Improving Water Management Practices and Outcomes

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Are we (you!) getting carried away?

Planning and modelling affordability and more

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Improving water management practices and outcomes

Strategic, Simple, Practical, Future Proof

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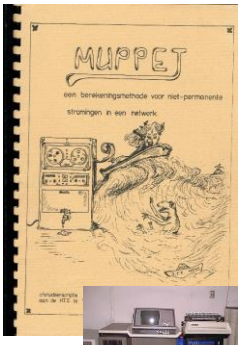
My presentation

- My background
- How I have experienced modelling
- How to model changes in land-use?
- Models and Water Sensitive Design
- Modelling affordability.
- Need for top down approach
- Models one off or operational?
- Credibility and standardisation

My background

- **Graduated in 1979 – thesis: coding a one dimensional hydraulic model**
  - ≈ used to calculate overflow wave in a Dutch ditch (that didn't cope)
  - ≈ Never used a model since



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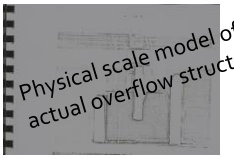

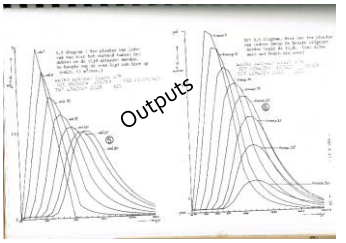

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My work career

- **In NL with Water Authorities**
  - ≈ Effects of largely combined sewer systems on water quality
  - ≈ Quantity and quality modelling
  - ≈ Helped setting standards
- **In NZ**
  - ≈ Strategic Wastewater Planning (project CARE)
  - ≈ Strategic Stormwater Planning
  - ≈ Stormwater and Landuse
    - Long Bay structure plan, other plan changes, Unitary Plan, etc
  - ≈ Input into strategic documents
    - Auckland Plan, growth strategies, etc

How I have experienced modelling

- **QA/Check by client**
  - ≈ Often engineer – common sense / order of magnitude
    - No real check of model setup and all the dials
  - ≈ Model peer review by modeller
    - Appears to be very worth while. Finding many issues/errors
    - -> sometimes significant implications
  - ≈ Calibration / verification
    - Reliable representation of actual behaviour
- **Looking at / using the outputs (not how they have been calculated)**
- **Testing options / what if's / design**
  - ≈ Options - relative differences ✓
    - Sensitivity runs
  - ≈ Design – absolute outcomes ?
    - But how accurate / reliable is a model? (and the assumptions?)
    - How much safety margin (compared to traditional conservative calcs) are we giving away?
- **Communication tool**
  - ≈ Complex -> simple (challenge for most modellers)
- **Used to support legal challenges**
  - ≈ Hearing / Environment court.

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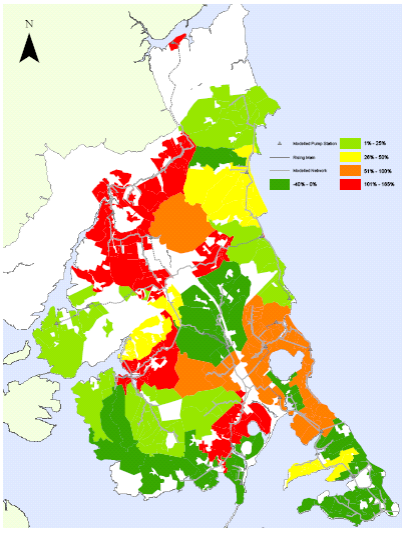
How to model changes in land use?

- **Planners 'change' their mind all the time**
  - ≈ District Plan = 10 years
  - ≈ Auckland Unitary Plan 40 years – but will be revised many times
  - ≈ Assets last 100+++ yrs and represent huge investment
    - often one opportunity to do it well – very expensive/impossible to fix later (in build up area)
- **Intensification**
  - ≈ Permissive (Unitary Plan) – not controlled – no nothing about uptake (location, timing)
  - ≈ Can't predict (?)
- **Infrastructure Planner**
  - ≈ Conservative / Pre-cautionary (not all of us)
  - ≈ on the safe side
  - ≈ → MPD'ish good idea ?
- **Demand predictions**
  - ≈ the smaller the scale the larger the potential error
  - ≈ Wastewater and water supply | not stormwater



