

The potential of geospatial tools for enhancing community engagement in the post-disaster reconstruction of Christchurch, New Zealand



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International Conference on
Sustainable Design,
Engineering and Construction

10-13 MAY,
2015 CHICAGO,
USA

Today's presentation

Introduction & context

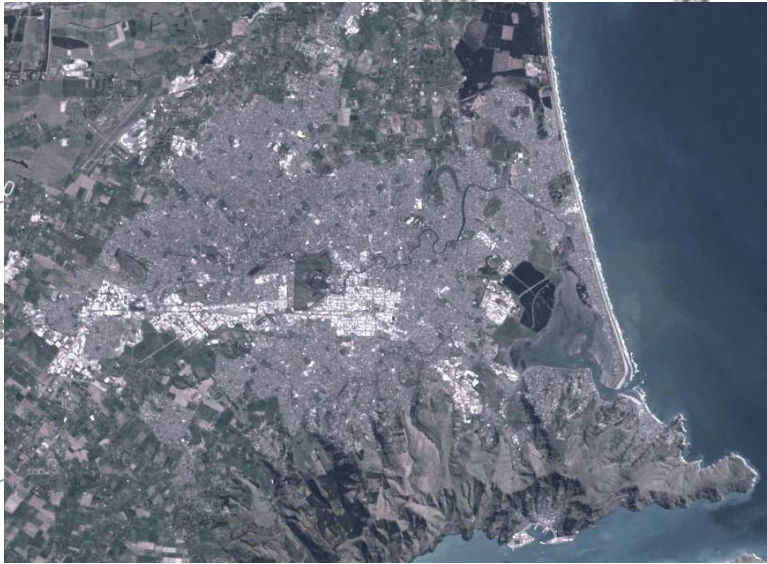
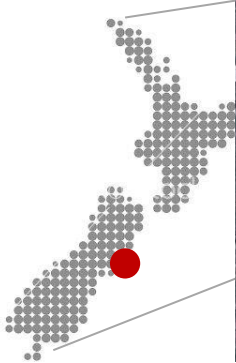
- Christchurch before and after the 2010/11 earthquakes
- Research need

Greening the *Greyfields* research project

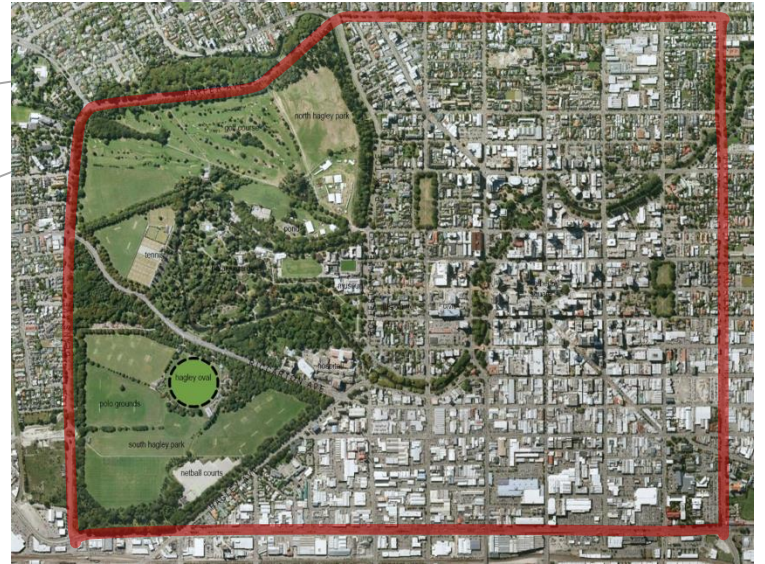
- The geospatial tools for community engagement: Envision & ESP
- Implementation challenges
- Community & Stakeholder engagement framework

Let's talk about this!

