# Brisbane River Catchment Flood Study

Hydrology Phase

aurecon · Royal HaskoningDHV (Enhancing Society Together) · Hydrobiology · Deltares (Enabling Delta Life) · Don Carroll Project Management

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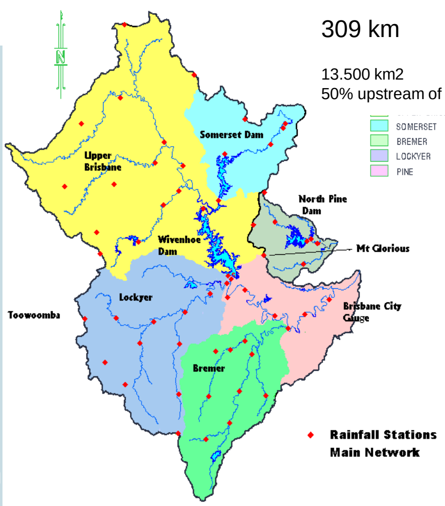
## Brisbane river catchment:


309 km

13.500 km2
50% upstream of Wivenhoe

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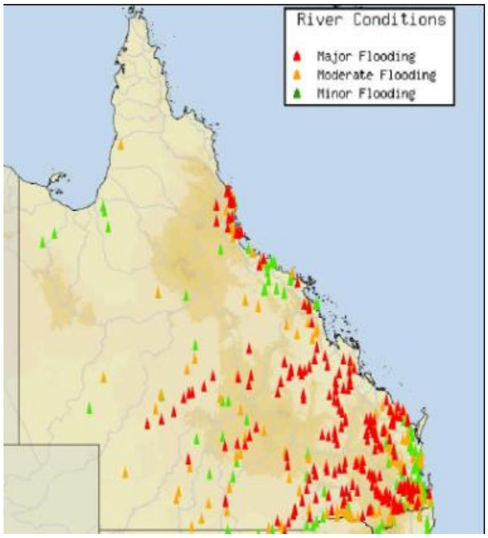
## Floods in january 2011

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## 2011 event – Lower Brisbane River floodplains

University of Queensland
13 January 2011

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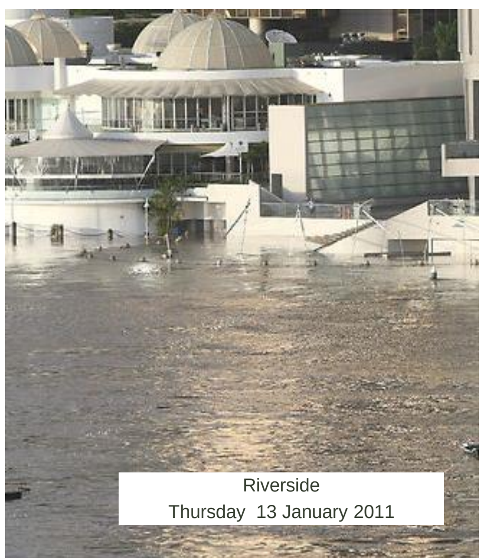
## Flood Impact – Brisbane City

Estimated 26,600 houses and 5,000 businesses affected during the flood.

Estimated 12,500 properties were inundated by flood waters.



Riverside
Thursday 13 January 2011

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## Lockyer Valley flash flood

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## Major spilling was required for dam safety purposes

Wivenhoe Dam
Wednesday 12 January 2011

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## Reservoirs close to full capacity


