



Trusting your expert gut in wastewater network renewal planning

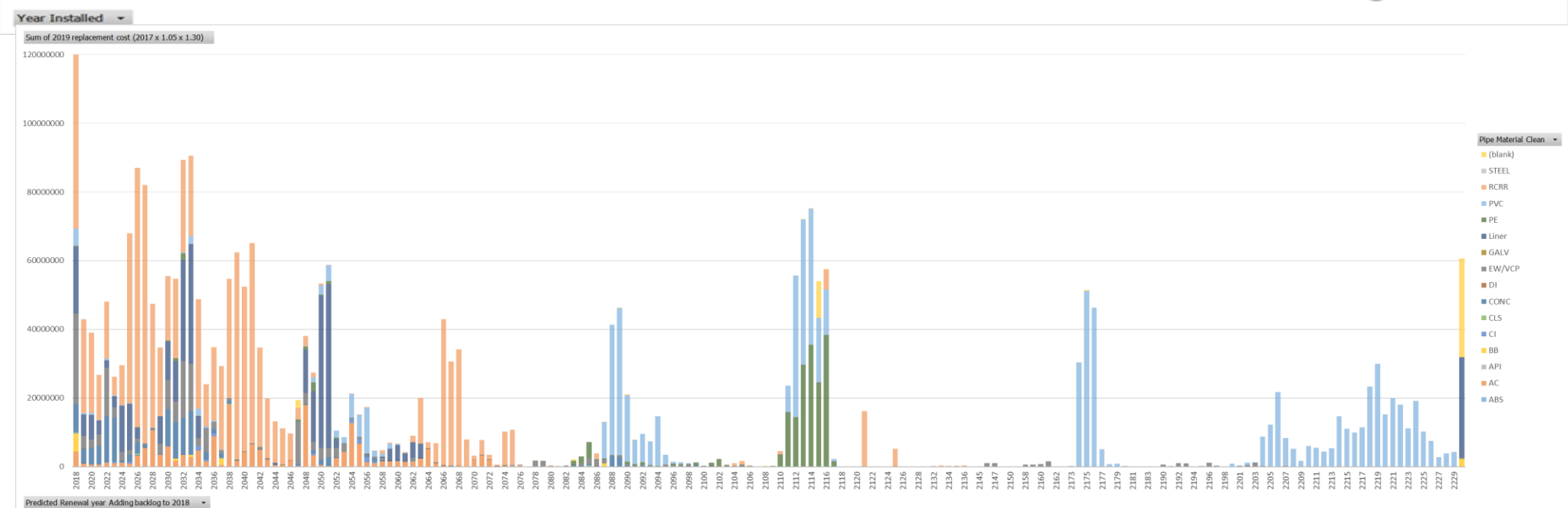
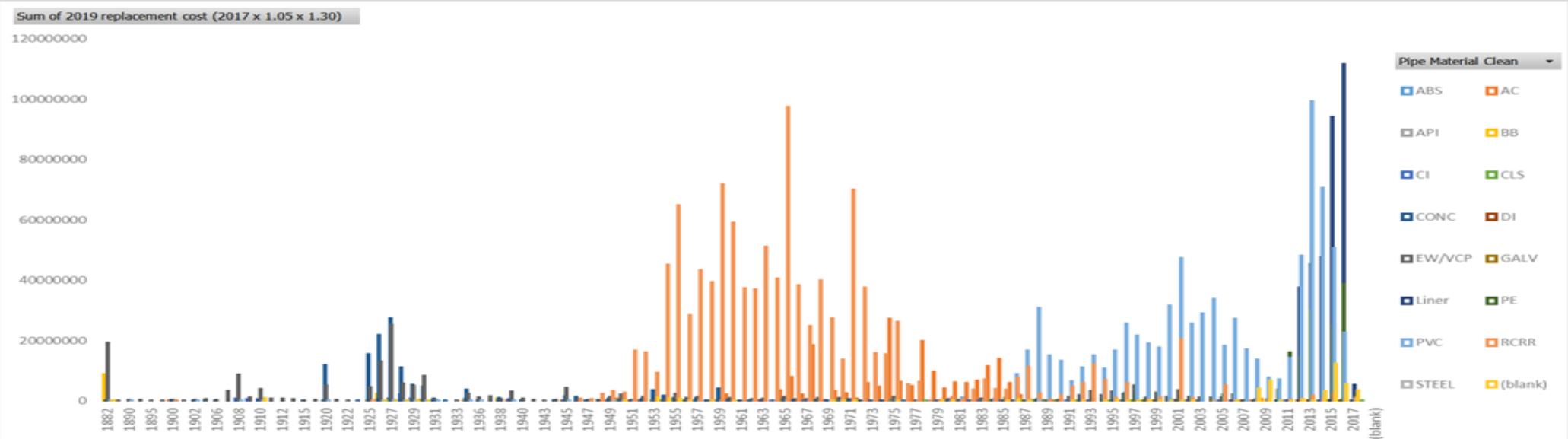
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New Zealand



