The WOW Population Model

Michael P. Cameron

University of Waikato

WISE Technical User Group Workshop,

6 November 2013

Background

- WOW (Whole-of-Waikato) population model was developed alongside the Creating Futures project

  - It has also been used for preparing population projections for TCDC, FutureProof (Hamilton, Waikato DC, Waipa)

  - It has been extended to stochastic population projections, but that functionality is not included in WISE

  - The same framework is now being used for new projections for FutureProof, TCDC/MPDC/Hauraki, SmartGrowth (Tauranga/WBOPDC), and in two large MBIE-funded projects (Climate Change Impacts and Implications (CCII) and Nga Tangata Oho Mairangi (NTOM))

- It follows a standard cohort-component model (CCM) framework, but with some important differences from the CCM model employed by Statistics New Zealand (SNZ)

WOW, within the WISE model
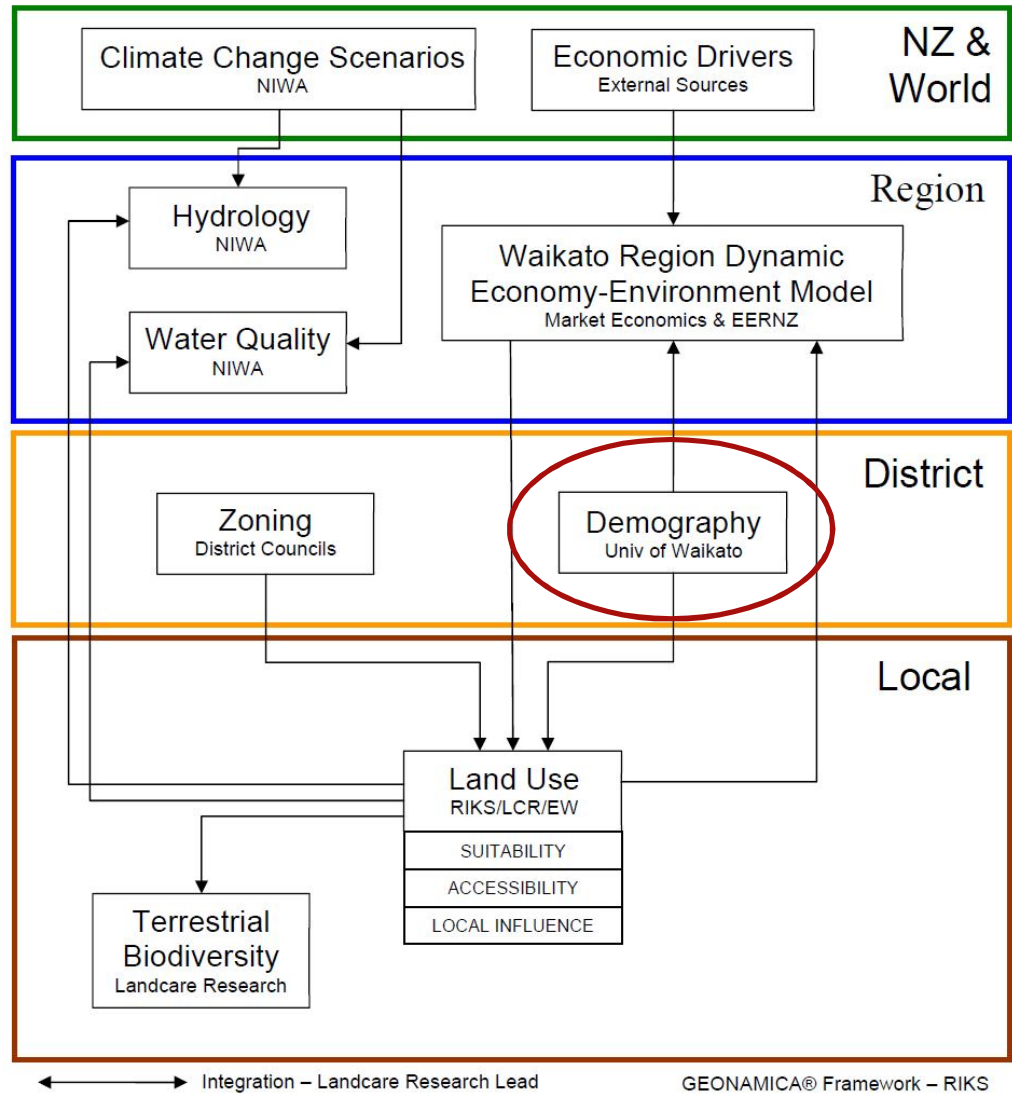
The WOW model

