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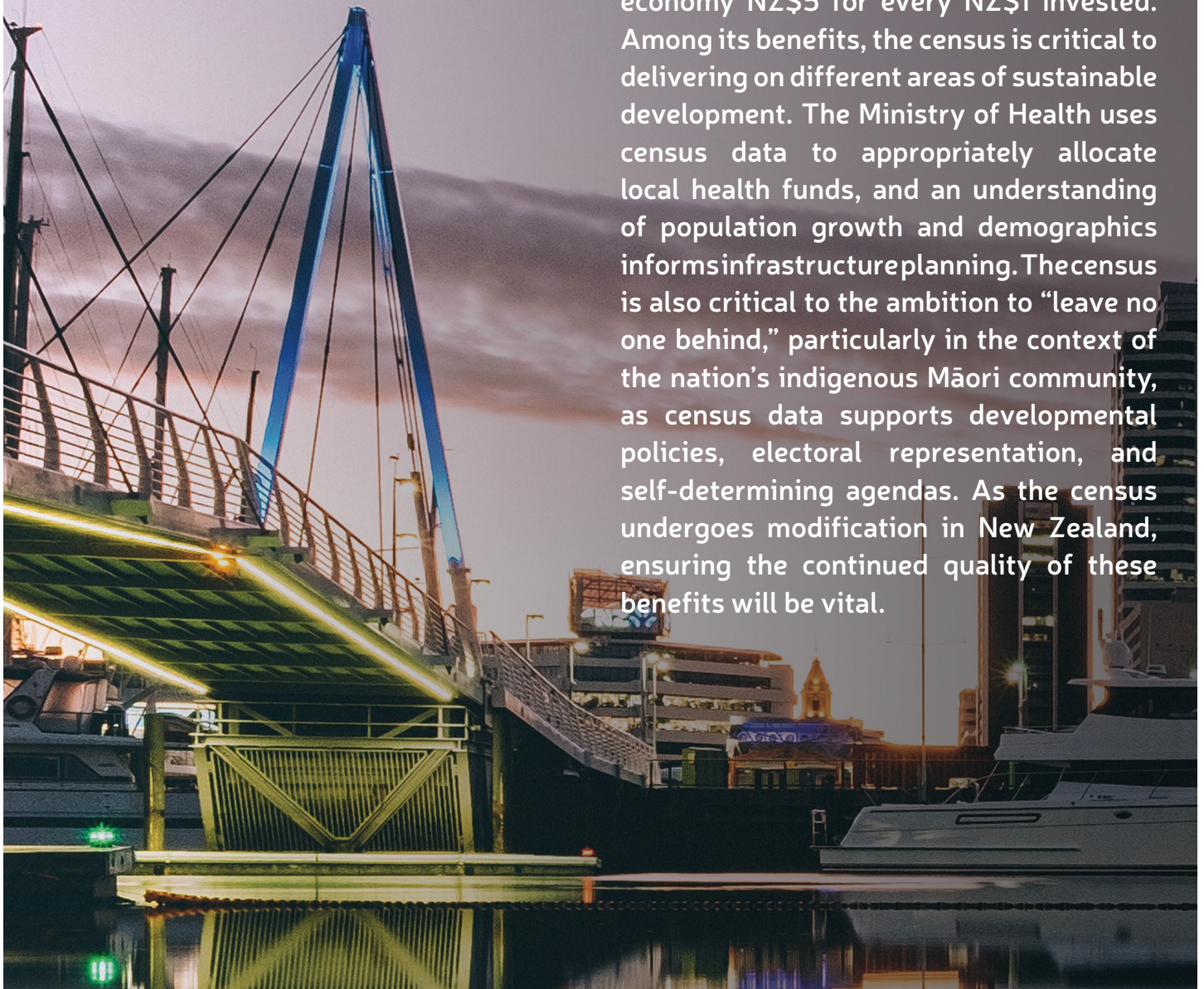
TRÉND^S