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## Wivenhoe Dam

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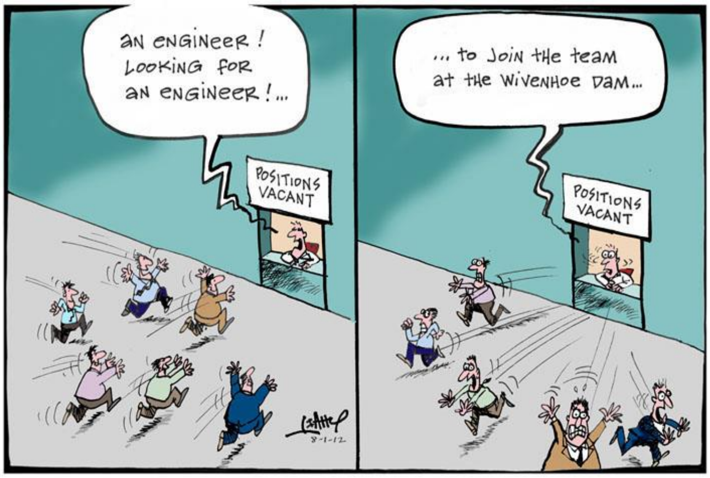
## Dam operation was heavily critisised

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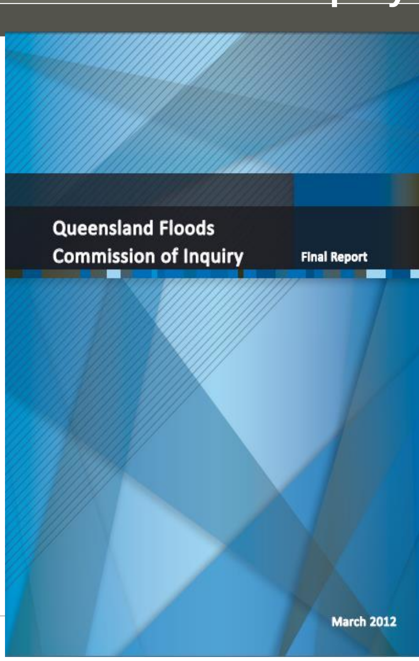
## Flood inquiry




Flood Study
-Hydrology
-Hydraulics

Flood management study

Flood management plan

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## Brisbane River Catchment Flood Study – phase 2

Estimate probabilities of flood discharges and volumes at 23 locations using the following methods:

1. Flood frequency analysis
2. Design event approach
3. Joint probability (Monte Carlo) approach

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## Essence of Monte Carlo Simulation

1. Generate a large number of synthetic events
2. Simulate each event with a hydrological/hydraulic model
3. At each location, quantify how often flood levels are exceeded

**Main challenges:**

- **Synthetic events have to be realistic and representative**
- **Computation times**

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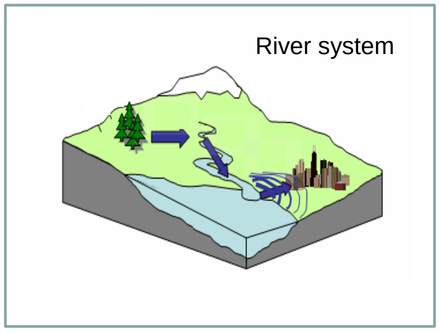
## Monte Carlo method for Brisbane River catchment

Takes into account the variability of the relevant factors that contribute to flood levels:

- ❑Rainfall depth
- ❑Spatio-temporal rainfall patterns
- ❑Initial soil conditions
- ❑Initial reservoir conditions
- ❑Ocean water levels

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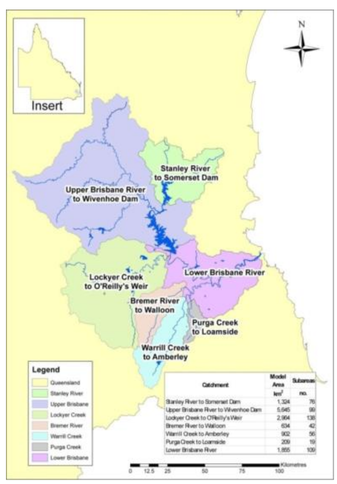
## Correlations

1. Extreme rainfall likely to co-incide with increased ocean water levels
2. Reservoir volumes at the beginning of an event are related (if one reservoir is full, the other reservoirs are more likeley to be full as well)
3. Initial soil conditions in the various subcatchments are related

