Environmental Data Collection, Storage, Evaluation and Dissemination

The Regional State of Play

Stephen Swabey, Manager Environmental Science

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Environmental Data for Precise, Accurate, Timely Decision-Making

- Environmental data underpin decision-making in environmental, economic, cultural and social domains
  - Regional councils are tasked by s.35 of the RMA 1991 to monitor the state of the environment and report at least every 5 years
  - Consent monitoring, compliance investigations and regional plan implementation monitoring all produce environmental data

- Continuous improvements in instrumentation technology, data management, and data presentation techniques have made these tasks easier – and more complex

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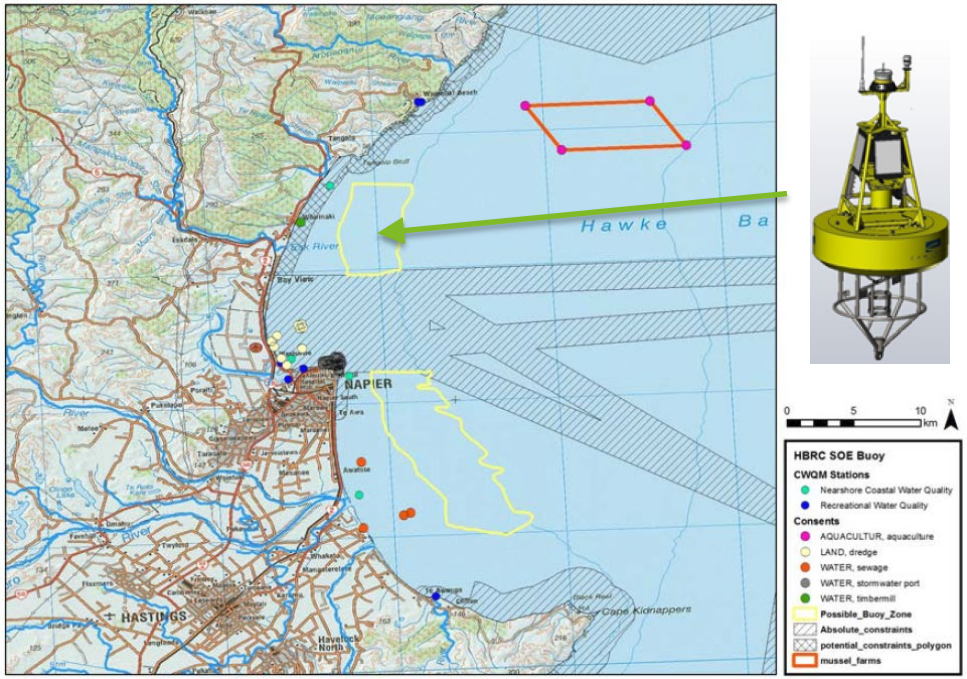
Instrumentation Technology Improvements

- Data used to be collected by regions mostly by direct observation, or by water sampling. Major exceptions were water level, temperature, turbidity, and climate stations.



- Data now are collected more frequently, for more parameters, in more locations:
  - Continuous (ie, seconds to minutes) parameter monitoring now also includes temperature, conductivity, dissolved oxygen, water pressure, nutrients
  - High spatial discretisation eg - LiDAR/LADS topographic data; aerial/satellite data for wide range of applications

