# Waikato Projections to Support Planning

## Summary of Data Needs and identified issues & options for Modelling & supply

Background

In 2014 the Waikato Regional Council (WRC) initiated a coordinated approach aimed at developing and making accessible a consistent set of projections for the next 30-50 years based on the 2013 Census, including for land use, population and economic activity/ employment for the Waikato region, its districts and census area units (CAUs). The results and reports are available via a shared folders.

The Waikato Projection Working Group builds on this process to develop projections based on the 2018 Census data, including any improvements and needs identified by various users of the projections. WRC continues to support the process as long as there is an agreement to use the results (to ensure consistency), and the needs and identified imrovements are of common interst (not specific to one/few councils only).

The following is a summary of the identified data needs for future projections data (Table 1) to support council planning processes. The issues with providing the identified data types are outlined in order of importance/dependence, with discussion on the issues and options for resolution or further questions that the projections group need to answer to refine/defines options.

The current discussions have been aimed at supporting the planning requirements for the 2021-2031 LTP (see appended draft timeline), although some of this data may be required for other planning in different timeframes (see Issue 1).

### Summary of Issues

1. The timeframe for data input to 2021 LTP and the expected release of census 2018 data from Stats NZ will mean only ‘draft’ projections will be available by February 2020, and a rerun of projections modelling will be required in November 2020.
2. The WISE model is currently set up with a starting date of 2013, best practice would be to update key elements (land use, zoning and infrastructure layers) to allow for a 2018 start date. The business case for funding to undertake such an update needs to be made.
3. A number of additional improvements to WISE model have been identified (improved economic and population models, household modelling). Inclusion of these would ensure current best is being applied to projection. The business case for funding to undertake these additional updates needs to be made.

Even the inclusion of these additional improvements may not solve all the ‘expectations’ for the resulting projections. How household/population density anomalies are managed in large urban areas (particularly HCC), needs further consideration and analysis to identify what is possible and balance possible outcomes with expectations.

1. Projection results have been provided at TA and Area Unit scales, there is an interest in having projections provided by different spatial areas (wards/settlements). This may now be possible under revised census SA2 units, but an agreed set of finalise ‘additional’ areas will be required to finalise options for providing such analysis.

The presentation and reporting of projections data to support their use could be improved. There is interest in better visual presentation and reporting what it means by TA. Options are being considered, but the provision costs vs demand for detail will need to be agreed.

Current projections are provided in 10 year time steps – detailed planning may require smaller time steps. Additional modelling vs interpolation options need to be considered and agreed.

1. Additional parameters to the current projection results have been identified by some TA’s (rating units, dwellings) and there is also additional analysis being undertaken for Housing NPS for Future Proof area. Further discussion is required to determine if these data need should be part of this wider projections work planning or not.

### Issue 1: Timeframes for Data needs

A draft timeline has been prepared to show what steps are required to undertake a repeat of the previous projections process. This includes updates to modelling processes (WISE, new population model, new economic model, households) and when the required input data might be available from 2018 census.

The previous draft timeline was reviewed based on the consensus was that the projections data would be required by February 2020 to fit into the LPT planning process.

**Issue:** Based on previous releases of census data from STATS NZ it is expected that population results would not be available until ~October 2019, and household generation rate data would not be available until ~mid 2020.

* Therefore to provide projections data by February 2020 would mean initially using household generation rates based on the 2013 census – so the households projections would need to be considered “draft” and would need to be rerun after ~mid 2020. The population projection would however be based on 2018 census data (Usual Resident Population – although STATS NZ did revised this data after its initial release from the last census so would need to check in mid-2020 to see if a rerun for population projections was warranted)

**Options:**

* Seek feedback from STATS NZ about likely release dates for required data and put a case forward for earlier release.
* If earlier release unlikely councils will need to accept time and cost for two runs of projection modelling, the ‘draft’ in Feb 2020 and then final set in Nov 2020, and plan to use the data accordingly.