New Zealand





D/S : 17808

U/S : 17809

0.00m



Asset management

High level principles

- Well understood
- IIMM
- ISO 55001

Practical application

- Little guidance
- Which pipe do I actually replace?



Masters Thesis:

Intuitive decision making for
wastewater pipe networks

Wastewater networks = **complex systems**

- Socio technical
- Network complexity
- What's the cause?
- Incomplete data

Deterministic decision making

“is less able to find appropriate solutions where problems or decision making systems grow increasingly large, complex and less well understood” (van Riel et al, 2014)

Intuitive decision making

“Engaging in conscious calculated thought process was concluded to be more effective for simple decisions, however the intuitive thought process delivered great effectiveness for more complex decisions” (Dijksterhuis et al, 2006)

Intuition is powerful

Bias and heuristics



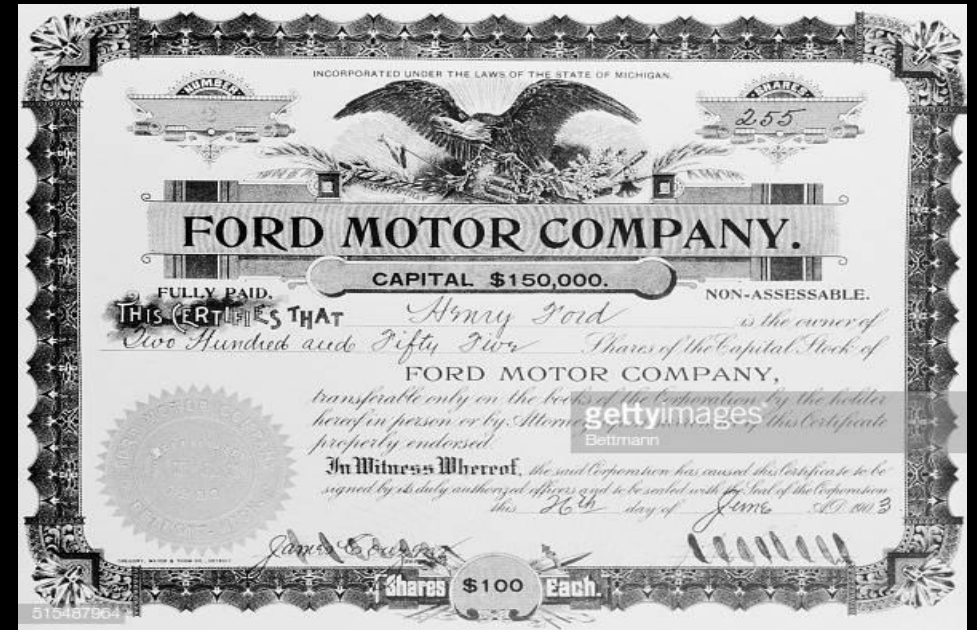
Nobel prize winning psychologist Daniel Kahneman