Thematic Research Network
on Data and Statistics

Valuation of the New Zealand Census

A Case Study by SDSN TRéNDS

New Zealand has conducted its census since 1851, providing a vital source of data about the size and demographics of the country's population. In 2014, a valuation of the census was performed. Even though the scope was limited to a select number of quantifiable applications, the study found that over the next 25 years, the census would return to the national economy NZ\$5 for every NZ\$1 invested. Among its benefits, the census is critical to delivering on different areas of sustainable development. The Ministry of Health uses census data to appropriately allocate local health funds, and an understanding of population growth and demographics informs infrastructure planning. The census is also critical to the ambition to "leave no one behind," particularly in the context of the nation's indigenous Māori community, as census data supports developmental policies, electoral representation, and self-determining agendas. As the census undergoes modification in New Zealand, ensuring the continued quality of these benefits will be vital.





Introduction to the New Zealand Census

The New Zealand Census of Population and Dwellings is conducted by the country's statistics agency, Statistics New Zealand (known as Stats NZ). It provides an official count of people, along with demographic and socioeconomic information at the community level (Stats NZ – Tatauranga Aotearoa 2018a). The census was initially conducted every three years beginning in 1851; in 1881, the frequency was changed to every five years (Stats NZ – Tatauranga Aotearoa, n.d.). The census is undertaken with this regularity in part because New Zealand has considerable population changes, with high internal and external migration (Bakker 2013). New Zealand has, from time to time, decided to either forgo or delay the census—notably, at the times of the Great Depression, the Second World War, and the 2011 Christchurch earthquake. The 34th census was conducted in 2018.

The New Zealand Census of Population and Dwellings is conducted every five years.
– Stats NZ, Tatauranga Aotearoa 2018a

The census supports Stats NZ's mission of “providing independent, trusted data and enabling policy makers” by delineating timely and detailed information about the population (Stats NZ – Tatauranga Aotearoa 2018a). It serves a range of functions, from informing policy decisions to serving as the basis for other statistical products and surveys (Bakker 2013). Among other uses, census data helps direct billions of dollars (NZ\$) in government spending annually (Stats NZ – Tatauranga Aotearoa 2018a). Furthermore, the census is viewed and used by thousands. As of 2014, 67 territorial authorities and 11 local councils were identified as regular users, along with a wide network of central government officials and university researchers (Bakker 2013).

Stats NZ has a long-term goal of extracting more census information directly from administrative data, but existing administrative sources cannot yet replace the traditional census model (Stats NZ – Tatauranga Aotearoa 2018a). The 2018 Census began the process of modernization



by introducing a digital-first strategy that encouraged respondents to complete the census form online. Yet the 2018 response rate was lower than expected with only 90 percent of the population providing full or partial information, making it the lowest response rate from among the past five censuses (New Zealand Herald Staff 2018). Due to this challenge, Stats NZ has delayed the release of data by half a year and will need to impute data, the process of using statistical methods to estimate missing data (Stats NZ – Tatauranga Aotearoa 2018c). Members of the public have expressed concerns about the completeness and representativeness of the census, with some even calling for an entirely new census to be performed (Espiner 2018).

Valuation Approach

In 2014, Stats NZ released a report that estimated the economic returns of investments in the census (Bakker 2013). The assessment was performed by Carl Bakker of TDB Advisory Ltd., an economist with experience valuating government surveys and consumer products. In general, national censuses provide a unique function, so there were no market prices against which he could directly compare census products. Instead, Bakker explained, “The approach was thinking through the universe of valuation tools and approaches I could see referenced in the literature [...] and then sifting through to the choice of the valuation approaches that would work for this particular area” (Bakker 2018). Focus was given to the major areas of data use that were amenable to quantification. Generally, the approach was to establish a counterfactual scenario that supposed census data were no longer available. Bakker then considered what the impact might be on the accuracy and implementation of various programs if other data sources had to be used (Bakker 2013).

The calculations were made to reflect a conservative estimation. Through evaluation of past censuses, Bakker calculated the cost of a census as NZ\$198 million (US\$244 million, expressed in 2012 currency and exchange rates) (Bakker 2013). His study then determined net present values (NPVs) for the following 25 years. Bakker also chose a discount rate of 8 percent, representative of the rates used for cost-benefit analysis in the public sector. The costs of the census occur over the first five years, while additional (though diminishing) benefits are



gained with every year of data use. In total, 11 impacts were assessed. Three areas with particular relevance to sustainable development are profiled here, expanded upon with additional research and interviews.