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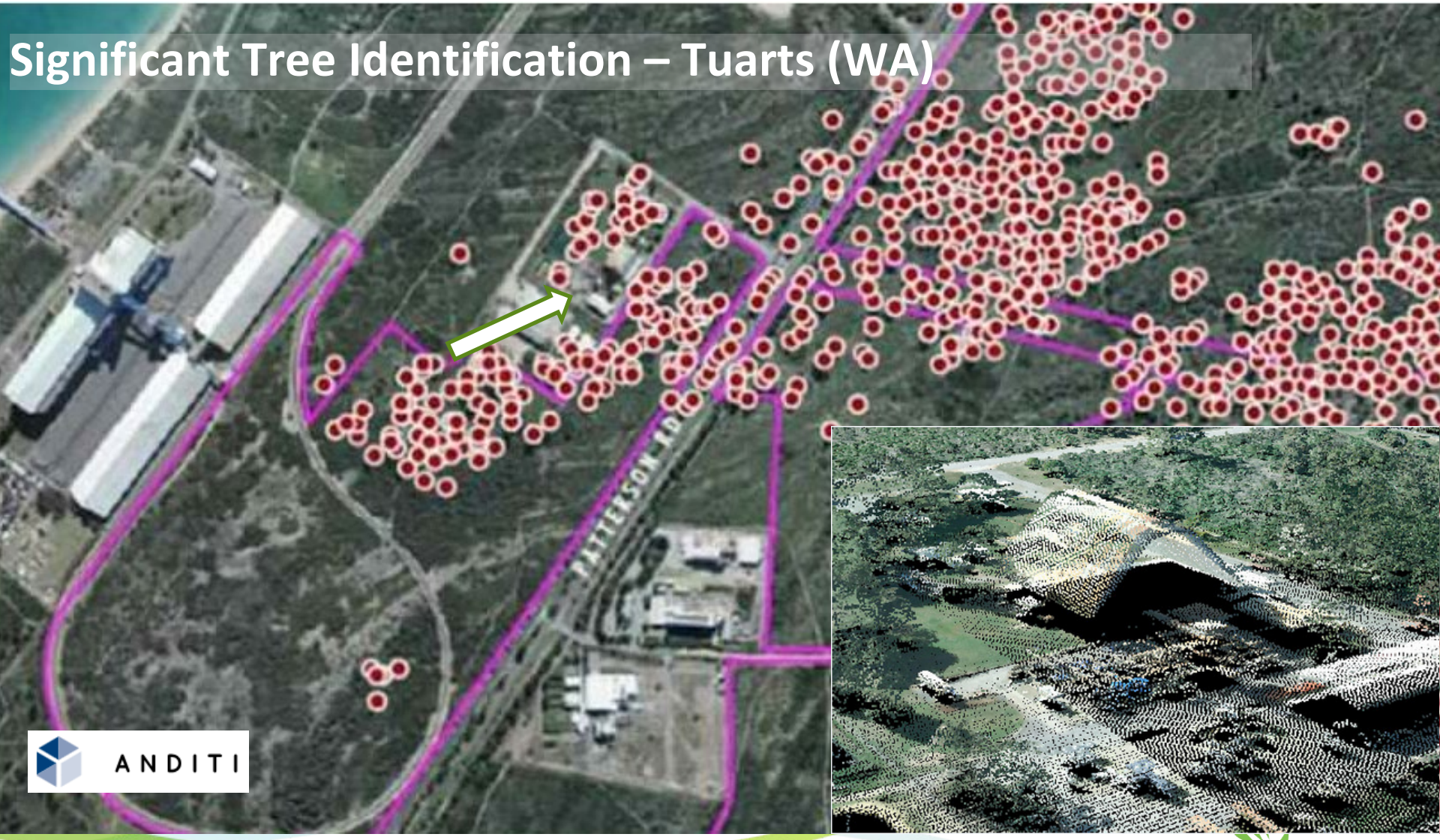
Significant Tree Identification – Tuarts (WA)