**Table 1:** Summary of Data Projection Needs

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Projected Parameters of Interest** | | WDC | HCC | Waipa DC | | MPDC | HDC | TCDC | ODC | SWDC | Waitomo DC | Taupo DC | Rotorua DC | WRTM | | DHB |
| Population by TA | | X | X | X | | X | X | X | X | X | X | X | X | X | |  |
| Population by CAU | | X | X | X | | X | X | X | X | X | X | X | X | X | |  |
| Population by Ward (1) | |  |  |  | | + | + | + |  |  |  |  |  |  | |  |
| Population by Settlement/Urban area (1) | |  |  |  | | + | + | + |  |  |  |  |  |  | |  |
|  | |  |  |  | |  |  |  |  |  |  |  |  |  | |  |
| Households - types by TA | | X | X | X | | X | X | X | X | X | X | X | X | X | |  |
| Households - numbers by CAU | | X | X | X | | X | X | X | X | X | X | X | X | X(5) | |  |
| Households by Wards/Settlement/ Urban area (2) | |  |  |  | | + | + | + |  |  |  |  |  |  | |  |
|  | |  |  |  | |  |  |  |  |  |  |  |  |  | |  |
| Dwellings - by CAU (3) | |  |  |  | | + | + | + |  |  |  |  |  |  | |  |
| Rating Units by CAU (3) | |  |  |  | | + | + | + |  |  |  |  |  |  | |  |
|  | |  |  |  | |  |  |  |  |  |  |  |  |  | |  |
| Labourforce by CAU | | X | X | X | | X | X | X | X | X | X | X | X | X(5) | |  |
| Employment by CAU | | X | X | X | | X | X | X | X | X | X | X | X | X(5) | |  |
| Added Value by CAU | | X | X | X | | X | X | X | X | X | X | X | X |  | |  |
|  | |  |  |  | |  |  |  |  |  |  |  |  |  | |  |
| Business floorspace demand / capacity (4) | | X | X | X | | + |  |  |  |  |  |  |  |  | |  |
| Residential area demand / capacity (4) | | X | X | X | | + |  |  |  |  |  |  |  |  | |  |
|  | Projections - modelled by University of Waikato | | | |  | | ME Projections - modelled using WISE Land Use (LU) and other models | | | | | | | |
|  | Projections - modelled using WISE LU and other models | | | |  | |  | | | | | | | |
| X | Data generated for current projections | | | | + | | Additional data of interest to councils | | | | | | | |

1. Current boundaries would require new modelling - updated boundaries could resolve this – see Issue 5 below.
2. Not possible with current census boundaries – updated boundaries could resolve this – see Issue 5 below.
3. Would require agreement on assumptions/methodology - see Issue 5 below.
4. These parameters are currently being modelled for FP only by Market Economics - based on existing projections outputs (land use, households etc)
5. WRTM would need these data at a finer scale than CAU - they have 2500 modelling zones - logistics/feasibility of doing this needs further discussion.

**Issue:** How and when might data from this process feed into other modelling or planning work? - does this have implications for timing/approach taken to projections.

* For example HCC identified - we will look at is how and when information feeds from this process into our infrastructure models for transport (WRTM) and 3 waters. We want to make sure this happens in a timeframe that allows the analysis to feed into the preparation of AMP thinking for those activities for 2021. The lead-ins are significant.

**Questions:**

* What are the other modelling/plan processes that councils would want to use this data for?
* What are the timeframes for these processes over the next 5 years?
* What are the data requirements for these processes and do they impact on needs as shown in Table 1?

**Options:**

* To be defined

### Issue 2: updating of WISE to 2018 start date

The current version of WISE (V1.4) has a starting date of 2013. For any projections modelling for the 2021 LTP or other work to be the most robust several aspects of the WISE model need to be updated to provide a starting date of 2018.

**Issue:** WRC at this stage has not made a commitment to funding the update of WISE to a 2018 start date (part of WISE business case for 2018-2028 LTP) .

* Without an update the next set of projections could only be modelled using the current WISE 1.4 version with a 2013 start date.
* The minimal update of WISE to V1.5 with a starting date of 2018 would require:
  + 2018 Land Use Layer
  + TA Population projections (based on 2018 census)
  + Economic input parameters update
  + Zoning/growth cells update to represent TA’s plans status at mid-2019
  + Infrastructure/Accessibility layers update
  + Calibration of updated Model
* Options for discussed additional improvements to WISE are covered in Issue 3 below.

**Options:**

* The benefits of using WISE to support these projections needs to be communicated to executives at all TA’s.
* A strategy for how a WISE version update might be funded and implemented needs to be developed.