Introduction & context



Christchurch City: 1,426 sqkm, approx. 362,000 inh



Garden City: 161ha Hagley Park, four inner-city avenues

Christchurch before 2010



- Founded in 1856, Christchurch is the oldest urban settlement in New Zealand
- Historical city: important architectural heritage from the 19th century
- The city centre integrates a regular grid, and was designed according to the principles of the *Garden city*
- In 2010 nearly overtook Wellington to become the second largest city in NZ
- Intensification of *greenfield* development vs degraded city centre
- City centre congested with traffic, and declining attractiveness

The 2010 and 2011 Christchurch earthquakes

- September 4th, 2010 (Canterbury earthquake) - 4:35am, 7.1ML, 10km of depth



- February 22nd, 2011 (Christchurch earthquake) – 12:51pm, 6.3ML, 5km of depth
- And subsequent aftershocks, until January 2012 – up to 5ML
- Severe infrastructural damage, rock fall, cliff-face collapse, liquefaction



Christchurch after the 2010/11 earthquakes

- 185 fatalities
- Estimated 75% of residential buildings suffered damage
[7.5% collapsed or require demolition]
- CBD: 90% of buildings have been demolished



- Most affected areas:
 - Mid-suburban districts closest to the river and sea
 - Severe infrastructural damage and social disruption



Overall Road Damage

- Severe
- Major
- Moderate
- Minor





- Socio-demographic shifts and changing housing demands
 - By 2031: 65 years + will nearly double
 - 10 years for the city's population recover to pre-earthquake levels
 - To reduce pressure on greenfield development, the Christchurch City Council:
 - Rezoned 9000 households in central Christchurch (medium density)
 - Started assessing opportunities for Brownfield redevelopment
 - Should consider mid-suburban areas
- Significant demand pressures on retail, and commercial premises
 - Investors are 40% more optimistic about Christchurch than the rest of NZ

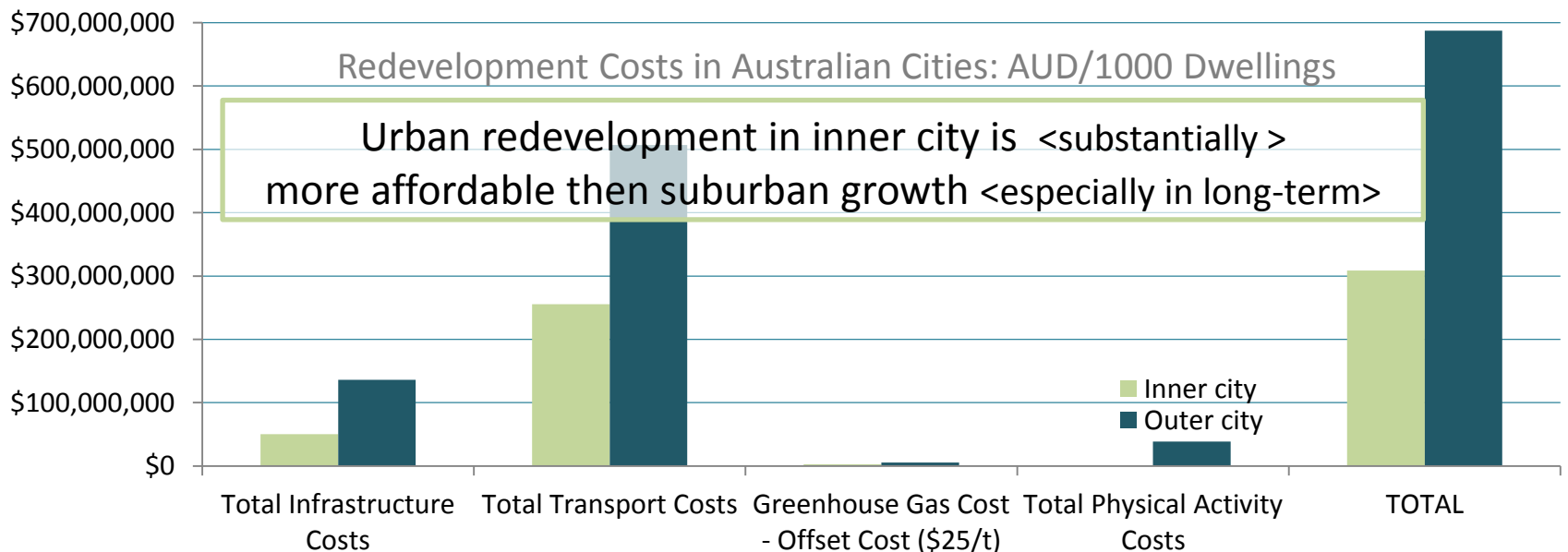
Christchurch, an emerging resilient city