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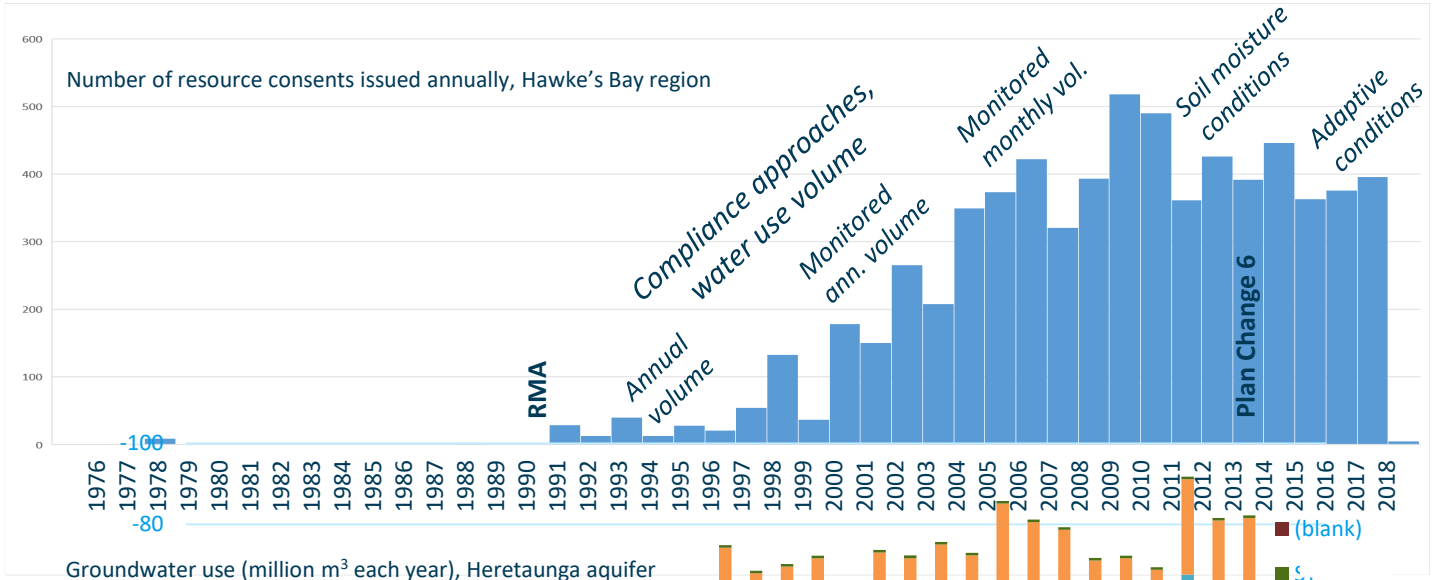
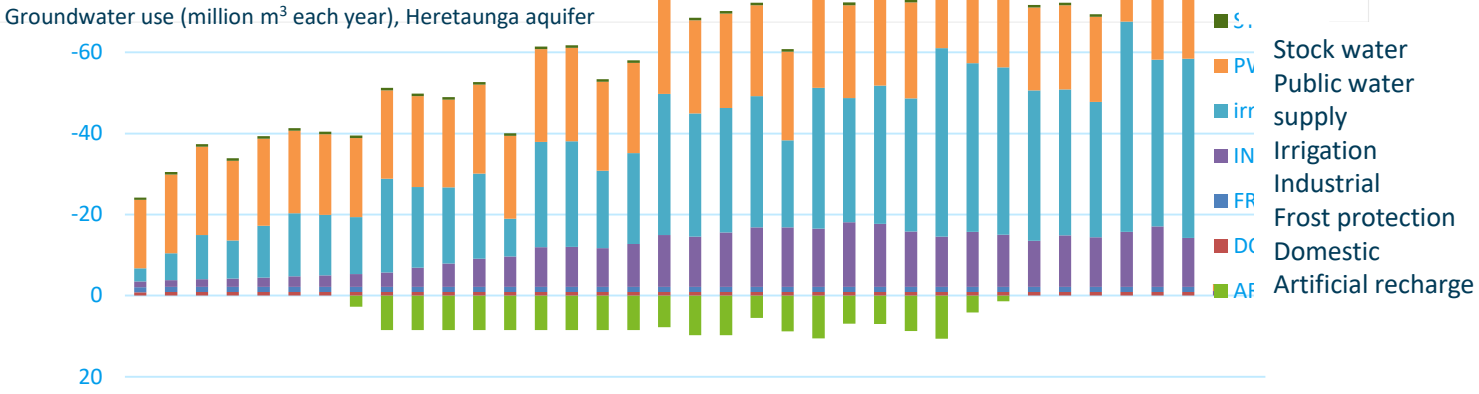
Resource Consents and Consent Conditions