- Projects population into the future for the Waikato region

  - By single-year-of-age (up to 100+) and gender

- Annual timesteps

- Spatial resolution is the TLA (District) level

- No endogenous inputs from other models

The standard cohort component method (CCM)

- The population usually resident in area i at the end of year t

  =   The population usually resident in area i at the beginning of year t

  +   births to mothers residing in area i during year t

  – deaths of residents of area i during year t

  +   inward migration from other regions into region i during year t

  +   inward migration from overseas into region i during year t

  – outward migration of residents from area i to other regions during year t

  – outward migration of residents from area i to overseas during year t

- Note: All migration is conventionally combined into one net migration number (by region, age and sex)

Parameters in the CCM model

- Projections implicitly assume correlation between fertility, mortality and migration assumptions, and develop scenarios on this basis

- SNZ has recently extended their projections to include other scenario combinations

- WOW doesn't constrain parameters to certain scenarios
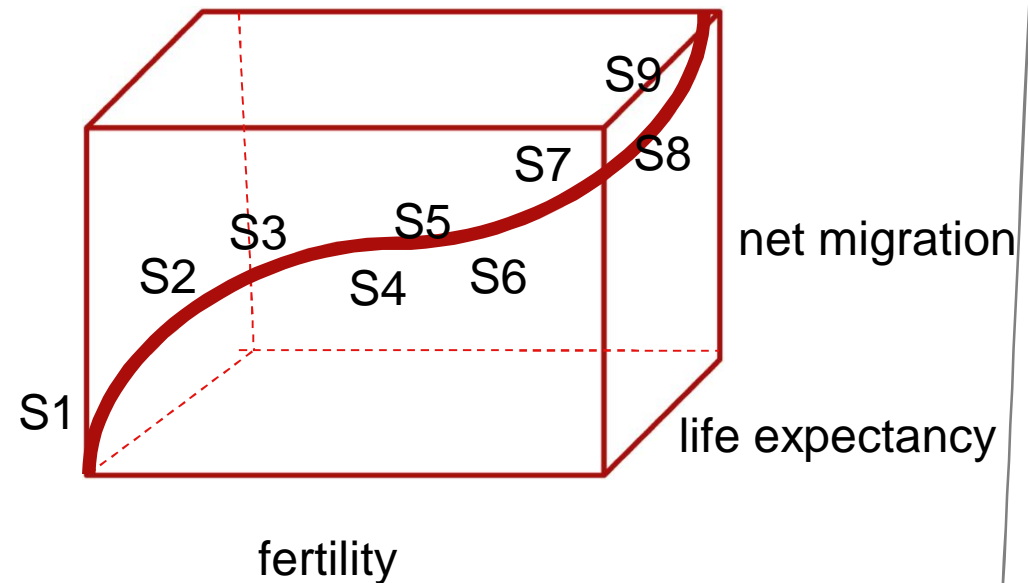
Source of parameters

- Fertility: Standard SNZ sub-national fertility assumptions (based on past fertility trends projected into the future)

  - Total fertility rate

  - Constant age distribution

- Mortality (Survivorship): Standard SNZ sub-national mortality assumptions (based on past mortality trends projected into the future)

  - Life expectancy at age zero (E(0))

Source of parameters

- Migration: Age-gender-specific net migration rates, derived using a combination of residual and regression methods from past sub-national inter-Censal migration patterns (1991-2006)

- Projected into the future only as a moving average

    - Too little available data to project using more sophisticated time series methods

- This differs substantially from SNZ's approach, which is to project absolute numbers for net migration based on past trends and expected future changes