- Major reconstruction effort is underway
 - Since Sept 2010 nearly 8,000 building consents issued in Canterbury
 - By 2016 infrastructure reconstruction will have cost \$2 billion
 - Economic growth in Canterbury is currently around 6% p.a.
(mostly boosted by construction sector)
- Strengthened social and economic resilience
 - Recovering business environment:
 - Non-residential building consents in central city remain high
 - Since Sept 2010 – 15,000 *new* businesses in Canterbury region
 - Strong community empowerment and more social events in the city

Research need

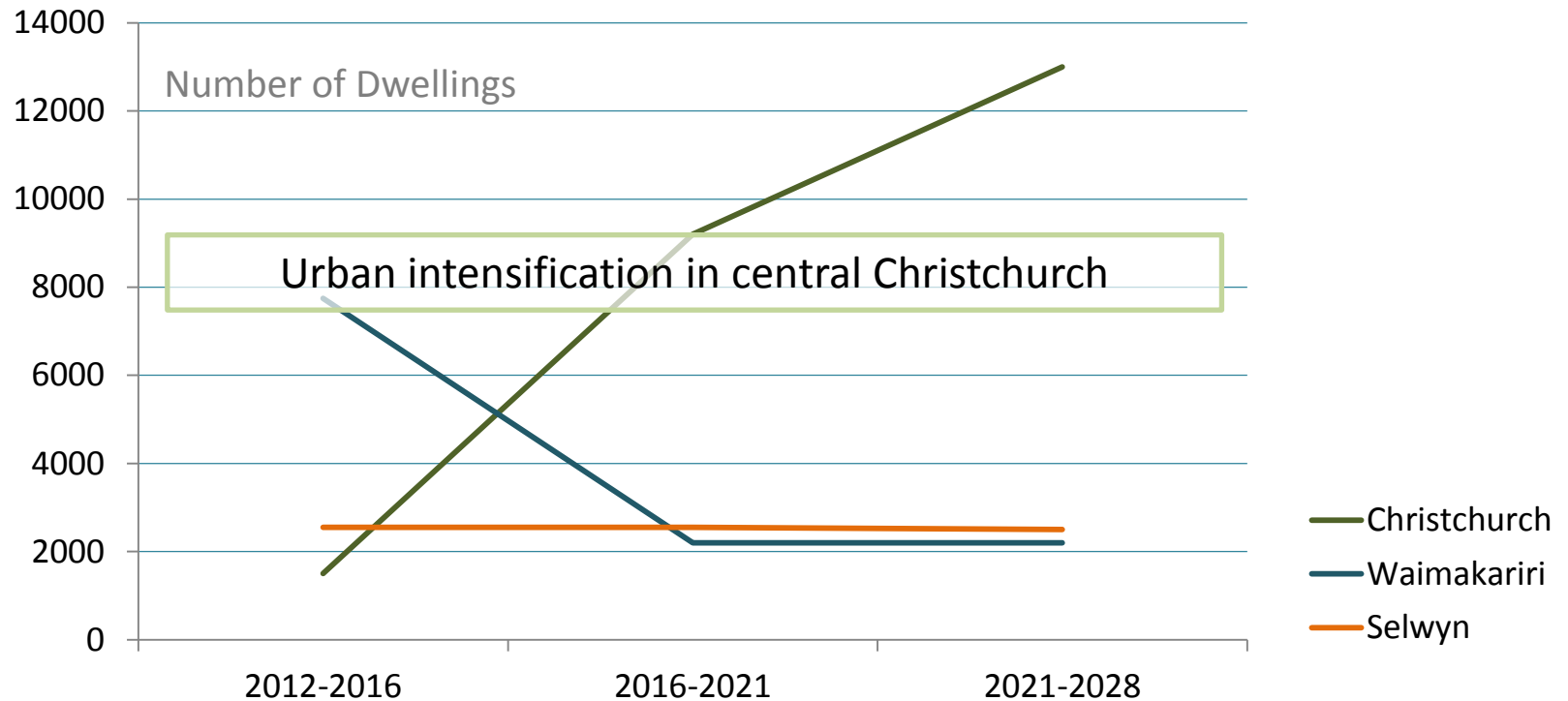
- Support decision-making in the opportunity to *rebuild smarter*
 - Livable city centre: more attractive, economic resilient, and socially convivial
 - The right levels of urban intensification, with the needed urban amenities
 - The accessible city: pedestrian and active-mode oriented
- Create show cases of inner city redevelopment vs. suburban development



Source: Trubka, Newman & Bilsborough, 2010, The costs of urban sprawl – physical activity links to healthcare costs and productivity. Urban Design Guide Gen 85.