**The cost of producing the 2013 Census was NZ\$198 million in 25-year net present values, or NPVs (US\$244 million, expressed in 2012 currency and exchange rates).
– Bakker, 2013**

Healthcare Funding

Census data plays an important role in New Zealand's healthcare system. In 2001, New Zealand created district health boards (DHBs) that manage health care provision in different areas of the country (MoH, 2016). This system is complemented by the population-based funding formula (PBFF), a technical tool designed to equitably distribute funds among DHBs (New Zealand Ministry of Health – Manatū Hauora, n.d.). The formula does not determine the total amount of funds, but helps decide how funds should be allocated among districts to provide for primary care, hospitals, and more. The PBFF is one of the largest determinants of public expenditures in New Zealand (Penno, Audas, and Gauld 2012). As of 2018, it was responsible for allocating NZ\$12.8 billion (US\$18.4 billion, according to 2017 exchange rates) in health spending (McHugh 2018).

The model works by determining the healthcare costs on the national level associated with different demographic groups, including age, sex, socioeconomic status, and ethnicity (McHugh 2018). Every October, Stats NZ releases new population projections based on the census. DHB funding allocations are then updated according to local population size and composition. A review of the PBFF was completed in 2015 following the 2013 Census, and the recommended changes were incorporated into the 2016/2017 funding allocations (New Zealand Ministry of Health – Manatū Hauora, n.d.).



According to Mhairi McHugh, the team leader for Capital and Operations with the National Health Board, the census is “critical” to the PBFF operation (McHugh 2018). Both the population projections and measures of socioeconomic status are derived from census data, and these tools allow the PBFF to be more responsive to demographic change. For example, census data have helped document significant growth in the population of Auckland, New Zealand’s largest city, and funding has been adjusted accordingly (McHugh 2018). As McHugh explained, “If you don’t have some measure of population movement, you don’t know that’s happening” (McHugh 2018).

If census data were not available, the health system would instead need to use enrollment data from primary health organizations (Bakker 2013). McHugh explained that this “[...] would require substantial investment from us. [...] It would require quite a lot of work to collect the data, to remove duplicates, trying to figure out how to deal with moving people” (McHugh 2018). This would also introduce issues of representation. Although 90 percent of New Zealanders are enrolled nationwide, there is considerable variation among DHBs, ranging from complete enrollment of residents to 76 percent enrollment of residents (Bakker 2013).

Bakker estimated the value of the census to the PBFF by calculating the balance of over- and underfunding that would occur if only incomplete enrollment data were used (Bakker 2013). The suboptimal allocation can be viewed as a “social cost,” because portions of the population would receive inadequate health resources and would need to be compensated. DHBs that run short of cash can access some deficit funding, but this comes with intensive monitoring and new management requirements. On the other hand, DHBs that run a surplus are able to spend this money (McHugh 2018). Estimates suggest that the availability of census data avoids welfare costs of between NZ\$119 million and NZ\$179 million (between US\$147 million and US\$221 million, using 2012 exchange rates), expressed as a 25-year NPV.



In addition to these quantified benefits, census data support service planning and performance monitoring in the health sector (Brown 2018). Population figures provide the denominators for multiple health indicators, such as breast and cervical screening rates. Additionally, DHBs use health profiles to identify urgent health needs and form strategic plans, and census data are a critical input to these profiles (Brown 2018).

Infrastructure Planning

New Zealand has set the goal of developing infrastructure that is both resilient and contributes to quality of life by 2045 (New Zealand Treasury – Kaitohutohu Kaupapa Rawa, n.d.). Towards this goal, the government created a National Infrastructure Plan in 2011 that committed to a number of actions, including the formation of a stronger evidence base for infrastructure planning (New Zealand Treasury – Kaitohutohu Kaupapa Rawa 2011). The National Infrastructure Unit then launched a scenario modeling workstream in 2013 to examine how different infrastructure sectors might prepare for major trends in population, economics, technology, and resources (New Zealand Treasury – Kaitohutohu Kaupapa Rawa National Infrastructure Unit 2014).