### Issue 3: AdditionAl improvements to WISE

A number of improvements have been identified for the way land use modelling is undertaken in WISE. These are discussed here. Other specific area based issues, which are more about the setup to represent plausible outcomes for a specific area are discuss in Issue 6 below.

The implementation of these additional improvements is predicated on the updates in Issue 2 being undertaken and depends on other needs and uses of WISE. These improvements are an integral part of ongoing maintenance and enhancement for WISE (funding as per WISE business case for the 2018-2028 LTP).

**Issue:** Although the additional improvement identified would provide a more robust outcome there is no current funding commitment to support these improvements.

* The following have been identified as priority additional improvements that could be undertaken to improve a “minimalist’ update as outlined in Issue 2.
  + *Suitability layers* - Review current layers and identify any new (risk based) suitability layers. Based on other modelling work on "living preferences" apply a layer to influence where residential growth occurs.
  + *New Population Model* - UoW has developed a new population model which includes improved migration modelling (Gravity modelling) this would be used to replace the existing population modelling in WISE.
  + *New Economic Model* - Integration of the new computable general equilibrium (CGE) economic model for the Waikato Region that Market Economics have developed.
  + Households Model - Integration of University of Waikato household modelling approach into WISE to provide household estimates and not just population densities (a priority for TAs).

Options:

* Seek funding to undertake these additions as their inclusion would introduce current best practice modelling for economic and demographics.
* Further investigate the integration of a household model.

**Issue:** The inclusion of these additional improvements would not solve all the ‘expectations’ for the resulting projections. The issue with previous projections, particularly for HCC, was the diversity in starting residential density and the ‘anomalies’ this creates in projected output for CAU level indicators (households, population) due to the modelling framework where WISE uses a TA level residential density per land use class. The ‘expectation’ gap occurs when disaggregation of resulting residential growth at sub TA levels is undertaken.

* The addition of a household model (suggested above) would provide more flexibility in being able to adjust household type parameters by TA. This would allow for adjustment to household size and section size as has been considered separately in a spreadsheet model for recent Future Proof work. **However**, the additional of a household model will not entirely fix the density driven ‘anomalies’ in projections as WISE would still be applying TA level residential density per land use class – these would just be household densities instead of population densities.
* The density driven ‘anomalies’ are caused by a TA level residential density being the starting input for WISE. As the model runs and the average residential density for a land use type changes (due to say smaller section sizes in greenfield). In an area (AU) where there is no potential for infilling taking the TA average density at the end of projection and converting it back to people or households will sometimes appear as unexpected change for that AU.
* There is a demand to correct this density driven ‘anomalies’ to improve ability to model urban infill in more detail to represent what can occur in large urban areas. This is primarily an issue in large existing urban areas (Hamilton City, Cambridge). The additional of one or more new residential land use classes is an option to mitigate this ‘density’ behaviour in WISE. This change in WISE is expected to be significant and costly so would need to be investigated further to see if resulting improvements would meet HCC expectations.
* In the previous round of projections this density difference was ‘adjusted’ for outside the WISE process (by calculating CAU densities at 2013 and projecting these forward based on WISE land use change) and prior to projections being undertaken by University of Waikato. The cost benefit of repeating this approach also needs further consideration.

**Options:**

* Consider cost/benefit of adding a new residential land use class vs repeating the previous process of density adjustment.
* Discuss these issues specifically with HCC to better understand the details they require and expectation for projections

**Issue:** During development of previous projection a desire to simplify the process so reruns could be undertaken more quickly and outputs were easily available.

* This issue could be improved by more automation of indicator outputs and automating some of the spatial disaggregation of results. This could allow for selection of different spatial breakdowns (CAU, TA, Wards) to provide LU results at that scale.
* For Land use projections automation of processing the WISE outputs is reasonable straight forward. Would need to discuss further with University of Waikato and Market Economics.
* For repeatability/automation there would need to be agreement on total set of spatial disaggregation’s required across the Region.
* This would be beneficial but the cost benefit of doing so probably sits after the WISE model update and additional improvements already outlined. This improvement idea also has no funding to be undertaken in foreseeable future.

**Options:**

* Seek further input on automation options.
* Identify costs to achieve improvements.

### Issue 4: data outputs – Spatial grouping and presentation

Some TA’s have raised a desire to have projections to be undertaken at different spatial groupings (ie Wards or Settlement areas) and to have reporting more TA specific so that outputs are more easily used by them.