Rational:
(System 2)

- Slow
- Calculating
- Effortful

Intuitive:
(System 1)

- Fast
- Instinct
- Judgements



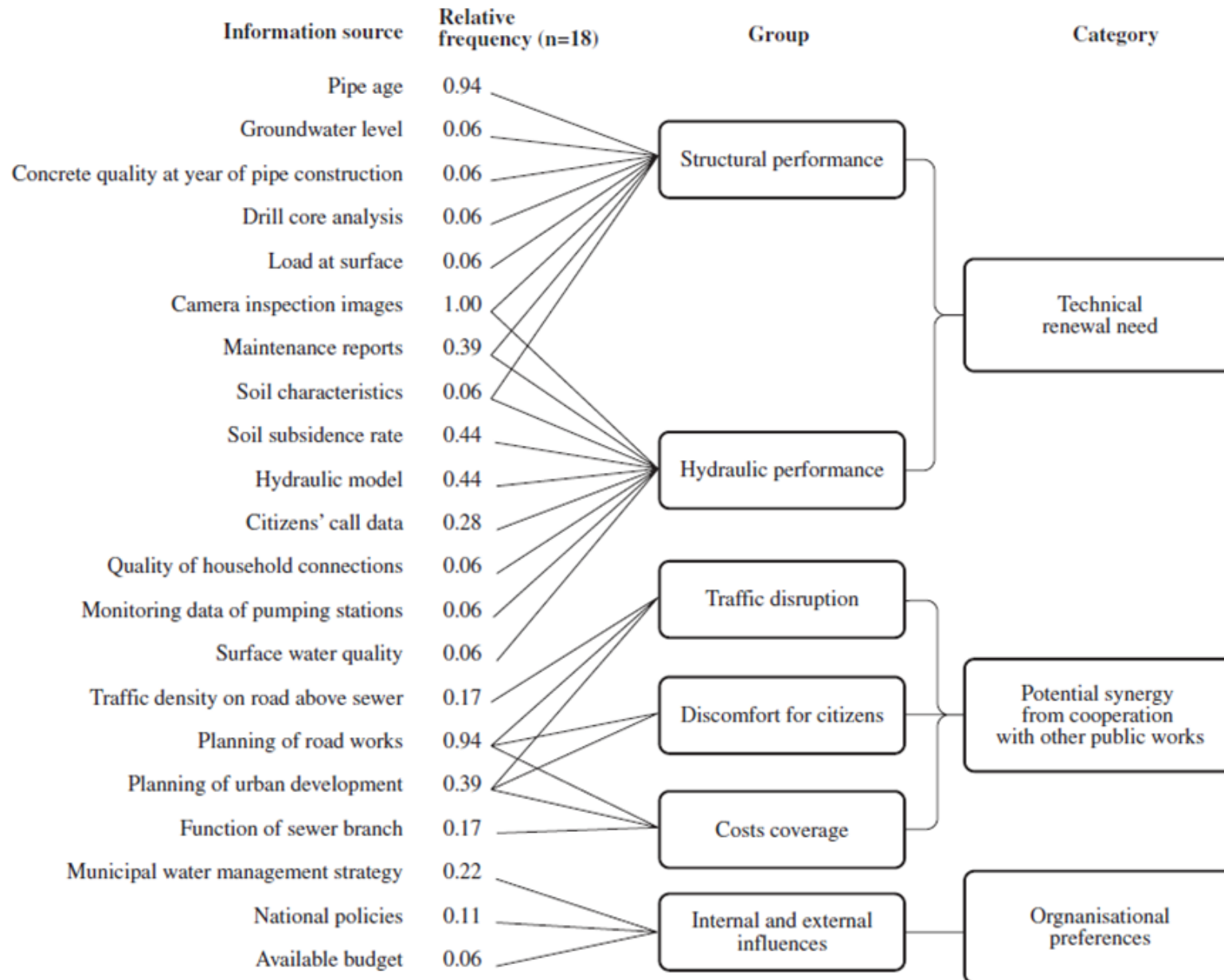
Pitfalls of intuition

1 x 2 x 3 x 4 x 5 x 6 x 7 x 8 x 9

Pitfalls of intuition

Answer: 362,880

Intuition: wastewater networks



Unskilled intuition

Skilled intuition

Write it down!