Census data are used to forecast government spending and capital investments. In particular, the age profile and spatial distribution of the population are important to the creation and use of infrastructure assets (New Zealand Treasury – Kaitohutohu Kaupapa Rawa National Infrastructure Unit 2014). Less accurate population forecasts would increase the risk of some infrastructure being underutilized while pressure points appear elsewhere in the system (Bakker 2013). The valuation considered the impacts on longer-term infrastructure investments if planning had to rely on administrative data (Bakker 2018). The cost estimates were based on National Infrastructure Unit work from 2009/2010 that followed on discussions with New Zealand's major infrastructure providers about the factors considered when planning investments (Bakker 2013). According to this research, population forecasts affect nearly all (98 percent) of infrastructure investments by these major providers. Bakker estimated that if census data were not available, then between 1 and 5 percent of



infrastructure investments would be misdirected and fail to return on capital. This suggests an annual benefit of between NZ\$7 million and NZ\$36 million (between US\$8.6 million and US\$44 million) as a result of more accurate investments, giving a 25-year NPV of between NZ\$69 million and NZ\$353 million (between US\$86 million and US\$436 million).

Census data is important to transport infrastructure. The NZ Transport Agency is responsible for delivering and regulating land transport systems, and it takes an evidence-based approach to ensure funds are appropriately allocated and land transport infrastructure projects are future-proof (Lukkien 2018). The agency is working to address a range of government priorities, such as road safety and a zero-carbon target. It also takes an integrated planning approach, increasing the effectiveness of solutions by considering how transportation, urban design, and land use impact one another (NZ Transport Agency – Waka Kotahi, n.d.). Census data are important to understanding the current breakdown of the population and forming population projections (Lukkien 2018). According to Dr. Carolina Lukkien, Senior Manager for Research Programme Transformation at the NZ Transport Agency, “We utilize Stats NZ population projections and population statistics, as well as the census demographic data” (Lukkien 2018).

“We utilize Stats NZ population projections and population statistics, as well as the census demographic data. [...] Without population data, we wouldn’t be able to accurately anticipate growth areas and future demand, which could impact on our ability to manage our land transport system and build our future transport system.”
– Dr. Carolina Lukkien, Senior Manager for Research Programme Transformation at the Transport Agency
Lukkien, 2018



The NZ Transport Agency does internal work around forecasting and scenario analysis that sets the scene about where it wants to be in the next 30 years. Stats NZ generates population forecasts based on census data, and these projections are used to understand where the greatest population growth is anticipated. Lukkien said that without Stats NZ census population figures and projections, “We wouldn’t be able to accurately anticipate growth areas and future demand, which could impact on our ability to manage our land transport system and build our future transport system” (Lukkien 2018). When planning infrastructure investments, the agency primarily designs around median projections, but longer-term plans consider a range of possibilities.

The NZ Transport Agency uses an Investment Assessment Framework to prioritize certain infrastructure investments (NZ Transport Agency – Waka Kotahi 2018). The Government Policy Statement (GPS) on Land Transport sets out the government’s priorities for expenditures from the National Land Transport Fund.

The GPS released in 2018 sets out safety and access as key strategic priorities, and a corresponding Investment Assessment Framework was created to achieve value for money by selecting projects that will meet targets with favorable cost-benefit ratios. A number of economic and demographic variables derived from the census are considered during the decision process, including population data, socioeconomic figures, and historic trends (NZ Transport Agency – Waka Kotahi, n.d.).

