

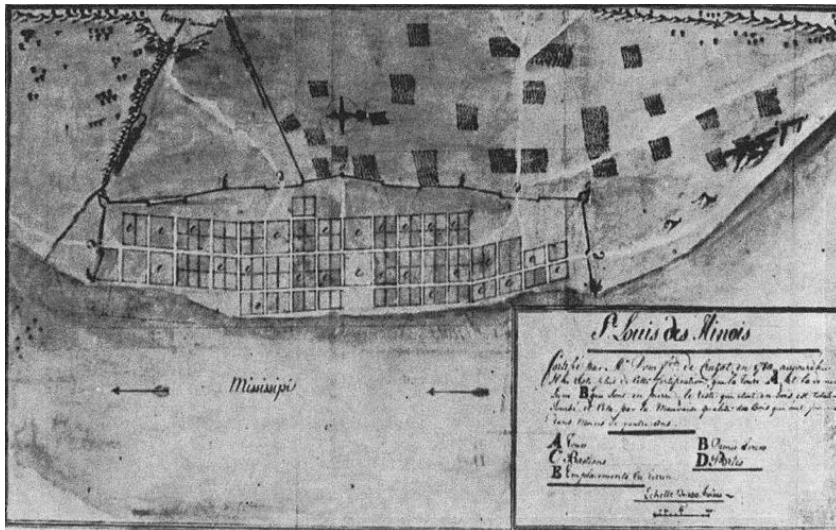
From air pollution to floods: exploring 'urban climate risk' in New Zealand



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What is Urban Climate Risk (UCR)?

Images of St. Louis



1780



Today

UCR in St Louis today?

2013



1993



Urban Climate Risk is RELATIONAL

A single, fixed definition in time or space
doesn't work

- We have to ask:
 - who needs to know?
 - what do they need to know?
 - why do they need to know it?

Crucially also need to know WHERE – both
locality and scale.

UCR is not new... but has evolved in time and space

- Unprecedented numbers of people in urban areas at risk from climate related events
- Scales have changed
- Climate no longer considered stable
- Climatic variability and vulnerability not necessarily in sync spatially

How is UCR often approached?

- Scientific risk assessment
- Event-based, caused by climate variability
- Functions of precipitation and temperature
 - Fires, floods, droughts, heat waves, etc.

$$\text{UCR} = P(\text{event}) \times \text{outcome (cost)}$$

Case study: 1 in 100(0) year events?

What exactly is a 1,000-year rainfall?

By Allen Best

Writers on the Range

10/12/2013 05:01:00 PM

Do you know how to make a meteorologist squirm? Ask for hard numbers immediately after a flood or a big rainfall, especially something like the September deluge that drenched many parts of Colorado's Front Range with 10 inches of rain in just a few days. In some places, up to 18 inches of rain fell, most of it within the space of 36 hours.

Almost immediately there came a report that this was a 100-year flood in Boulder. Well, no, said a later report; it was more like a 50-year flood, and possibly less. Maybe it was a 100-year flood somewhere else. Check with us in a few months.



A truck moves through the streets of Boulder on Sept. 12 after record-breaking rain turned normally quiet creeks into raging, brown torrents. (Craig F. Walker, The Denver Post)

THE DENVER POST

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$$\text{UCR} = P(\text{event}) \times \text{outcome (cost)}$$

UCR is multi-faceted and complex

Quake-damaged cliff-top house demolished

7:16 PM Monday May 20, 2013

★ Save



http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10884884

What (*e/else*) is Urban Climate Risk?

UCR is situated:

- Urban climate is variable
- Our experience of urban climate is *also* variable
- More than one parameter (temperature, precipitation, wind, air quality)
- Our vulnerability is variable in time and space

How is Urban Climate Risk often approached?

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$$\text{UCR} = P (\text{event}) \times \text{outcome (cost)}$$



How is urban climate risk being studied in New Zealand?

