



*Inspiring the industry to provide
better buildings for all
New Zealanders*



Overview and Infrastructure Related Activities

BRANZ Ltd

Vision



Inspiring the industry to provide better buildings for New Zealanders

Goals



Ensuring the industry gets the greatest benefits from investment of the Building Research Levy



Applying our industry-leading expertise to produce accessible knowledge for the industry



Developing enduring relationships with clients to help them achieve benefits over the long term

BRANZ

... we are not ...

- part of Government
- the regulator
- setter of Standards

... we do ...

- provide independent, impartial evidence to support and guide the industry
- support the performance based Building Code through provision of CodeMark and BRANZ Appraisals for products and systems

Better Buildings Team

- Fire engineers – passive fire protection, fire spread, toxicity.....
- Structural engineers – light timber framing, pre-cast hollow core floors (seismic resilience), connections.....
- Materials chemists – materials durability, corrosion, structural adhesives.....more details on the next slides

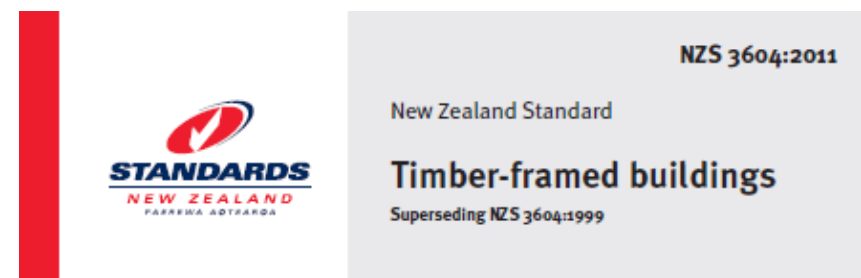
New Zealand

a unique place to build

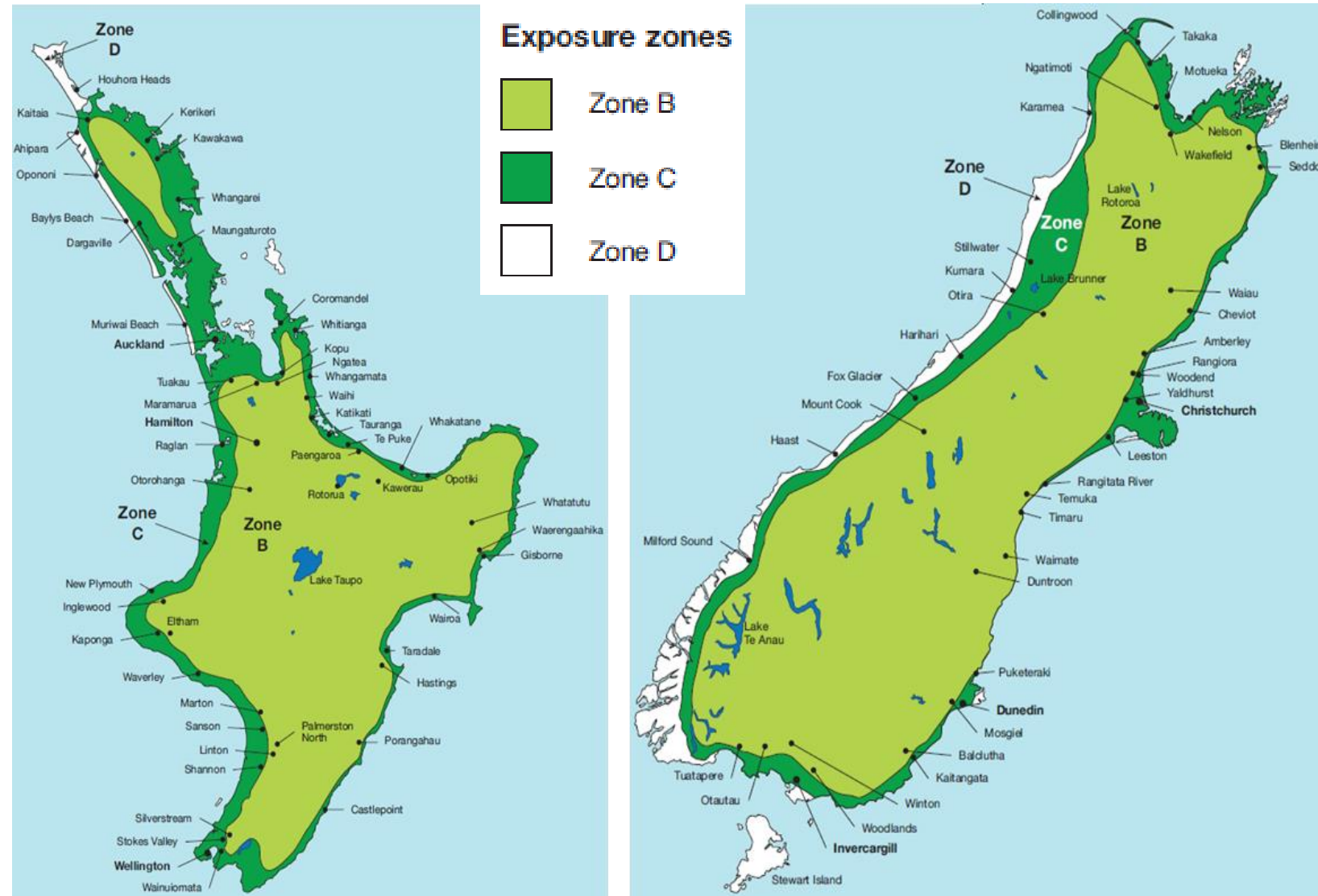
- ❖ Unique environment with diverse influences: marine, industrial, geothermal and volcanic
- ❖ A performance-based building code