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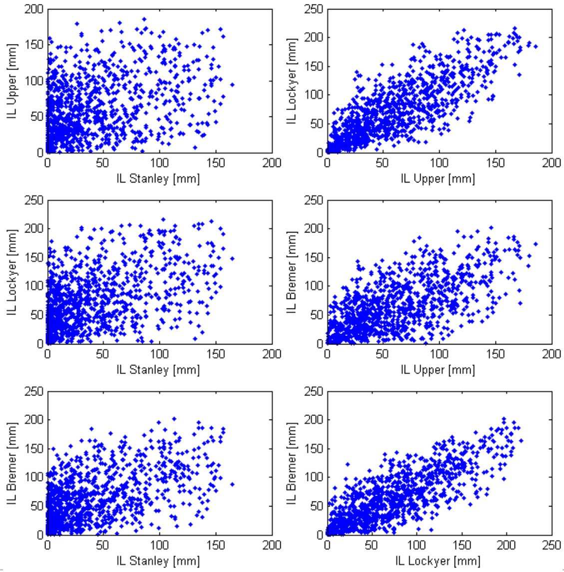
## Correlation model for initial losses

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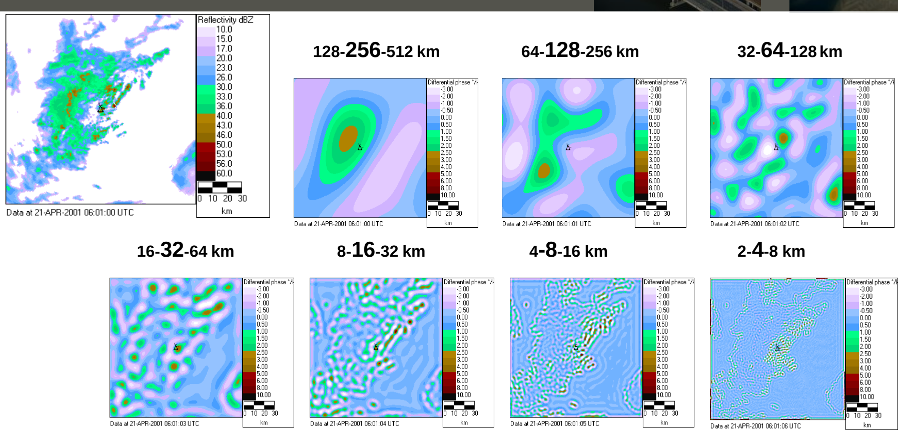
## Spatio-temporal rainfall patterns (STEPS)




Break up the rainfall map into a set of maps for different scales
Parameterize time evolution of each scale, large scales evolve slowly, small scales fast
Multiply maps to get the rainfall forecast.

From: Seed (2013)

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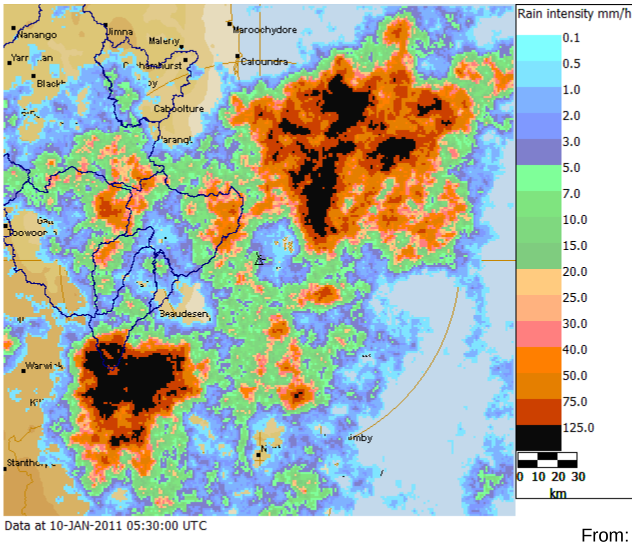
## Results are realistic rainfall patterns