1. Urban climate adaptation toolkit (Tait et al. 2012)
2. Health and Air Pollution in New Zealand (HAPiNZ, 2012)

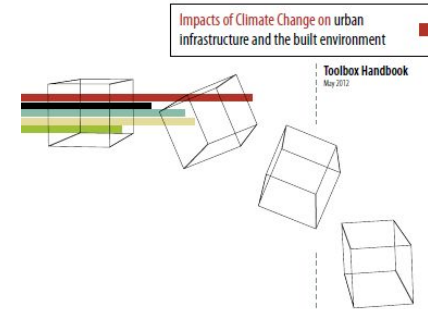
UCR in practice

- Impacts of Climate Change on Urban Infrastructure and the Built Environment
- Downscaled climate model outputs
 - Predict and adapt to deterministic projections
 - Direct infrastructure provision for flood protection

$$\text{UCR} = f(\text{Precip} \times \text{Temp changes}) \times \text{Outcome}$$

UCR in practice

Urban Impacts Toolbox



Urban Impacts Toolbox

Basic Toolbox structure showing Toolbox homepage and section main pages.



Toolbox Overview



Toolbox Trays



Case Studies



Key contacts and links

Health and Air Pollution in NZ (HAPiNZ)

National epidemiological study of air pollution morbidity/mortality

Health Effects = Exposure * Exposure Response Function * Population Exposed

Social Costs = Health Effects cases * Cost per case

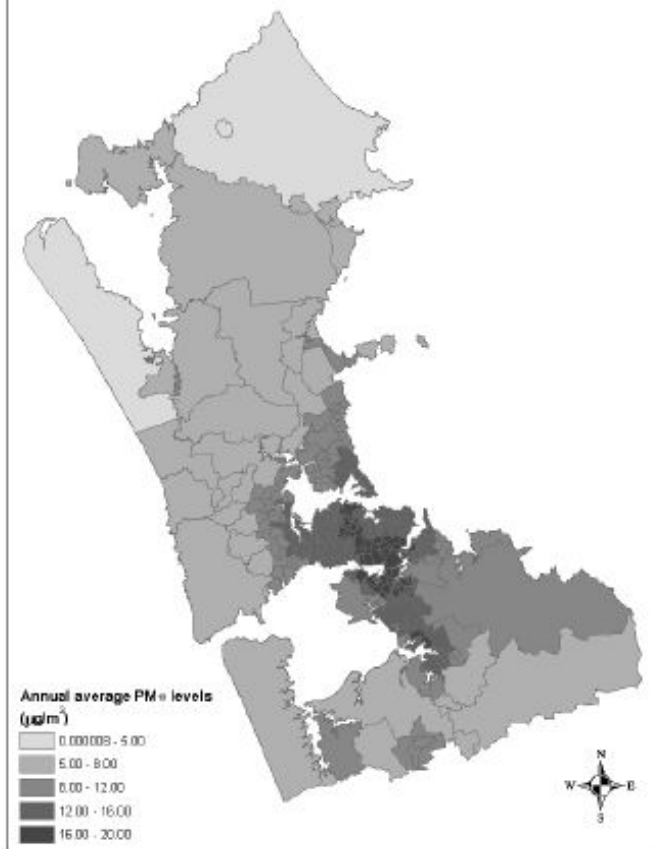
UCR = f (ambient particulates) x outcomes