Research need

- Create sustainable and innovative show cases to assist the already ongoing processes of urban intensification in Christchurch



Source: CERA 2014, Land Use Recovery Plan, p18. Statistics NZ medium growth projections, and Statistics NZ projections for gross housing demand in metropolitan Christchurch and other data

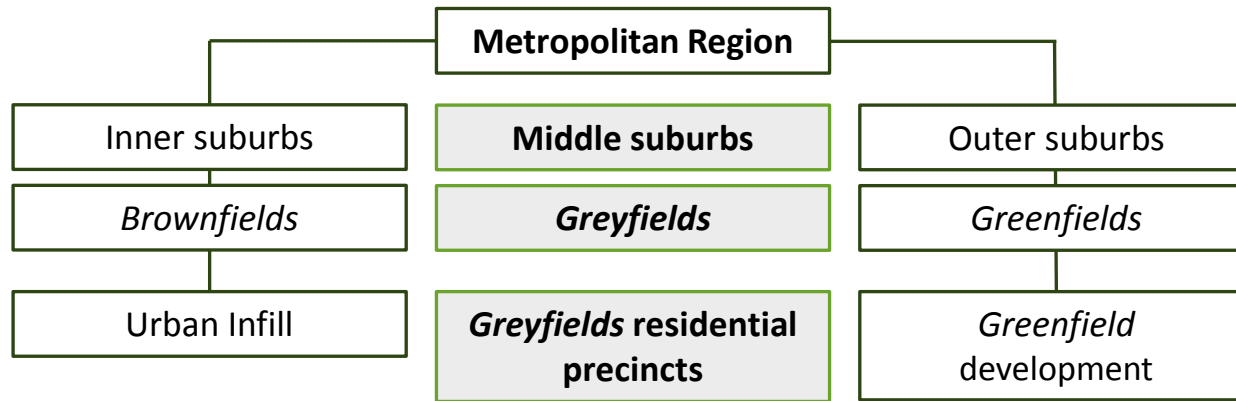
Research need

- Promote information, collaboration and engagement of communities in urban redevelopment and reconstruction
 - Promote the integration of local *know-how* for better social and economic outcomes
 - Endeavor to integrate everyone's "voice" in the transformation of their city
 - Enhance local pride and inspire communities, which impacts positively in the management of urban spaces



Greening the *Greyfields* research project

What are the *Greyfields*?



"Greyfields" are those **ageing** but occupied **tracts of inner and middle ring suburbia** that are **physically, technologically and environmentally failing** and which represent **under-capitalised real estate assets"**

(source: Newton 2010)

Greening the *Greyfields* research project

[Objective 1]