Net migration rates

Age-Specific Net Migration Profile for Hamilton City Males, 2006 and 2031
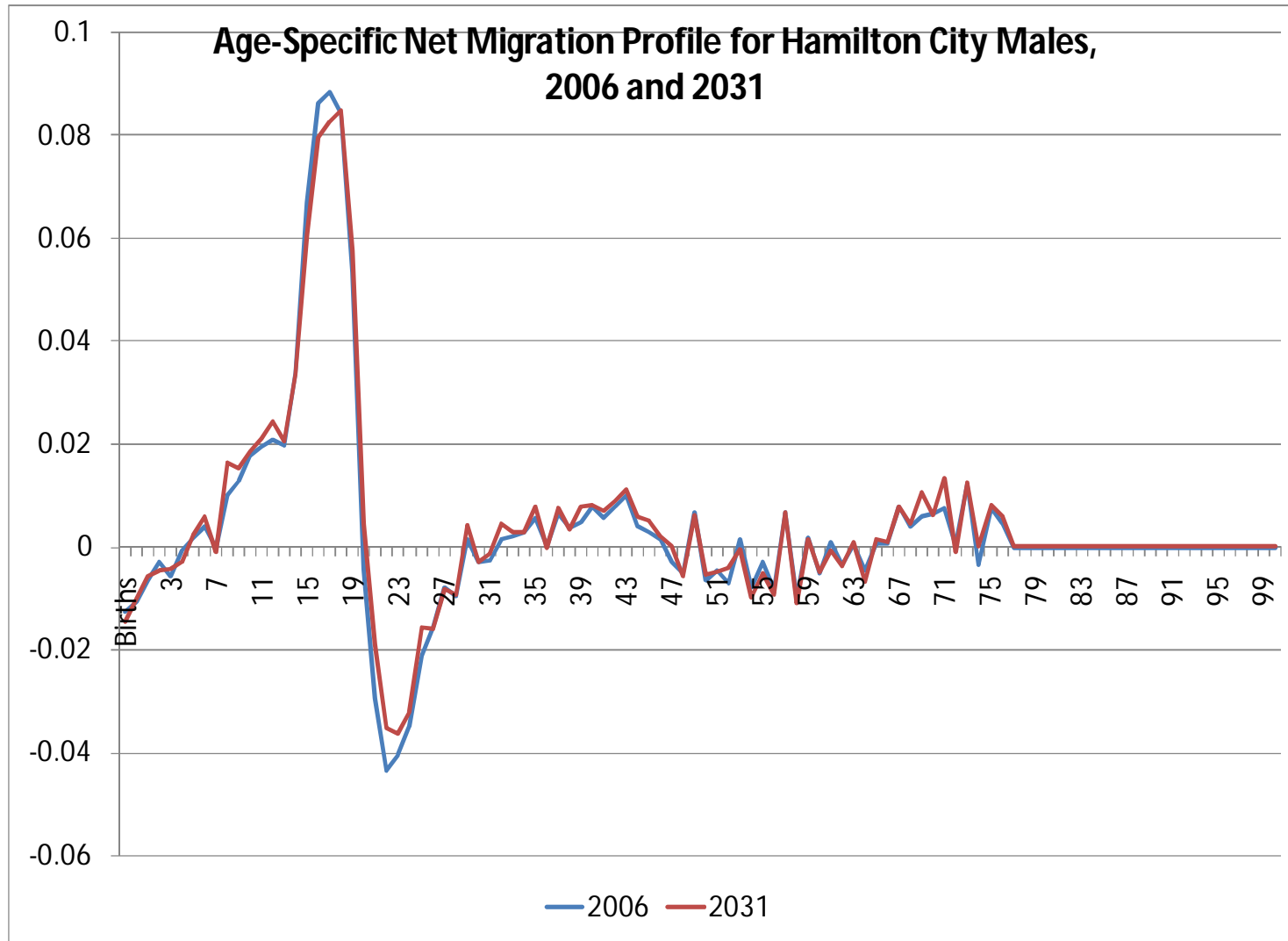
Levers for adjustment in the model

- The parameters are drawn in from an external spreadsheet in WISE.

    - These parameters could be altered (not recommended)

- Instead, there are a number of 'policy levers' implemented in WISE

    - Fertility (to +/- 5%); constant across all districts

    - Mortality (to +/- 2%); constant across all districts

    - Net migration (to +/-50%); can be altered independently for each district

- The initial parameter value for each level is zero, which will reproduce the baseline population projection for each district

- The range restrictions on these levers mimic the maximum variance in these parameters over the last sixty years

Words of caution

- The policy levers give substantial scope for adjustment in the model

- However, large adjustments to all parameters simultaneously may give unexpected results

- As with any projection model, parameter adjustments to develop alternative scenarios must be considered in a logically consistent and thoughtful manner

  - We recommend consultation on scenarios before large parameter adjustments are made

Future directions

- As noted, the WOW model is developing in further directions

    - Stochastic modelling

    - Gravity modelling of net migration rates (CCII, NTOM)

    - Climate interactions, especially with mortality and migration (CCII, NTOM)
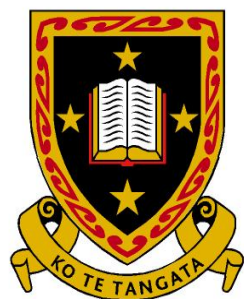
THE UNIVERSITY OF WAIKATO

Te Whare Wānanga o Waikato

WWW.WAIKATO.AC.NZ | 0800 WAIKATO

National Institute of Demographic and Economic Analysis
Te Rūnanga Tātari Tatauranga
THE UNIVERSITY OF WAIKATO