HAPiNZ outputs

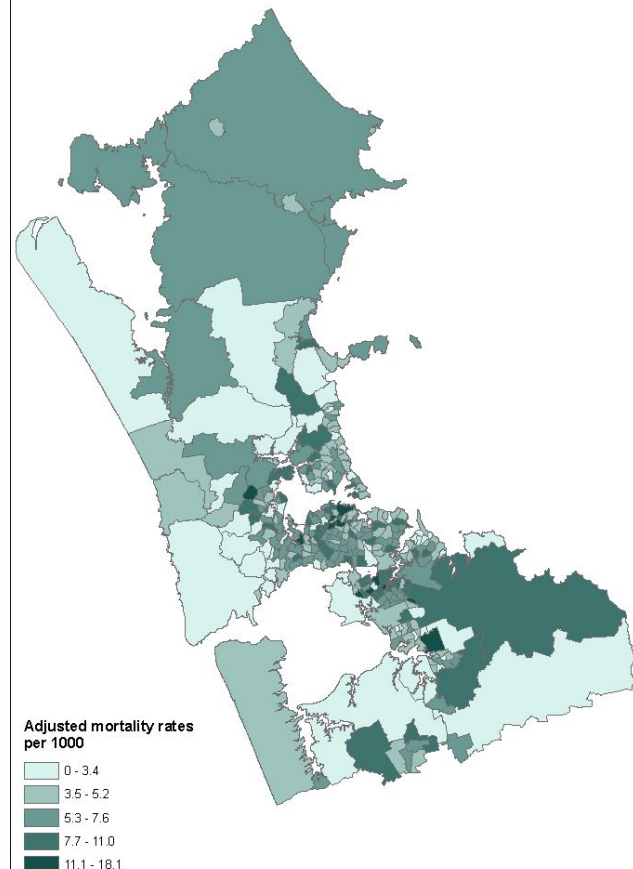


Prepared for Health Research Council of New Zealand,
Ministry of Transport, Ministry for the Environment
and New Zealand Transport Agency
March 2012

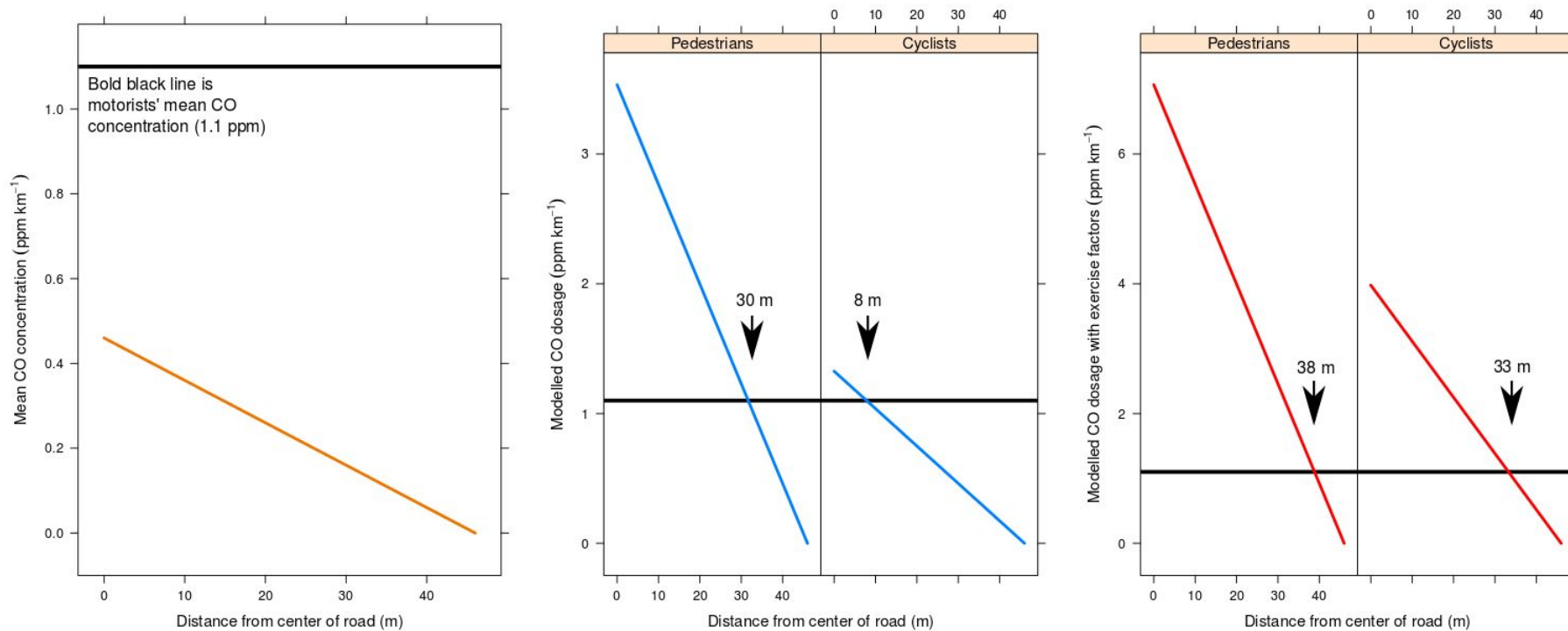
Spatial distribution of PM₁₀ in Auckland for 1999



Spatial distribution of age sex ethnicity adjusted mortality rates
in Auckland for 1996



Fixed monitoring 'v' personal exposure



- Personal exposure is not the same as fixed monitoring
 - Exposure is not the same as dose
- (See talks by Dirks et al. and Lim et al. Thursday late morning and posters by Cunniffe et al., and Miskell et al.)