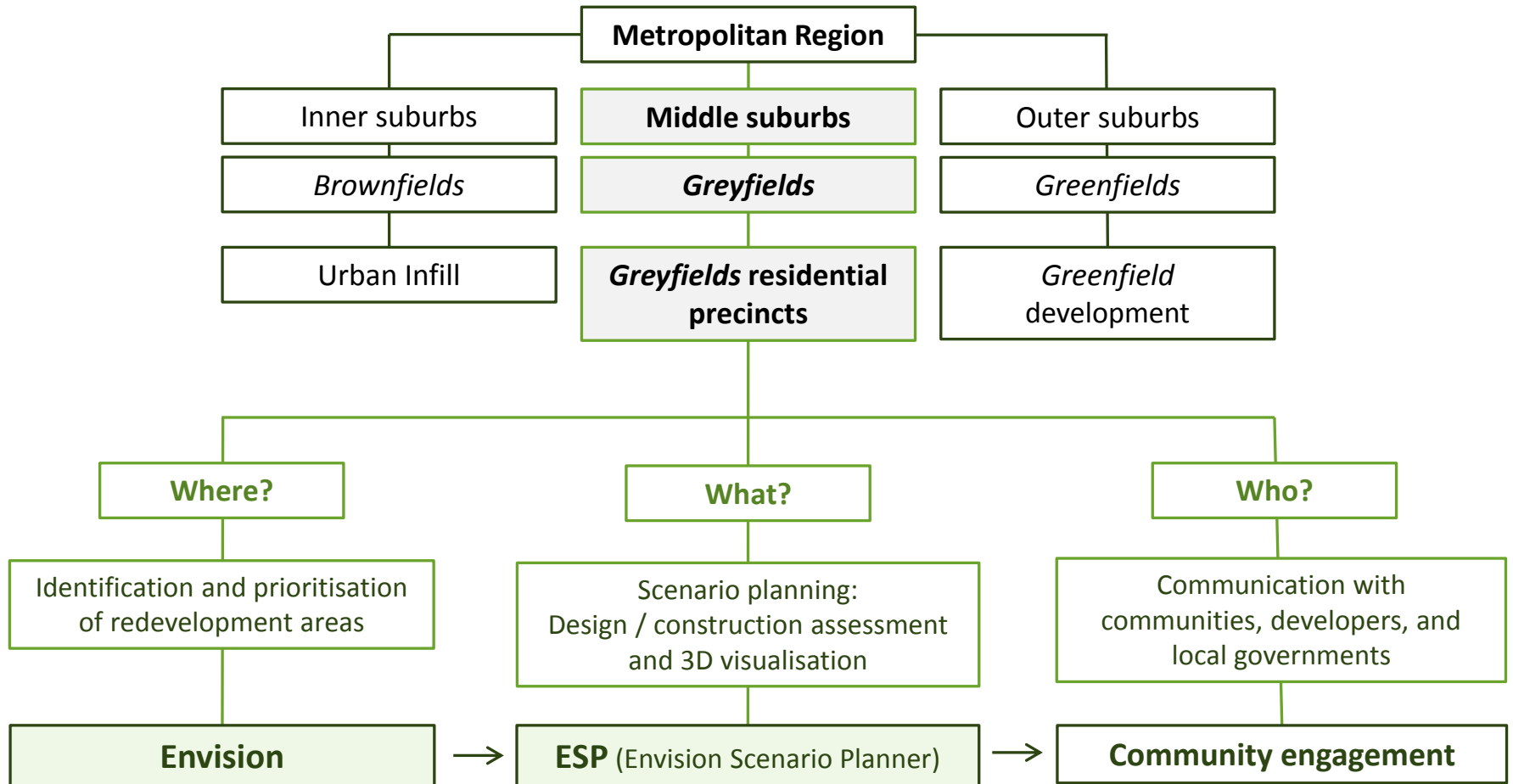
- Develop a urban planning toolkit for sustainable decision-making:
 - Support the opportunity to *rebuild smarter*
 - Demonstrate *Greyfield* precinct redevelopment vs. *Greenfield* development
 - Develop sustainable and innovative show cases of urban intensification
 - Integrate communities in the process of decision-making

[Objective 2]

- Deliver the toolkit while supporting Local Government Authorities to carry out *Greyfield* redevelopment and reconstruction:
 - Engaging stakeholders and communities
 - Supporting processes of property amalgamation
 - Assess legal vehicles [and barriers]

Greening the *Greyfields* research project

Where? What ? Who ?



Greening the *Greyfields* research project

[Aims]

- 1) Assessment of precinct redevelopment opportunities in *Greyfield* areas, and reconstruction priorities
- 2) Identification of the best precincts for *Greyfield* redevelopment / reconstruction



Envision

Greening the *Greyfields* research project

[Aims]

- 3) Assessment of environmental and economic impacts of sustainable and innovative construction vs B.A.U.
- 4) Scenario modelling for precinct redevelopment and reconstruction
[B.A.U., efficient; and advanced]
- 5) Development of strong visualisation tools oriented for public participation and community engagement