**Issue:** The option of modelling projections outputs at other spatial areas appeared more difficult under the current census / TA sub area boundaries due to lack of concordance. However the Stats NZ review of its SA1 and SA2 boundaries appears to have improved the ability to do this modelling.

* Any ‘other spatial area – i.e. Ward/settlement’ which is a concordant AU/SA2 or aggregation of AU’s or SA2’s then providing results for population, and household for this spatial area is easy – just add up separate projected AU/SA2 figures  within that boundary.
* If however the ‘other spatial area – i.e. Ward/settlement’ is a concordant meshblocks/SA1 or aggregation of meshblocks or SA1’s then a separate model to estimate population would be required, and no household estimates would be defendable (as household generations data is only at UA/SA2 level).
* If the  ‘other spatial area – Ward/settlement’ is NOT a concordant AU/SA2 or aggregation of AU’s or SA2’s and NOT a concordant meshblocks/SA1 or aggregation of meshblocks or SA1’s – then its not doable in terms of defendable projections.
* (Need to Check with Garry about what this means for the economic projections).

**Options:**

* Initial analysis of some of the new SA2 boundaries indicates that spatial breakdowns for most sub-TA areas of interest are possible. The next step would be to get a list of all the areas TA’s are interested in and check with the draft boundaries.

**Issue:** Outputs from projections can be presented in many ways – aim is to define and meet output information needs for TA’s. However, TA specific reporting would increase the cost of data presentation.

* The presentation of previous projections data and reporting has been limited.
* The Rationale Reports done for HDC, MPDC, TCDC provide a good example of data presentation, and excel spreadsheets provided make good use of Pivot Table to make assessment of data.
* There is such a wide range of tools and options for presenting data and expectations across TA’s.

**Options:**

* There are so many options for presenting data – need to get some general agreement on where to balance the cost of creating presentation options against the fact that some councils are wanting to analyse data and create own stories.
* Determine what is an acceptable ‘suite’ of presentation outputs – are these just data presentation or do users want reporting/stories developed to go with data?
* Other methods of data presentation / accessibility could be explored for future work. WRC is current migrating to ArcGIS. This could provide prospects for exploring its web service and interactive infographic capabilities in the second half of this financial year.

**Issues:** Projection timeframes and intervals

* Projection timeframe - previously 2013-2061, next round 2018 to 2068?
* One need identified is for year-on-year projections. Projections in say 5 or 10 year bands is not suitable for detailed planning or LTP requirements so we need the data to be available each year over the projection period.
* Current projected data is at '10 yearly' intervals - (2013, 2021, 2031, 2041, 2051, 2061) - shorter time intervals will require more modelling and cost (estimated cost $800 per run, i.e. $4000 for the 50 years projection using 10 years intervals).
* The easiest option is to linearly interpolate between modelled numbers – it this an option?

### Issue 5: Additional Parameters to Previous Projections Otuputs

In addition to data provided in previous projections there is some interest in additional parameters such as rating units and dwellings, and data required for the Housing NPS.

**Issue:** There is a demand from TAs to be able to project future changes in “Rating Units” and Dwellings. Could we use WISE modelling to help generate future estimates of number of Rating Units?

* There is mixed interest across the TA’s in these parameters – especially at a CAU level. Would TA level analysis suffice?

**Options:**

* Need to test the level of interest for these parameters as part of this work – currently only three TA’s have indicated a need for this data.
* If are going to do this analysis as part of the regional projections then need to agree on the definitions and methodology to apply. Then consider who to undertake work.

For the NPS requirements Market Economic is going to be doing some floor space projections for FP council area based on data from previous projections. This might provide some useful insight into possible process for future NPS data analysis.

### Issue 6: Site Specific modelling issues

Issue: Representing decline in a CAU correctly when the overall district population is increasing – this cause problems for projection in two AU for Taupo DC.

### Other Issues

1. Data needs for Transport Modelling were identify as breakdown to WRTM modelling zones for Households and employment projections. This would have to be undertaken by further disaggregation of the CAU level data. How this is undertaken and by Whom will require further discussions
2. Be good knowing more about migration trends (both as a proportion of population change and spatially from where to where).
3. Indicator tool in ISC – could explore and see if this offers some options?

**Appendix 1: Process timeline for Model updates and provision of projections for 2021 LTP**