From: Seed (2013)

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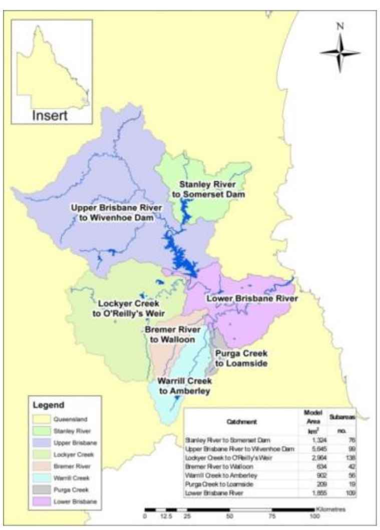
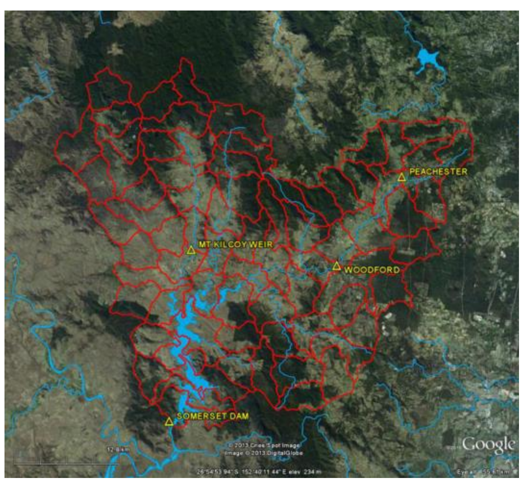
## URBS hydrological model

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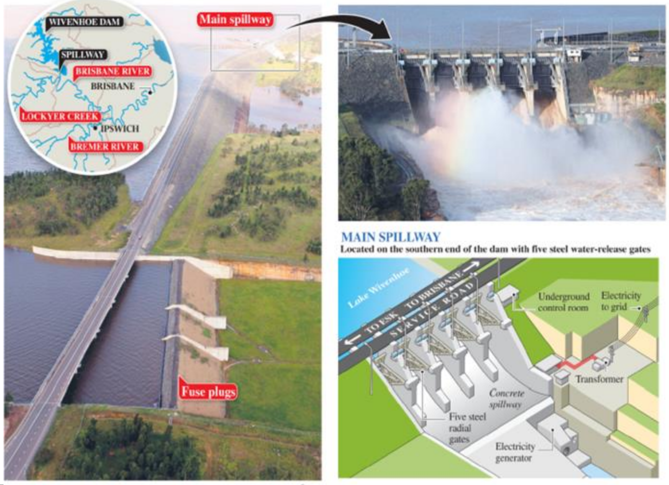
## Reservoir modelling in RTC tools

Loss-of-communications strategy




m: Seed (2013)

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## Flow diagram as implemented in Delft-FEWS

*Pre-processing*

**1 Rainfall sampling**
- duration
- AEP of depth

**2. Catchment rainfall depth**
- catchment IFD curves

**3. Rainfall patterns**
- spatio-temporal patterns
- scale to rainfall depth

**4. Sampling of other variables**
- initial losses
- ocean water levels
- reservoir volumes

*Processing*

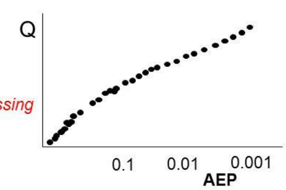
**5 URBS/RTC input**
- rainfall time series
- initial losses
- reservoir volumes
- ocean water levels

**6 URBS/RTC runs**
- reservoir modelling
- hydrological modelling

**7 URBS/RTC output**
- max q&V at output

*Post-processing*

**8 Derive frequency curves**
- AEP of q&V

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# Current status of BRCFS – phase 2

- ❑ **Finalising draft computation results of the three methods**
- ❑ **Reconciliation proces started**
- ❑ **End of October: finalisation of the project**

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