Kestle, L. (2014), Built environment research at Unitec. Presentation at the 4th New Zealand Built Environment Research Symposium (NZBERS), 14 November, Massey University, Albany campus.
The objective of the paper was to review the potential short-comings of the Auckland and Unitary Plan for Auckland with respect to ‘disaster preparedness and response’, based on lessons from the Christchurch earthquake experiences, but also in response to the key points on the ‘Resilient Cities Framework’ (RCF) checklist.

So, the question posed was “whether we are really listening or learning, or not, as the 30 year Auckland Plan, and Auckland’s Unitary Plan are rolled out?“
The Unitary Plan for Auckland is sadly lacking as a tool to ensure Auckland’s business and residential sectors can be relocated, and/or accommodated seamlessly when large scale natural disasters strike Auckland.

No mention is made of a budgetted disaster plan, or a hazard data-base being updated and maintained, nor are realistic or pertinent risk compliant building regulations included.

No mention or recognition of how and where rebuilds, relocations of businesses will/could be addressed and catered for in a disaster recovery plan, nor is there any sense in the 30 year plan of the need for the involvement of the relevant community organisations in the planning and implementation process.

This despite the fact that almost half of NZs population live and work in Auckland city, and Auckland is where a very significant proportion of New Zealand’s GDP is created.
### Renewable Headroom

#### Old Wind Generation
- Capital Planning
- Wholesale Price

#### Wind Construction
- Build Wind

#### Hydro Construction
- Build Hydro

#### Geo Construction
- Build Geo

#### Bio Construction
- Build Bio

### Minimum New Plant Prices

#### New Supply Cost
- Aggregate Wind Installed
- Aggregate Hydro Installed
- Aggregate Geo Installed
- Aggregate Bio Installed

#### New Hydro Plant Prices
- Minimum New Hydro Plant Prices

#### New Wind Plant Prices
- Minimum New Wind Plant Prices

### PC Coal Construction
- PC Coal Plant Size
- NGCC Plant Size
- IGCC Coal Plant Size

#### NGCC Construction
- NGCC CO2 Construction

#### IGCC Coal Construction
- IGCC CO2 Coal

#### PC Coal Construction
- PC Coal

#### IGCC CO2 Coal Construction
- IGCC CO2

#### IGCC Coal
- IGCC

#### PC Coal
- PC

### Under Construction?
- Min Fossil Production Cost By Region
- IGCC Coal
- PC Coal

#### Table 13

### Installed Biomass Gasification
- By Region GWh per yr

### Start Year
- Model Start Year

### Prepared by: Jonathan Leaver
Wetback Project- Tests were done with multiple configurations, and the data was able to be compared.

Facts About Water

Water boils at:
• 100° C at sea level
• 69°C on Mt Everest
• 107°C at a 3.0m head of water (under pressure)

Latent (‘hidden’) heat
When water reaches boiling point a lot of additional energy is required to turn it to steam (change state). This additional energy does not contribute to a rise in temperature.

Thermosiphon
Passive heat exchange based on natural convection
• Gravity acts on dense (cool) water drawing it downwards and displacing less dense (warmer) water effectively pushing it upwards
• The ‘hot air rises’ affect
Indirect system – conventional Wetback plumbing.

Indirect system – ‘counterflow’ Wetback plumbing.

**Facts About Water**

- Water boils at:
  - $100^\circ\text{C}$ at sea level
  - $69^\circ\text{C}$ on Mt Everest
  - $107^\circ\text{C}$ at a 3.0m head of water (under pressure)

- **Latent (‘hidden’) heat**
  - When water reaches boiling point a lot of additional energy is required to turn it to steam (change state). This additional energy does not contribute to a rise in temperature.

- **Thermosiphon**
  - Passive heat exchange based on natural convection
  - Gravity acts on dense (cool) water drawing it downwards and displacing less dense (warmer) water effectively pushing it upwards
  - The ‘hot air rises’ affect
We were then able to directly compare the performances under a wide variety of configurations.

**Facts About Water**

Water boils at:
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**Latent (‘hidden’) heat**

When water reaches boiling point a lot of additional energy is required to turn it to steam (change state). This additional energy does not contribute to a rise in temperature.

**Thermosiphon**

Passive heat exchange based on natural convection
- Gravity acts on dense (cool) water drawing it downwards and displacing less dense (warmer) water effectively pushing it upwards
- The ‘hot air rises’ affect
Employment growth in the Auckland C&I sector

Auckland has the largest share of forecast levels of growth for the C&I in NZ. Auckland’s construction sector is predicted to grow from 8.2 billion dollars in 2013/2014 to 11.8 billion dollars in 2018/19 and 12.2 billion by 2023 (48% higher than 2013/14).