Greater resource use leads to more resource consents & more complex monitoring conditions

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Data Collection Techniques

- Historically, SoE and Compliance data were collected by direct observation or paper charts, later loggers
- Now, data usually logged locally, and/or telemetered, including to HBRC
- Telemetry was through landline, radio, then cellphone. Now satellite, Internet of Things and LoRa (long range) networks are new options.
- Instant availability allows more responsive decision making

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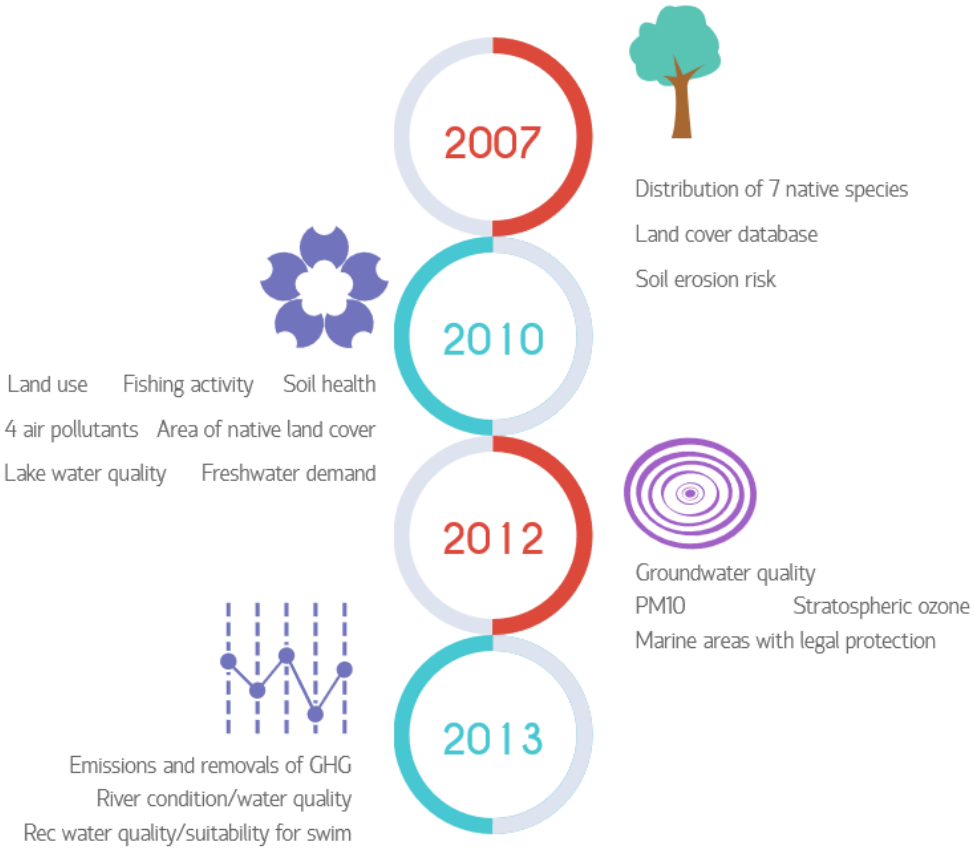
NZ Environmental Reporting:

MfE's Key dates...