Indigenous Population

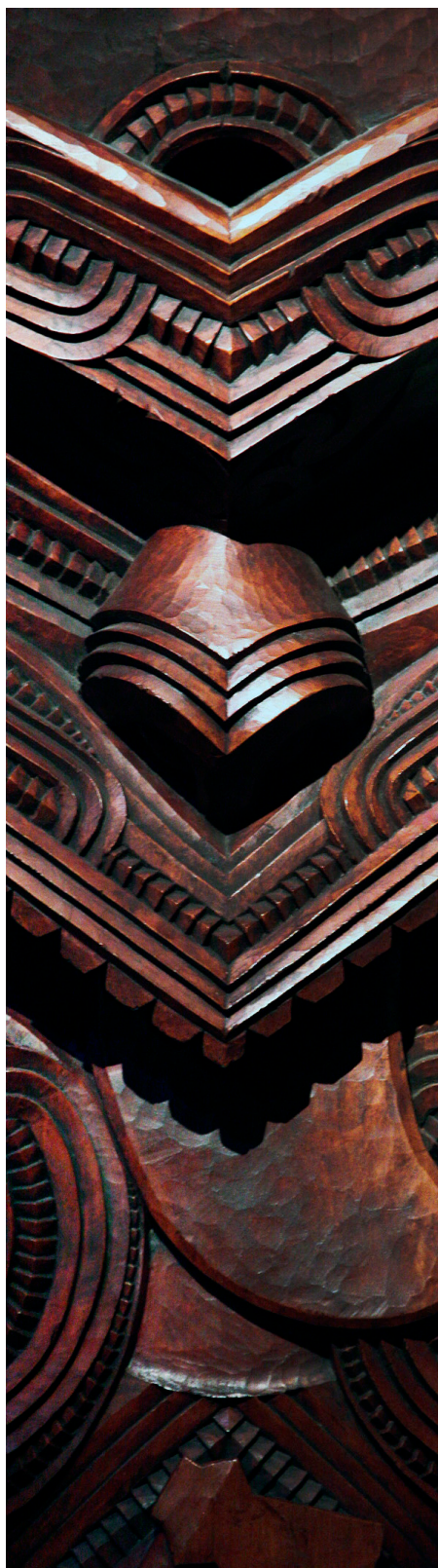
An important group for consideration in New Zealand’s census work is the Māori, the indigenous people of New Zealand. As of the 2013 Census, the Māori were the country’s largest ethnic minority, representing 15.6 percent of the total population (Stats NZ – Tatauranga Aotearoa, n.d.). Their proportional representation within the national population is projected to rise to 19.5 percent by 2038 (Stats NZ – Tatauranga Aotearoa, n.d.). In some areas, the Māori represent the majority of the local population, making them more visible than indigenous communities in most other colonial settler states (Kukutai 2018). The



Māori also speak a single language, which means it is possible to have census forms in their own language (Kukutai 2018).

The Māori's relationship with the census has been complicated (Kukutai 2018). Beginning with colonial rule, the census was historically used as a tool of repression and, until 1986, the census determined whether a person qualified as Māori based on blood fractions (Kukutai 2018). However, the "Māori Renaissance" that started in the 1970s brought about changes in the political opportunity structure (Hill 2009), and the census is now viewed as a source of data to support Māori aspirations for their own development (Kukutai 2018). The use of the census as a tool for understanding indigenous conditions has become more explicit, and census data informs government policies about closing gaps between indigenous and non-indigenous populations (Kukutai 2018). Starting in the 1990s, the census now allows individuals to self-identify as Māori (Kukutai 2018).

New Zealand is one of few countries that collects multiple, comprehensive sources of data about its indigenous population, and Stats NZ has been recognized as a leader in this domain (Māori Data Sovereignty Network – Te Mana Raraunga 2018). The Ministry of Māori Development, or Te Puni Kōkiri, leads public policy for the Māori by administering and monitoring related legislation, as well as advising on Government-Māori relations (Government of New Zealand – Te Kāwanatanga o Aotearoa, n.d.). The census is a source of valuable information about the Māori community that helps guide ministry activities (Bakker 2013). Major programs include Whānau Ora, which works to increase individual well-being within the extended family context (New Zealand Ministry of Māori Development – Te Puni Kōkiri, n.d.), and the Māori Language Strategy, a 25-year, coordinated effort to revitalize the Māori language (Controller and Auditor-General New Zealand – Tumuaki o te Mana Arotake 2009). Additionally, Stats NZ established a regular survey, Te Kupenga, that studies Māori experiences and well-being; a 2018 survey randomly selected 11,500 individuals who had indicated Māori ancestry on the 2018 Census (Stats NZ – Tatauranga Aotearoa 2018b).