Envision Scenario Planner

The geospatial tools for community engagement

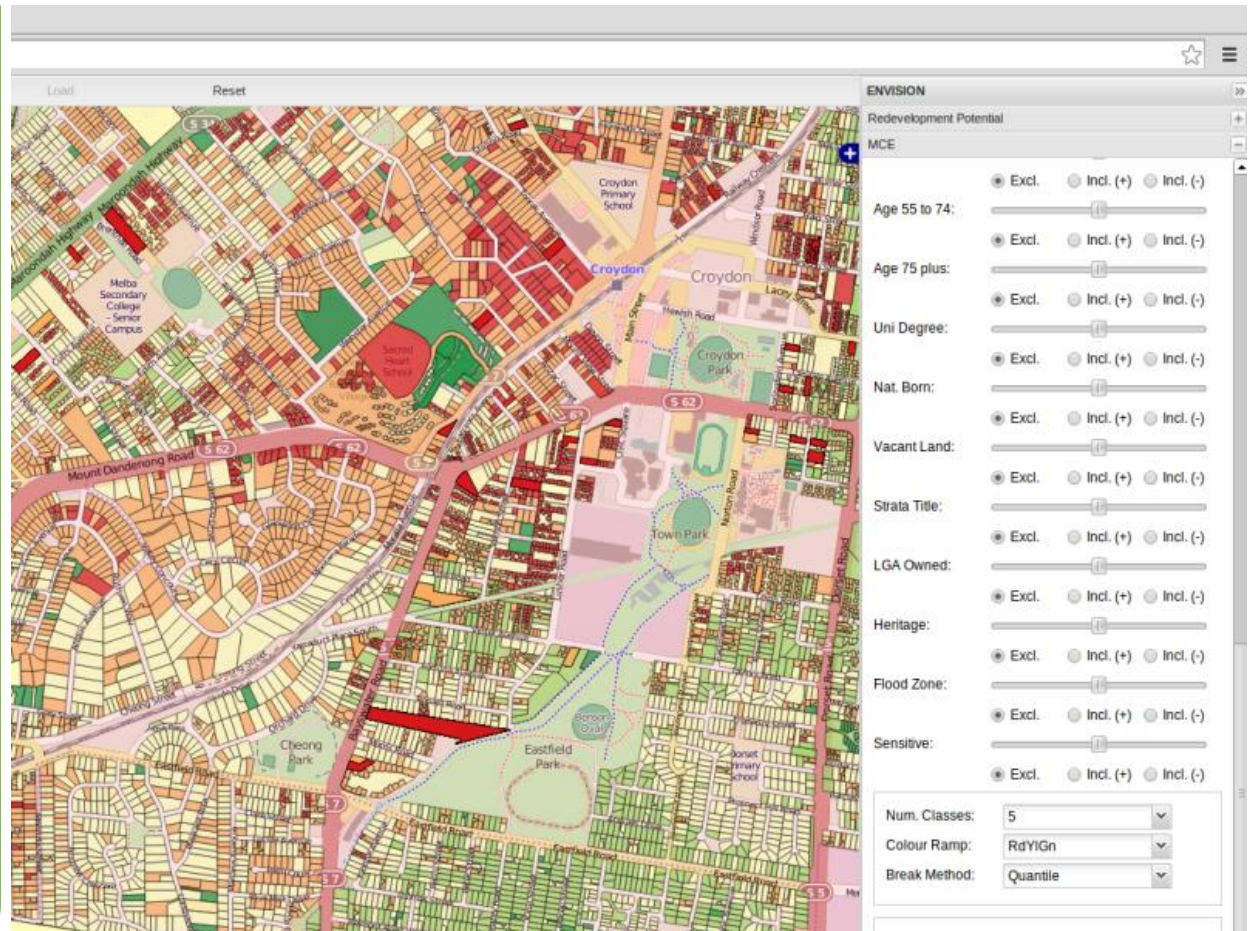
Envision

Multi criteria evaluation

- **Property attributes** (RPI, area, dwelling area, dev. Efficiency, etc.)
- **Demographics** (age groups, SEIFA quartiles)
- **Location** (Dist. To urban amenities, centres, schools, transportation)

Criteria weight management

Assessment of precinct redevelopment opportunities based on multi criteria weight