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Data Management Techniques

- Historically, data were managed using paper, spreadsheets and bespoke databases
- Now, shared relational databases common, 13/17 regional councils using Hilltop; IRIS common
- Database sizes have increased logarithmically – driven by new sensors, new domain monitoring and increased frequency of data collection
- Eg, LiDAR data can be 2 Tb per 1000 km^2 of data to LINZ-standard. This requires innovative data cataloguing and retrieval approaches to be effectively used.
- National-level data aggregation projects like LAWA now occur

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Data Evaluation

- Many councils now separate data collection teams from data evaluation/analysis/reporting teams
- Evaluation includes:
  - Data quality coding – NEMS key here
  - Censoring data
  - Analysing state and trends in the data
  - Preparing data for publication/dissemination
- Semi-automated approaches now common, eg R scripting

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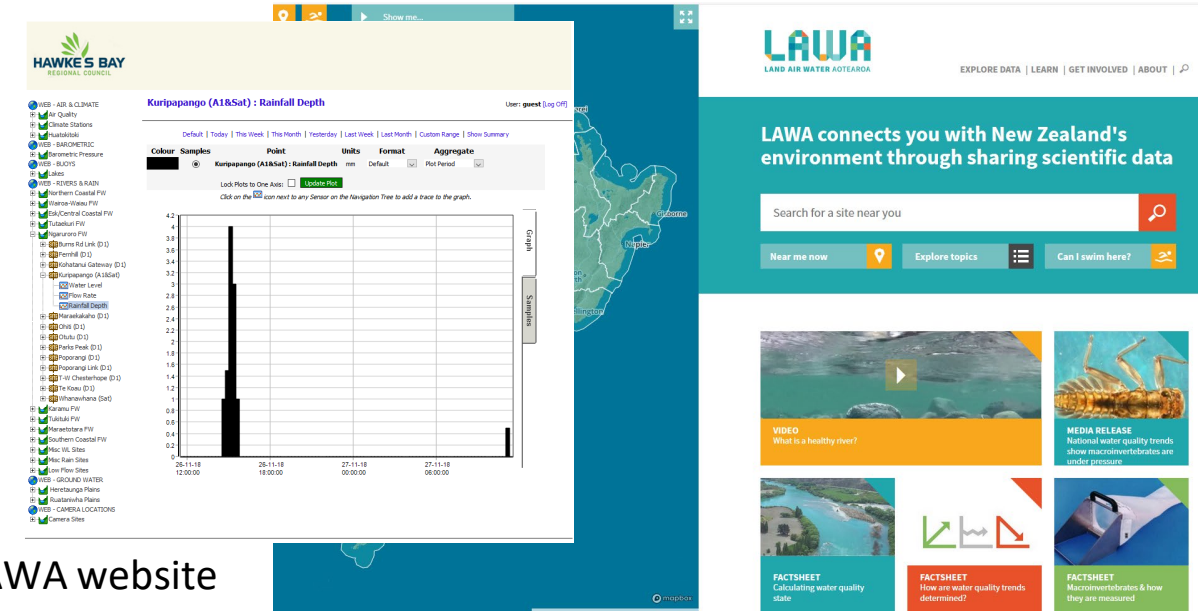
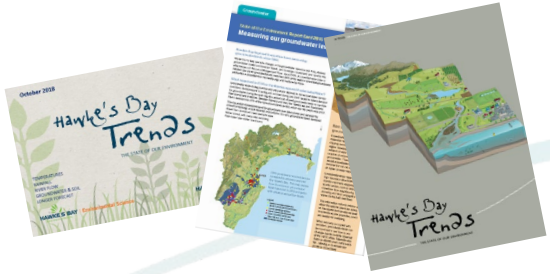
Data Dissemination



Reporting formats include:

- Raw data web services
- Presented data on websites
- Slightly processed data on LAWA website
- State of the Environment state and trend reporting to a typical formula
- Plan-change related reporting, which is more in-depth and interpretative