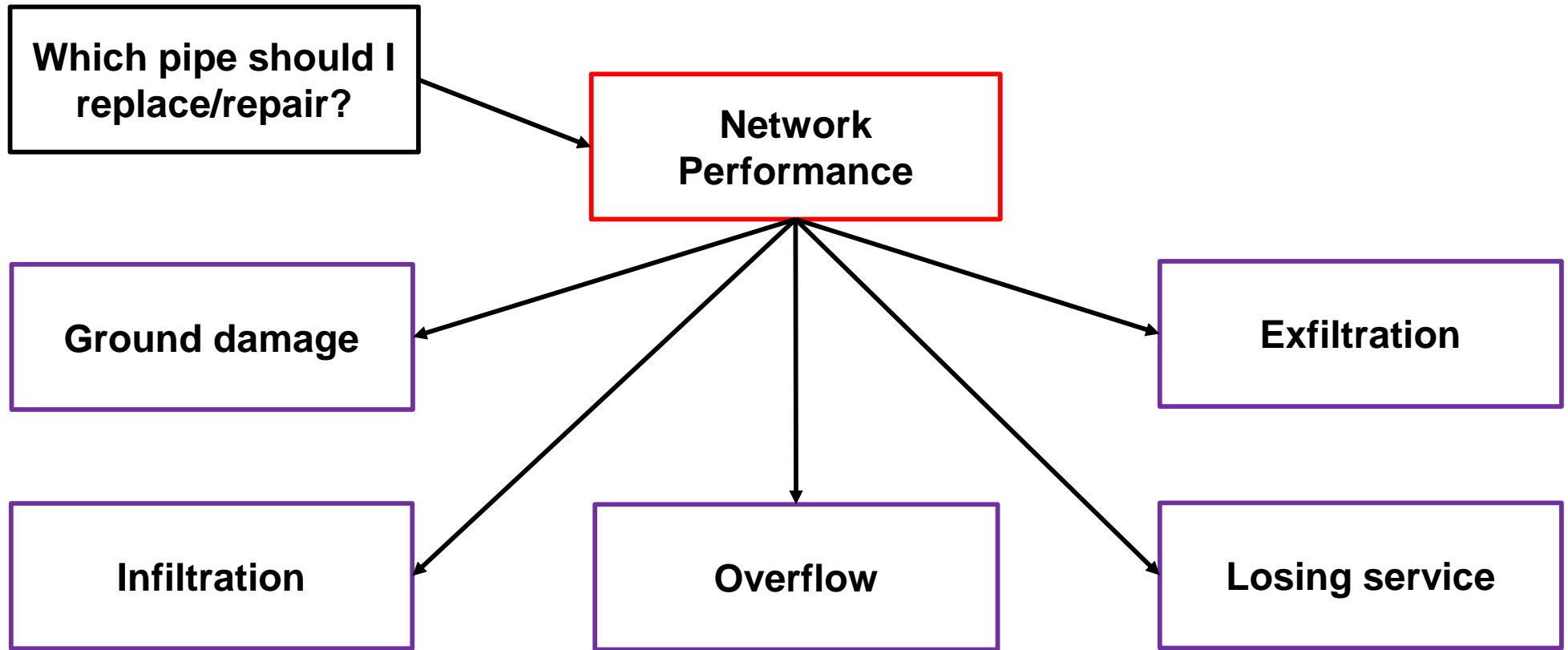
Where's the
opportunity for
learning?