Results of an assessment performed with the MCE tool

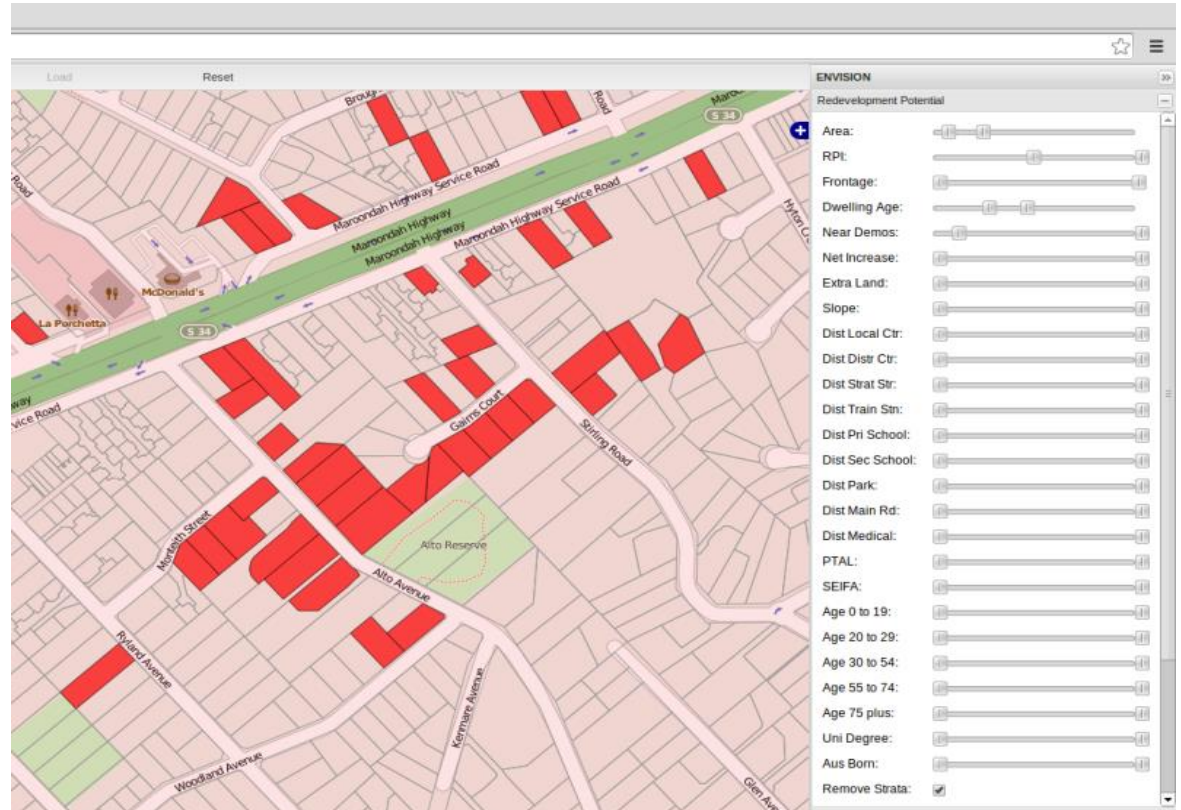
The geospatial tools for community engagement

Envision

Redevelopment tool

- **Attributes influencing redevelopment probability (RPI, dwelling age, relative density, recent demolitions, LGA owned, vacant land**

Identification of precincts that are likely to be redeveloped



Results of an assessment done with the Redevelopment tool

The geospatial tools for community engagement

Envision

Envision's potential

- Support the processes of urban intensification and urban regeneration
- Support decision-making [areas of multi-hazard risk, and master planning processes]
- Raise awareness on regeneration opportunities, enhancing community engagement and stakeholder's confidence