BRANZ Research on Environmental Material Degradation

- Assess durability / performance of materials, particularly new / innovative materials in well-characterised New Zealand built environments
- Understand the science of material degradation for the development of fit-for-purpose modelling and testing methodologies
- Support industry in making informed decisions with more relevant, robust and trusted data when specifying the right materials and maintenance schemes to improve overall building performance.



1) New Zealand Atmospheric Corrosivity Map



❖ 2010s

❖ 61 sites

❖ First-year corrosion rates of mild steel and galvanized steel

❖ Updated regional corrosivity maps for Auckland, Wellington, Christchurch and Dunedin

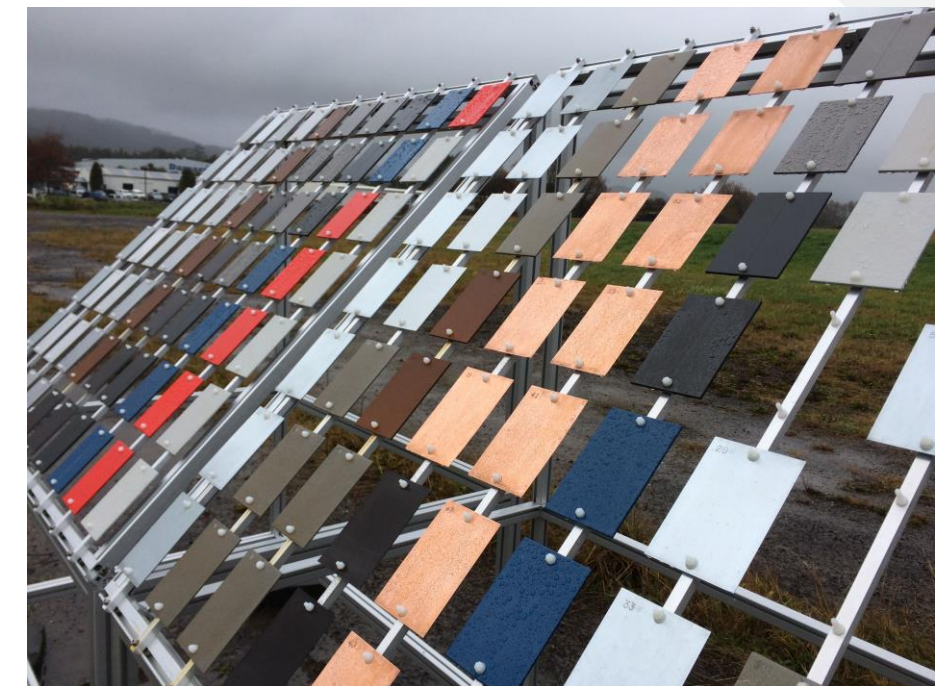
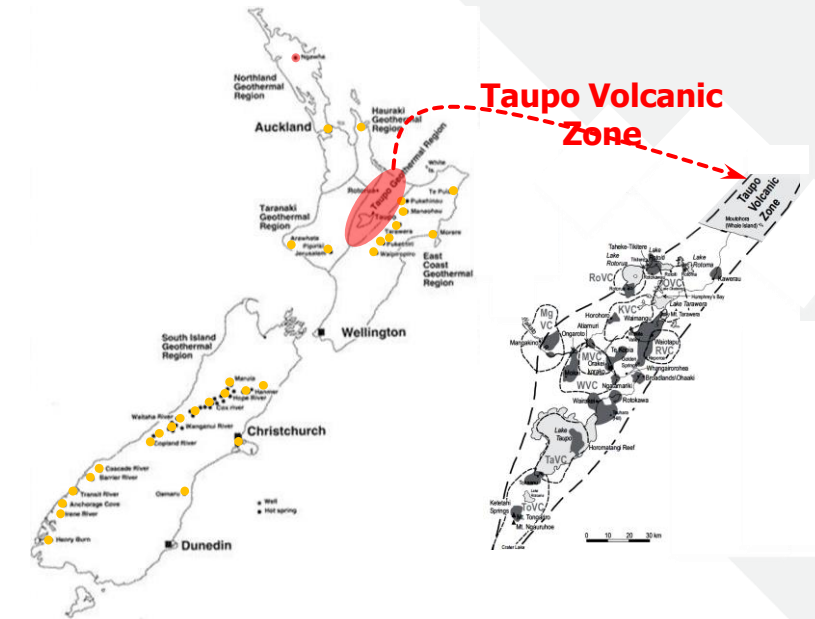
2) Microclimate - Geothermal