UCR is multi-faceted and complex

UCR more than a single aspect: multi-faceted in terms of risk and response

- Not just climate but air pollution and hydrology
- More than just evaluation for planning or safety or insurance
- More than just adaptation, resilience –moving towards resourcefulness

Auckland Plan: Urban Climate Risk?

“Our climate is changing, in both the short- and long-term, and this creates ***significant risks, uncertainties*** and challenges for Auckland”¹

“In Auckland, climate change is ***unlikely to result in new natural hazards***, but existing natural hazards are likely to worsen. For example, sea level rise, storm surges, tides and more sedimentation will increase coastal erosion, and more frequent or more intense storms will lead to more flooding.”²

“If climate change projections are applied in natural hazard assessment, then the risks can be appropriately managed.”²

1. Part 2 Regional Policy Statement»2.1 Issues of regional significance»2.1.8 Responding to climate change

2. Part 2 Regional Policy Statement»2.9 Responding to climate change

Draft Auckland Unitary plan available online: <http://unitaryplan.aucklandcouncil.govt.nz/pages/plan/Book.aspx>

Auckland Plan: Urban *air pollution* Climate Risk?

“In urban Auckland higher population densities, mixed residential, commercial and industrial land uses and the operation of high numbers of vehicles means there needs to be a **greater focus on both the management of individual discharges from various sources** and the separation of incompatible land uses and activities.”¹

“The quality of air discharges from domestic fires is targeted for improvement by the use of **new and efficient solid fuel burning appliances.**”¹

1. AQ Part 3 Regional and district objectives and policies»3.1 Auckland-wide objectives and policies»3.1.3 Natural resources»3.1.3.2 Air quality

Draft Auckland Unitary plan available online: <http://unitaryplan.aucklandcouncil.govt.nz/pages/plan/Book.aspx>

Ontological complexity of practising UCR

Draft Auckland Unitary Plan

Climate change

Planting

- Carbon sequestration
- Local cooling

Home heating

- Promote renewable heat sources

Air pollution

Planting

- Trapping pollution street scale
- Potential regional scale reductions

Home heating

- Restrict the use of solid fuel burners

Towards an open-ended notion of Urban Climate Risk?

- Different ways of researching (and acting upon) UCR
- Auckland Plan reveals tensions that can emerge through the different practices of UCR
- UCR fractured, emergent
- Promise and risk of co-benefits
- Is UCR simply *both* air pollution and climate change?

Urban Climate Risk

Our approach:

- UCR not something which has pre-defined properties
- UCR *emerges* out of research and policy practices
- UCR draws together
 - Communities of practice
 - Epistemic communities
 - Investment narratives

Summary: UCR *in place*?

How do we come to think about UCR *in place*?

- In Auckland we have come to approach UCR in *particular* ways
- Approaches to UCR are *contingent* (reflect past practices, existing categories) but are also *productive* (shape future practices, categories)
- Need to develop ways of seeing and responding to blind spots in theory and practice.

How can we be mindful of the contingency of our research practices?

Urban Climate Risk

- **Who** is(not) making and using the knowledge?
- **What** knowledge are they producing, what are they telling me, does it make sense to given my experience?
- **How** are they claiming they know what they know (credibility, expertise and power) and do they give me foundation to act personally and enact change?
- **Why** is there reluctance to face what the 'brute facts' are, and how do their value, priority and relevance of change according to context?
- **Where?** Is knowledge translational in time and space?

Urban Climate Risk

1. Urban Climate Risk is RELATIONAL

- a single, fixed definition in time or space doesn't work... We need to know WHERE and WHEN

2. To undertake scientific studies which inform the debate (and effectively communicate the results) we have to ask:

- who needs to know?
- what do they need to know?
- why do they need to know it?