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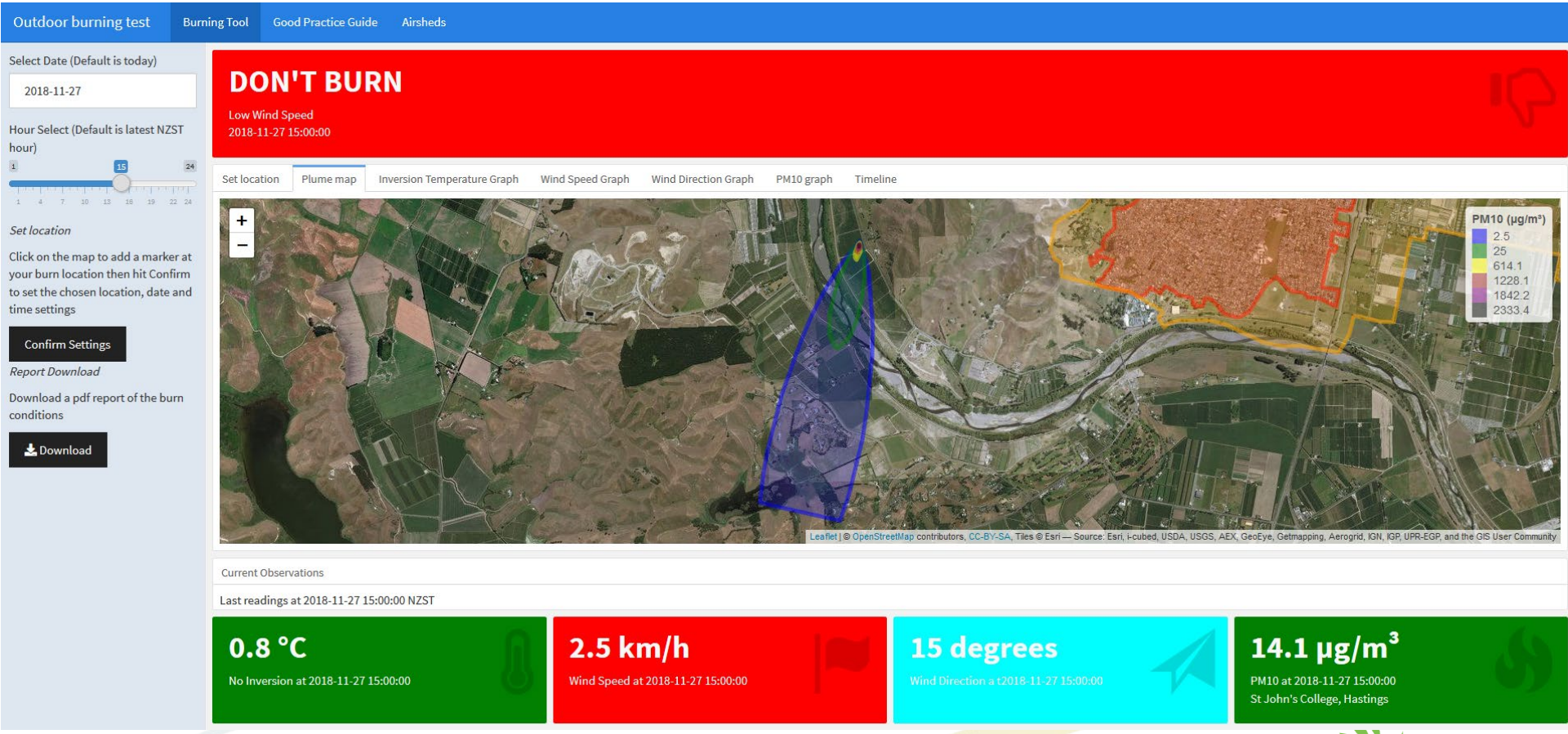
Real-Time Data Aggregation/Presentation



