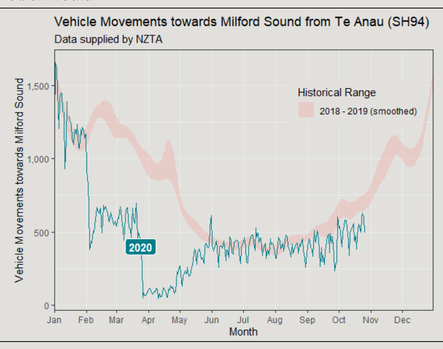
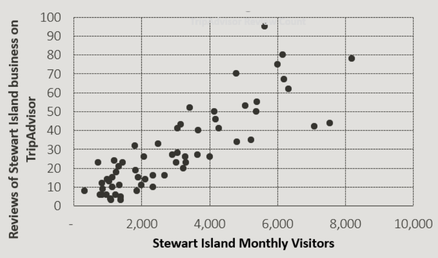
1. Project objectives

1. Awesome disaster risk assessments, need representative exposure scenarios.
2. Our existing, static assumptions around exposure need to be critically assessed, particularly in a post COVID world.
3. We need new, novel and authorative approaches to understand interactions of people with place, to better inform our modelling approaches

2. Opportunities to understand fluxes in populations

A number of ways of understanding flux in population and population movement, some of these include:

	Example	Comment
Census	Population Count, Demographics	Complete picture every 5 year
Electronic Card Data		Complex, expensive, timely to process. Difficult to back-calculate population exposure.
Mobile Phone traces		Emerging dataset, complete picture of all mobile devices in an area of interest.
Mobile Application Derived Information	USA (Californian) movements through Southland, Jan 20.  Source: UberMedia	User of mobile application movements (i.e. agents).
NZTA Road Counters		Sub-daily data across NZTA State Highway permanent telemetry network. Can derive flow direction, net movement.
Social Media/ Volunteered Geographic Information (VGI)		Sub-daily data from VGI (e.g. TripAdvisor, Instagram). Strong biases. Complex processing.

3. But, ultimately decision making context is key

Interviews with disaster risk reduction practitioners, have shown:

- Context is everything. Intelligence needs to be fit for purpose
- Data needs to be timely, accessible and easily understood.
- The ability to do this on the fly, in a near real time sense, is critical as events unfold or change.

4. Approaches in *Piopiotahi*, Milford Sound

- *Piopiotahi* is one of New Zealand's key disaster challenges. It was tracking towards 1 million visitors in the 2019/20 season (pre COVID).
- It presents a significant seismic and co-seismic hazardscape which intersects (Dykstra 2012; Orchiston et al. 2018) with a highly mobile population (up to 4,000 visitors a day) .
- Emergency Management Southland (EMS) need visitor flows, and visitor stay information to inform their disaster risk management approaches.

4.2 Estimating visitor exposure

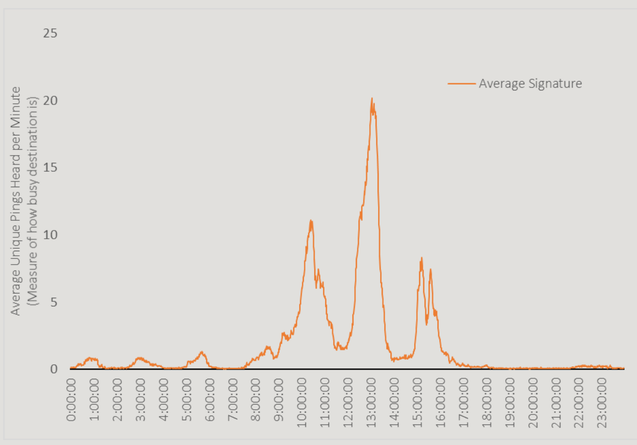


Figure 1: Average Count of probes heard per minute (May—December) 2020 at Milford Sound Visitor Terminal