According to Tahu Kukutai, a professor of indigenous demographics at University of Waikato, a high-quality census is indispensable to these government functions (Kukutai 2018). Bakker limited the valuation to estimating the benefit from the cost of policy advice for the Ministry of Māori Development (Bakker 2013). Of the NZ\$30 million spent annually on policy advice for Māori outcomes, Bakker suggested that census data improves its effectiveness by 20 percent, while the NZ\$49 million spent annually on Whānau Ora is improved by 5 percent—a conservative 25-year NPV for these initiatives ranging from NZ\$39 million to NZ\$118 million (between US\$48 million and US\$146 million).

The benefits of census data to the Māori community extend beyond basic policy advice. According to Kukutai, “Having a high-quality census is absolutely beneficial, particularly for groups whose self-determining agendas require data for development, monitoring, and advocacy” (Kukutai 2018). Data can help bring attention to issues that need to be addressed and can support community cohesion. As Kukutai explained, “In terms of Māori and tribal development, we need accurate data to show where our people live, and what their circumstances, characteristics, and needs are. Most Māori communities do not have the resources to be major data collectors so there is a dependency on the census, for better or for worse” (Kukutai 2018). The census is also critical to Māori representation in government. The Māori have been historically underrepresented, but the electoral system was changed in the 1990s, and the allocation of Māori electoral seats is now based in part on the number of Māori descendants and the number who choose to register on the Māori electoral roll (Kukutai 2018). A vital part of this determination is the enumeration of the Māori descent population based on the census, which is the only source for this information.

“Having a high-quality census is absolutely beneficial, particularly for groups whose self-determining agendas require data for development, monitoring, and advocacy.”
– Dr. Tahu Kukutai, National Institute of Demographic and Economic Analysis and the University of Waikato



However, Te Mana Raraunga (the Māori Data Sovereignty Network) has voiced concerns about the potential quality of data from the 2018 Census (Māori Data Sovereignty Network – Te Mana Raraunga 2018). The Māori have been historically underrepresented in the census; in the 2013 Census, the Māori undercount was 6.1 percent, compared to 1.9 percent for Europeans. Given that the 2018 Census received complete or partial responses from only 90 percent of New Zealand citizens, Te Mana Raraunga has suggested that the response rate among the Māori population might be less than 80 percent. This could result in constitutional issues, given the importance of census data to determining Māori electoral representation. The incomplete count could also impact resource allocations and produce inaccurate statistics about Māori well-being. As Kukutai remarked, “When things go bad, they almost always disproportionately impact those who most depend on that data” (Kukutai 2018). The challenges are increased by the need to impute missing variables from incomplete census forms. The decision to adopt a digital-first approach was reportedly made without much meaningful input from the Māori, and there is reason to expect that the associated difficulties will disproportionately impact the Māori representation (Kukutai 2018). Kukutai explained, “The more you shift the burden onto the respondent, the harder you make it for them to participate” (Kukutai 2018). Moreover, the Māori have lacked meaningful influence over the collection and governance of data, including issues of how identities are defined, how data is distributed, and who derives value from the data (Kukutai 2018). Te Mana Raraunga has called for increased participation, and the New Zealand Government Statistician has reportedly been highly engaged (Kukutai 2018). Eventually, the Māori hope to become their own data producers, rather than continuing to depend on the New Zealand government. The census may be part of the long-term model that best serves the community’s needs, but the Māori are not wedded to the census as the only potential source of data (Kukutai 2018).



Wider Impact

Bakker considered a number of additional benefits in the valuation report (Bakker 2013). As shown above, census data inform a number of other statistical products. Firstly, population data serve as the denominator for a number of key indicators. Secondly, the census is the basis for a variety of household surveys that explore economics, health, and other topics in greater detail. Without underlying census data, survey sample sizes would need to be increased to achieve balanced representation. “The availability of the census reduces the required sample size for surveys by 40 percent, and Bakker estimated that this creates a benefit of between NZ\$5 million and NZ\$12 million (between US\$6.2 million and US\$15 million) annually (Bakker 2013).