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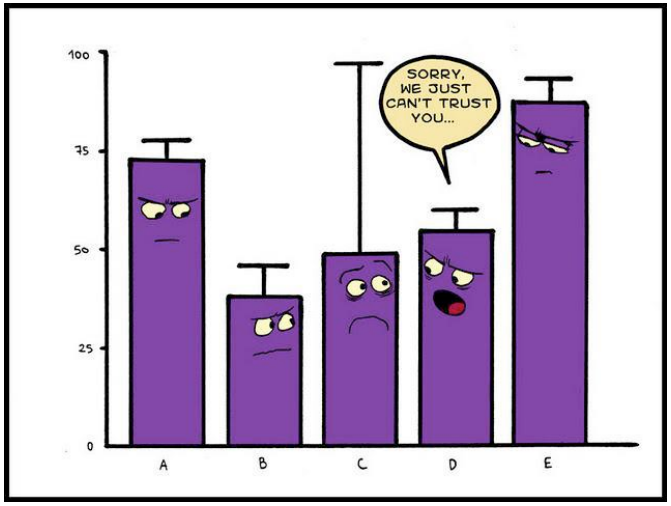
More Data is Good, Right?



Not always!

- Data obtained have to be representative of the system under investigation (and they may ONLY be representative in that context)
- Data sampling rates have to detect signals, while dealing with noise
- But, more data = more work, particularly in QA, storage and analysis…
- and, systems are not static, so detecting change must be considered too

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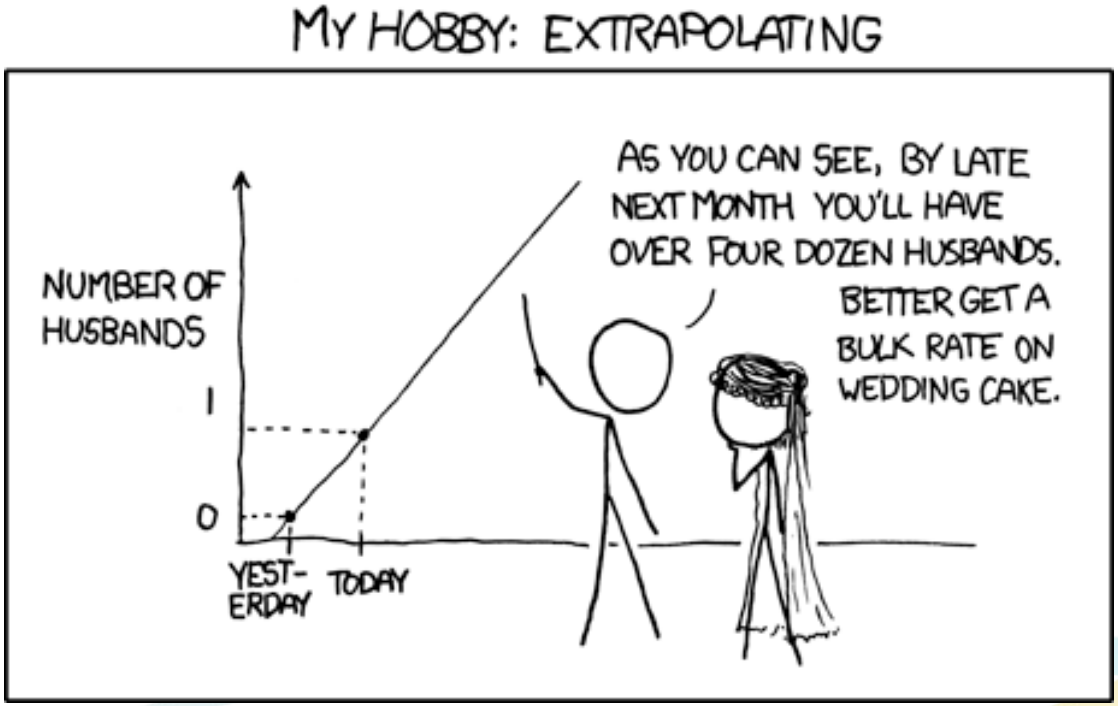
However, the risk is…



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