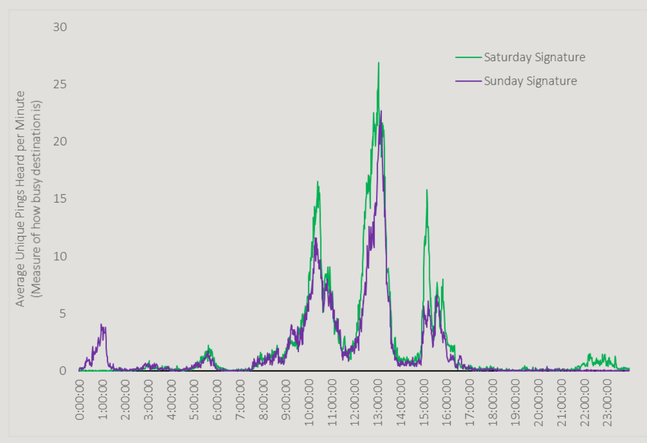


Figure 2: Average count of probes heard per minute (May—December) 2020, for Saturday and Sundays only at Milford Sound Visitor Terminal

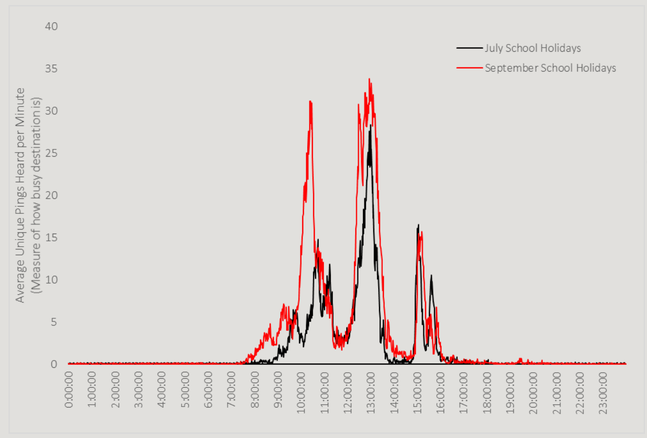


Figure 3: Average count of probes heard per minute during the July and October School Holidays (2020), at Milford Sound Visitor Terminal

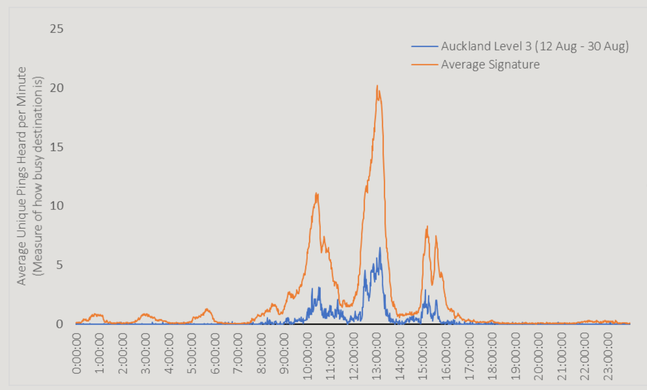


Figure 4: Average Count of probes heard per minute (May—December) 2020 at Milford Sound Visitor Terminal, against average count for the period of COVID Level 3 (August) in Auckland.

- Driven from these requirements, we installed a counter of wifi pings in the Milford Sound Visitor Terminal in May 2020.
- This counts the number pings heard over the course of the day from wifi capable devices (smartphones etc) over ~ 200m radius
- We use this as a proxy for number of devices, thus people in the range of the counter
- Fig 1 coincides with cruises of the Fiord arriving and departing. This also consistent with passenger manifest data
- Slight discrepancies can be observed with more movement on a Saturday afternoon, relative to Sunday afternoon in Fig 2.
- Fig 3 Trends are consistent with increased morning cruises in October, which also ran an hour earlier.
- Fig 4 shows the impact of the Auckland August COVID cluster on total numbers of visitors to *Piopiotahi*

5. Where to next?

1. Workshop data opportunities for DRR decision making (early 2021)
2. Build a near real time risk model, informed by dynamic exposure data – Queenstown—Milford Sounds Corridor
3. Build evidence base around use of wifi pings as a means to understand highly localised dynamic population exposure modelling.

References:

Dykstra , J (2012). The Post-LGM Evolution of Milford Sound, New Zealand: Timing of ice retreat, the role of mass wasting & implications for hazards

Orchiston, C., Mitchell, J., Wilson, T., Langridge, R., Davies, T., Bradley, B., . . . McKay, A. (2018). Project AF8: Developing a coordinated, multi-agency response plan for a future great alpine fault earthquake. *New Zealand Journal of Geology and Geophysics, 61*(3), 389-402.

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