The workforce in the Auckland construction sector is anticipated to increase at an annual rate of 4.8% per year between 2013-2018, higher than national growth forecasts for employment in this sector.

It is therefore essential that the future students (the participants) join the profession with a deep awareness of the importance of sustainability already embedded as part of their psyche.
- investigate the various categories of waste the participants identified, and investigate options available to re- or up-cycling for all of the products

- participate in a questionnaire that was designed to discover to what, if any, extent the participants’ understanding of waste management had been transformed by this process.

- this process in turn would encourage transformational thinking. Their critical analysis via the online forum, in conjunction with the results of the questionnaire.
Four main themes emerged from the questionnaire evaluation and their responses were examined in parallel with the forum responses made by the different groups after their exposure to the waste. These were:

1. Real World Waste
2. Waste management in industry
3. Money matters
4. Students’ perceptions of the activity’s value
disappointment seeing waste not properly grouped
“waste material sorting method wasn’t appropriate or correctly sorted” and
“people did not classify waste material very well”

… students starting to critically evaluate waste recycling
“students are mixing all the waste together which is very hazards’[sic] because most of the waste are flammable and easy to catch the fire.
Moreover the containers are uncovered and not made for collect most of the waste. In addition the safety topics are not covered in this area.”

… saw the importance of planning to reduce waste
“planning ahead of project saves material wastage”

… educating the community to be aware of recycle
“educating people”
The impact of an innovative construction system on residential internal environments

Collaborative Research in the FTBE with Robert Tait, Andy Pivac, Roger Birchmore & Kathryn Davies
What are we doing?

Using ‘control’ and ‘test’ houses to monitor the seasonal performance. (Air temp, Dew Point, RH)

Monitoring the actual seasonal performance of particular components (The innovative wall construction)

Trying to get a computer simulation to replicate the actual results

Use the ratified simulation to try out other improvements

Test the best ones on complete houses

1. What changes can be made to a conventional NZ house design to improve:

i. energy efficiency
ii. thermal comfort
iii. and eventually sustainability?

2. Identify impacts on the construction process

3. Produce learning resource material
What are we doing?

Using ‘control’ and ‘test’ houses to monitor the seasonal performance. (Air temp, Dew Point, RH)

Monitoring the actual seasonal performance of particular components (The innovative wall construction)

Trying to get a computer simulation to replicate the actual results

Use the ratified simulation to try out other improvements

Test the best ones on complete houses
What we found - Outside conditions - Summer

Summer day 04/03 - 06/03

- dp outside
- temp outside
- Solar Radiation (RAW)

Test and Control House temperatures

Degrees C

Summer day 04/03 - 06/03

- temp test
- temp ctrl
- dp outside
- temp outside
- Solar Radiation (RAW)

- Watts/m²

Test and Control Dew Points

Summer day 04/03 - 06/03

Kestle, L. (2014), Built environment research at Unitec. Presentation at the 4th New Zealand Built Environment Research Symposium (NZBERS), 14 November, Massey University, Albany campus.
The Wrap appears to be performing as expected
   By keeping moisture out of the structure in winter
   (higher internal moisture levels)
   By allowing moisture though the structure in summer
   (higher internal moisture levels)

The internal dew points seem to follow the internal air temperatures, not the external dew point.

The daily variation in dew point equates to about 0.5 litre of water evaporating then being re-absorbed.
Questions still to be answered

Where is the moisture coming from and going to?

Will internal generation of moisture increase the differences between Control and Test Houses?

What is happening interstitially in the wall?

Why is there not a larger difference of internal temperature difference between Control and Test Houses in winter?
Robert Shaw
Shaw 12 metre Blink
1st on line Brothers race
Cook Strait NZ
October 2014

Kestle, L. (2014), Built environment research at Unitec. Presentation at the 4th New Zealand Built Environment Research Symposium (NZBERS), 14 November, Massey University, Albany campus.
Robert Shaw
Shaw 12 Metre performance yacht
Construction overview
Features, full carbon construction,
50 degree canting keel, twin
asymmetric dagger boards, twin
rudders, High modulus carbon
mast with carbon rod rigging
2013

Kestle, L. (2014), *Built environment research at Unitec*. Presentation at the 4th
New Zealand Built Environment Research Symposium (NZBERS), 14
November, Massey University, Albany campus.
BIM research publications this year have, for example, been in the area of 5D BIMQS by Harrisson, Stanley and Thurnell (2014) and currently in the areas of BIM education at the undergrad level.