The geospatial tools for community engagement

Envision Scenario Planner

Analysis Components

Embodied carbon

Energy demand

Water demand

Transport VKT and emissions

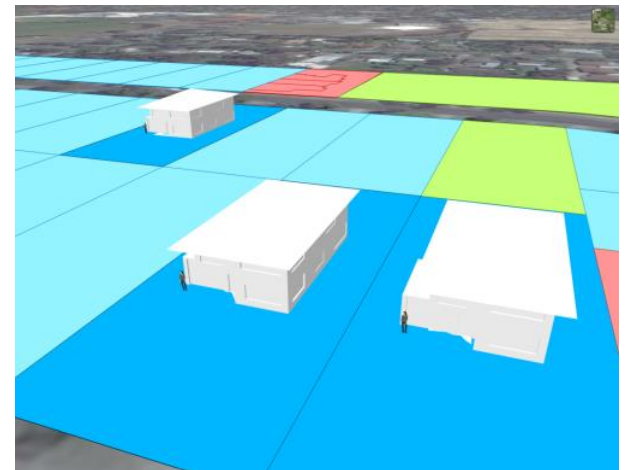
Construction cost

Economic viability

B.A.U.
typologies

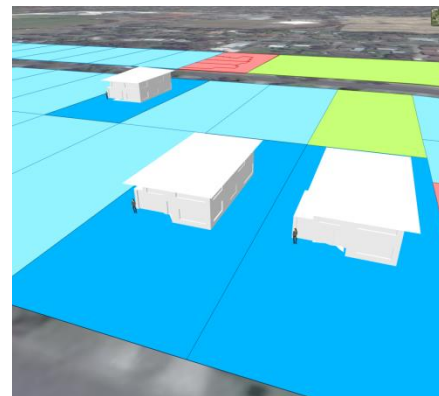
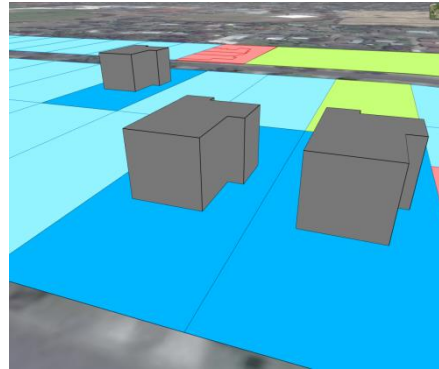
Efficient
typologies

Advanced
typologies



The geospatial tools for community engagement

Envision Scenario Planner



Reports	
Residential Report	<input type="button" value="↕"/> <input type="button" value="↺"/>
Space	
Lot Size (m ²)	10,518.94
Extra Land (m ²)	6,875.99
Footprint Area (m ²)	3,642.95
Gross Floor Area (m ²)	3,612.80
Plot Ratio	4.09
Dwelling - Density (Dwellings/ha)	280.74
Dwellings - Total (Dwellings)	25.00
No. Occupants (Persons)	297.00
Extra Land - Lawn (m ²)	1,031.40
Extra Land - Annual Plants (m ²)	687.60
Extra Land - Hardy Plants (m ²)	2,406.60
Extra Land - Impermeable (m ²)	2,750.40
Energy Demand	
Heating (MJ/year)	141,948.96

- Land use management
- Several visualisation modes [building mesh, block, or footprint]
- Flexible reporting [entire precinct, several buildings, or per building]

The geospatial tools for community engagement

Envision Scenario Planner

ESP's potential

- Scenario planning [environmental impacts and economic feasibility]
- Support decision-making [infrastructure, amenities, and community facilities]
- Develop business cases [new forms of urban intensification], providing confidence to communities and stakeholders
- Strong visualisation tools enable better debates and more engagement

[Augmented Reality extension]



Street view



3D model visualisation

Implementation challenges

[Cultural/ Political/ Planning context]

- Resistance to urban intensification and propensity for low density suburbia
- Community/stakeholder engagement is multi-faceted and complex
- Common lexicon to facilitate the communication between engagement arenas, while maintaining accuracy for urban planning experts (our main stakeholders)

[Recovery / reconstruction context]

- Difficulty to establish contact with most affected communities in Christchurch
- Community engagement strategy must address the processes of social recovery

Community & stakeholder engagement framework

Identify key areas for redevelopment

- Decide on site identification criteria
- SWOT analysis for precinct redevelopment
- Integration of planning priorities (GtG's and LGA's)
- Envision training
- Identify precincts in Envision

[Praxis: Agreement on precincts – potential showcase] + Evaluation

Precinct co-analysis & co-design

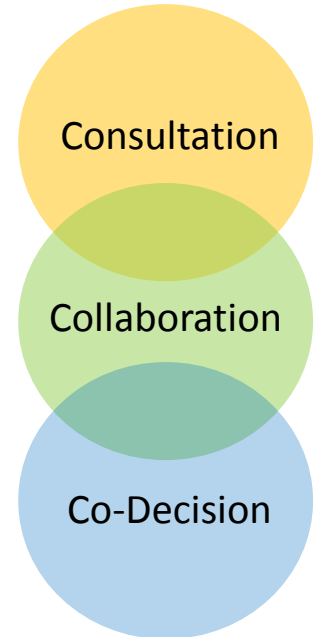
- Workshops: site visits & brief for scenario design
- ESP training → → → Scenario modelling
- Identify legal / statutory barriers and vehicles for GtG implementation
- Define financial schemas & partnerships models

[Praxis: Legal and financial showcase for precinct redevelopment]

Community / stakeholder validation

- Final consultations with resident, developer, and planning communities

[Praxis: Review of final strategy document for precinct redevelopment]



Thank you

Questions or comments?

Let's talk about this!