Models and Water Sensitive Design

- **Can you model an sponge?**
- **Water Sensitive (Urban) Design (wsud) or Low Impact Design (LID)**
  - ≈ Largely about mimicking nature
    - Quantity and quality
  - ≈ Current generation of hydraulic models
    - For design event – flooding / conveyance
    - From 'engineered solutions' to mimicking nature solutions
      - Modellers always argue that LID doesn't work (for a 100 yr storm) - really?
      - But a sponge has to work better
      - But we see examples all over the world that un-sponging has severe implications
  - ≈ Current need – to also consider smaller, everyday storm
  - ≈ Lots of talk – little operational / useful
- **Not just hydraulics**
  - ≈ LID is there (mainly) for water quality reasons!
- **Other models?**
  - ≈ Purrs, wuffs, music, impervious cover model
  - ≈ Deterministic or stochastic (complexity ~ stochastic?)
  - ≈ To include "water quality" or allow for subsequent water quality assessments

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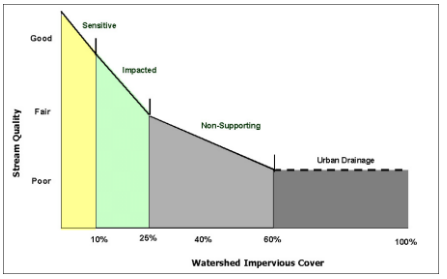
Impervious Cover Model – potential?

- **Example Stochastic model**
- **Based on catchment characteristics and receiving water quality observations**
- **Simple spreadsheet.**
  - ≈ Using impervious (+), compaction (+), mitigation (-)



- **Used and accepted on Long Bay by Environment court (as a logic, not the absolute outcomes)**
- **Requires operationalization for urban (and rural) NZ**
- **Who is up for the challenge?**
  - ≈ Nice research project

Modelling affordability
Meeting the clients needs

- **Trend**
  - ≈ more detailed more sophisticated – more expensive
  - ≈ Consent requirement – need detailed models for everything
- **Affordability**
  - ≈ Many councils cannot afford detailed CMP's and detailed Models
  - ≈ Managers (that don't understand?) demand quick and dirty
    - Inconvenient
    - More reactive planning → risk of sub optimal solutions.
    - Can we assess the (often long term) risks of not doing it properly (=our way)
- **Challenge:**
  - ≈ Come up with an approach that is affordable
  - ≈ High level (back of envelope) to provide big picture and high priority issues
  - ≈ Detailed only where needed
    - There are disadvantages (eg not operational in all location)
  - ≈ Anyone ever did a cost benefit analyses? Where is the balance
    - CARE $2m → $230 million programme (x%) and saved ###
    - Catchment → $200k-$400k incl gauging → programmes $5m - $30m and more (y-z%)
  - ≈ Can we model conservatively (at a crude scale)?
  - ≈ Maybe develop some 'horses-for-courses' NZ guideline

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Need a top down approach

- **Help zooming into problem areas**
- **What tools do we need?**
  - ≈ Can GIS be part of this?
    - Can we do basic analyses using GIS platform
    - Good example is overland flow.
    - Parts of catchments that have 'over capacity' because of minimum diameter
    - Can we use GIS algorithms to do some of the work
  - ≈ Rapid flood assessment another example
  - ≈ What other tools?

Models a one-off or operational?

- **Build it once – use it once and forget about it**
  - ≈ Technology change - need to rebuild anyway because of changes in software
  - ≈ Technical life 5-10 years?
  - ≈ So don't bother keeping up to date?
- **Operational – keep up to date**
  - ≈ Ability to respond quickly to planning demand (eg requests for info, scoping of a project
  - ≈ (how?) expensive
  - ≈ Probably many need this for performance reporting (consent requirement) – at what detail??
- **Modelling environment**
  - ≈ Huge investment – (model) assets
  - ≈ Needs an asset management approach

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Efficiencies / stream lining / best practice – horses for courses

- **Legal disputes costly and frustrating**
  - ≈ Credibility
    - For managers / hearing commissioners / environment court
    - Modellers disagreeing not good for credibilty
    - Need consensus on methodologies : NZ standards / Accreditation?
- **Agree on specifications and methods**
  - ≈ Nation wide
  - ≈ All subscribe to code of conduct
  - ≈ Horses for courses

Thank you
time for discussion

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