Impacts

- ❖ Materials degradation
 - Unusual metal corrosion kinetics & extremely high corrosion rates
 - Fast discolouration & decay of treated timber
 - Highly location dependent material performance
- ❖ Atmospheric corrosivity
 - 50m boundary defined by NZS3604 not enough
 - Atmospheric corrosivity of some areas in Bay of Plenty might be underestimated

BRANZ action

- ❖ Monitoring long-term material performance
 - Metal: Aluminium, copper, zinc
 - Steel: Mild steel, stainless steel, weathering steel
 - Coating: Al-Zn alloy coating, various paints
- ❖ Updating BoP regional corrosivity map



3) Building Micro-environment

NZS3604:2011 definition

- ❖ **Closed:** dry, internal location, not subject to airborne salts or rain wetting
- ❖ **Sheltered:** open to airborne salts, but not rain washed
- ❖ **Exposed:** open to airborne salts and rain wetting

Issue

- ❖ Comprehensive, comparative data not available to understand their characteristics and influences on material performance
- ❖ Inconsistent, confusing specifications in practice

BRANZ action

- ❖ Monitoring on actual building
 - Temperature
 - Humidity
 - Time-of-wetness (ToW)
 - UVA irradiation
 - Wind-driven rain
 - Surface deposition
 - Corrosivity (metallic coupon & mail in timber)



3) Building Micro-environment

Environment and performance monitoring on building over the 1-year period

WALL	POSITION	FIRST-YEAR CORROSION RATE (G/M ² /YEAR)			SALT DEPOSITION (G/M ²)			WIND-DRIVEN RAIN (MM) ^a	TIME OF WETNESS (HOURS) ^b
		0°	45°	90°	0°	45°	90°		
NORTH	Sheltered	162	147	69	1.015	0.547	0.166	Not measured ^c	3,180
	Boundary	156	120	69	0.442	0.251	0.077	94.4	4,442
	Exposed	245	107	65	0.292	0.193	0.053	297.8	4,151
SOUTH	Sheltered	127	112	33	0.700	0.522	0.123	0	3,727
	Boundary	184	144	54	0.623	0.407	0.105	19.6	4,394
	Exposed	220	170	81	0.288	0.241	0.085	19.4	5,195
EAST	Exposed – high	151	153	80	0.471	0.370	0.206	16.4	4,489
	Exposed – low	150	128	92	0.285	0.172	0.143	54.2	4,674
WEST	Exposed – high	178	166	80	0.469	0.381	0.189	2.6	4,247
	Exposed – low	193	154	88	0.273	0.198	0.084	14.0	4,483

Preliminary finding

Micro-environments around a building differ significantly from each other and from the surrounding atmospheric environment, leading to position-dependent material degradation patterns that could be different from common understanding.

4) BRANZ Monitoring Network

Standardised
Monitoring / Testing Sites
in Representative
Climate / Corrosivity Zones



Data Capture
&
Standardization

- ❖ Atmospheric & micro-environment: Temperature, humidity, time-of-wetness, rain, UV irradiation, surface deposit, airborne pollution (NH_3 , H_2S , SO_2 , NO_2 , Cl^-)
- ❖ Material: Composition, microstructure, phase structure of metals, coatings, paintings
- ❖ Environmental performance: Corrosion & degradation behaviour, form, kinetics

Utilization

- ❖ Support strategic planning and delivery of future materials research
- ❖ Assess durability/performance of new/innovative materials
- ❖ Generate a baseline to assess the influences of climate change on the durability, resilience and sustainability of materials, buildings and associated infrastructural assets

Open Access
Data

- ❖ Computational modelling & simulation of environmental material degradation
- ❖ Atmospheric corrosivity characterisation and mapping
- ❖ Lab-based accelerated assessment & testing methodology

To inform environmental assessment, materials specification and structure design for building, construction, and associated infrastructure across New Zealand with relevant, robust and trusted data

Thank you!