Census data are important to a number of other public services (Bakker 2013). For example, a school’s funding and catchment area are determined by several variables from the census, including population, income, parent occupation, and local educational attainment levels. Additionally, the electoral boundaries of New Zealand constituencies are defined by census data; although the greater benefit of protecting democratic fairness cannot be directly quantified, Bakker calculated the value of the census to maintaining electoral rolls. There are also indirect benefits. New Zealand local councils have to form sustainability plans, and this process is reportedly being informed by census data (Bakker 2013).

The private sector also depends on census data to a degree (Bakker 2013). Retail needs to consider changes in the local market, and age care requires an understanding of demographic changes to ensure that there will be a sufficient number of beds to serve the population. Likewise, census data are important to marketing, because they reduce the size of customer surveys and support more targeted marketing campaigns.

**Calculations found the census and associated population estimates have a 25-year NPV of nearly NZ\$1 billion, with the possible range from NZ\$679 million to NZ\$1.975 billion (between US\$838 million and US\$2.437 billion).
– Bakker, 2013**



Combining the quantifications from 11 sectors, Bakker estimated that the census and associated population estimates would have a 25-year NPV of nearly NZ\$1 billion, with the possible range spanning NZ\$679 million to NZ\$1.975 billion (between US\$838 million and US\$2.437 billion) (Bakker 2013). In other words, every NZ\$1 invested into the census generates over NZ\$5 in benefits. Although quantification is difficult, and other census models might be able to realize greater value, Bakker shows that the benefits of a census are much greater than the costs of production.

Use of the Valuation

Stats NZ commissioned the 2014 valuation as part of a wider effort to engage with census users (Bakker 2013). The report provided not only a New Zealand dollar figure for the benefits resulting from census data, but also a benchmark for evaluating future changes to the census model (Bakker 2013). Denise McGregor, manager of the 2018 Census and now Deputy Government Statistician, wrote, “We often use the headline figures, [e.g.,] NZ\$5 of value for every NZ\$1 spent, as this is the most understandable reference. This is used when we are talking to groups, including Government, about the value of the census” (McGregor 2018). The valuation study was also used in the business case for funding the 2018 Census, presented to the Cabinet Economic Growth and Infrastructure Committee (Stats NZ – Tatauranga Aotearoa 2014). Reflecting rising costs and changing technology, the business case suggested a modernized census in 2018 would provide NZ\$4.10 in benefits for every NZ\$1 invested, while the status quo census would offer less of a return on investment.

For every NZ\$1 invested into the census, there is a return of around NZ\$5 to the New Zealand Government and economy.

– Bakker, 2013



Conclusion

The New Zealand census provides data for a range of public and private sectors across the country. As demonstrated by the 2014 valuation and underscored by the data users themselves, the census produces meaningful benefits that cannot be realized with other sources of data. Among other outcomes, the census supports sustainable development by improving the allocation of healthcare, creating better informed infrastructure, and giving added voice to marginalized members of society. The valuation is likely a conservative estimate, and the detailed examples only begin to consider the implications of census data for sustainable development. Yet as demonstrated by the 2018 New Zealand census, maintaining a high-quality census—even when considering alternative data sources—is vital.

This case study was written by Hayden Dahmm (Analyst, SDSN TReNDS) with input from and thanks to Denise McGregor (Deputy Government Statistician, Stats NZ), Carl Bakker (Managing Director, Acuo Ltd., Tahu Kukatui (Professor, University of Waikato), Mhairi McHugh (Team Leader, Capital and Operations, NZ Ministry of Health National Health Board), Carolina Lukkien (Senior Manager for Research Programme Transformation, NZ Transport Agency), Debbie Brown (Quality and Patient Safety Manager, Bay of Plenty District Health Board), and Wing Cheuk (Public Health Physician, Counties Manukau District Health Board), as well as Tom Moultrie (UCT and SDSN TReNDS Member) and Jay Neuner (Communications Manager, SDSN TReNDS).



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The Maori are the indigenous people of New Zealand, who arrived in New Zealand in the thirteenth century AD having made the epic sea voyage from the islands of Eastern Polynesia. Picture: Jimmy Nelson