- reference point
- challenge assumptions
- audit - open book
- institutional knowledge

Research:

Method for documenting intuition

- relevant factors
- decision tree structure
- factor weighting



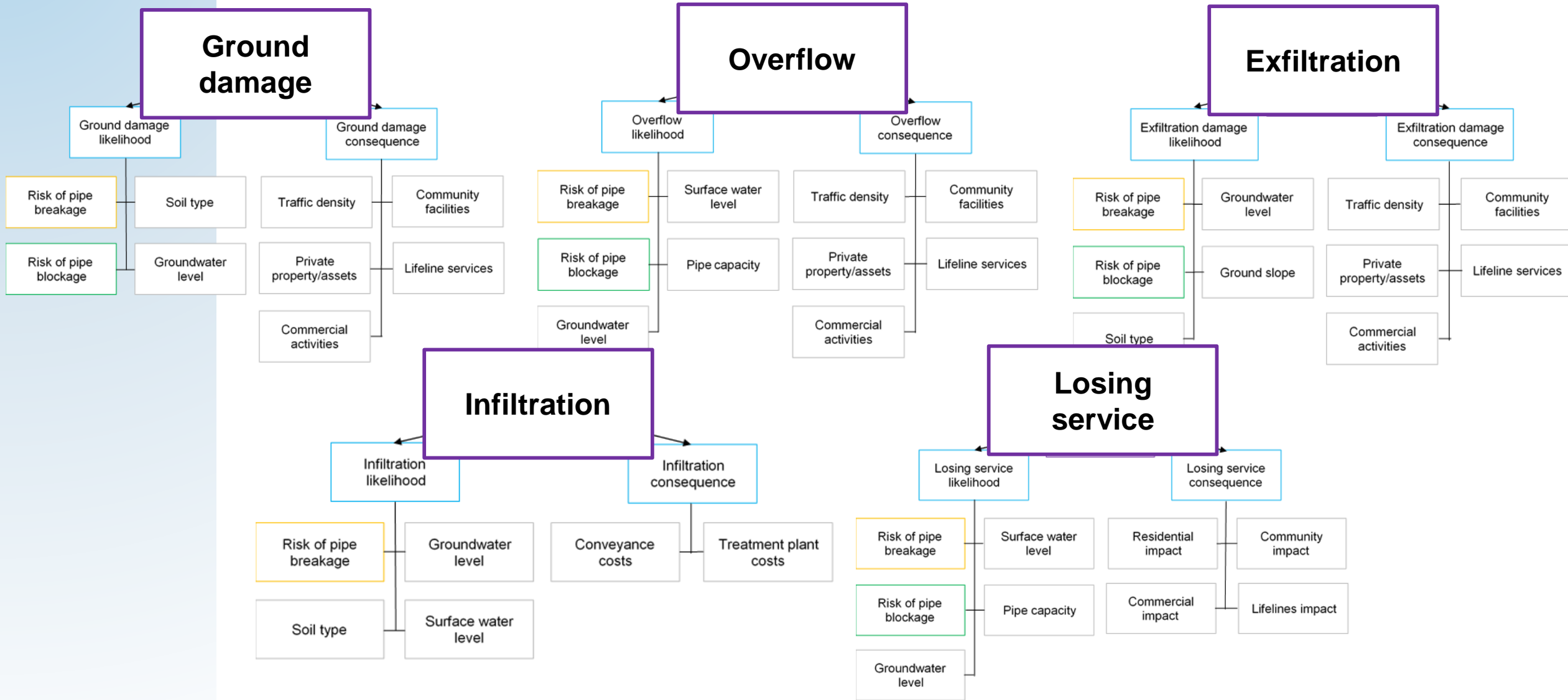
Ground damage

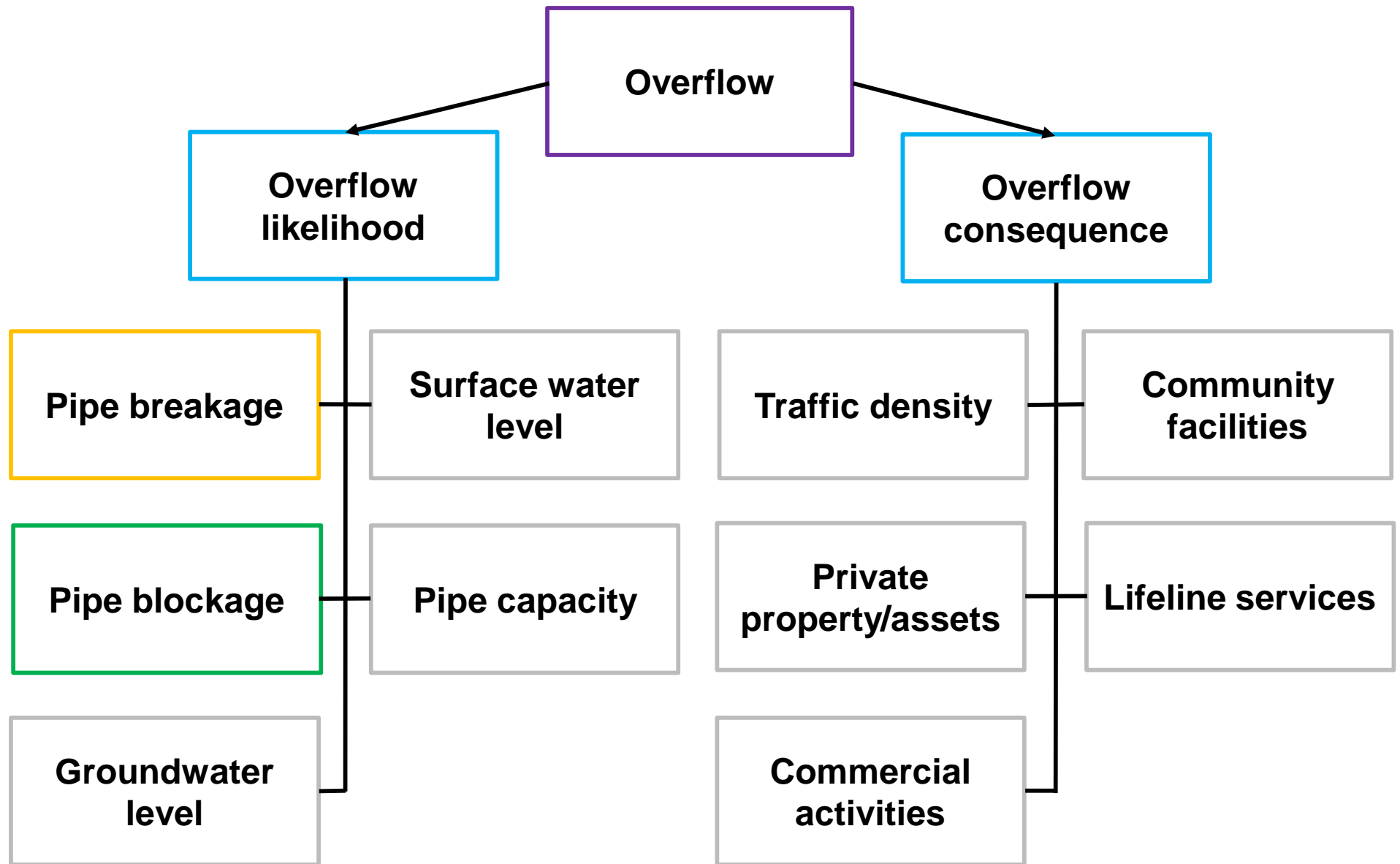
Overflow

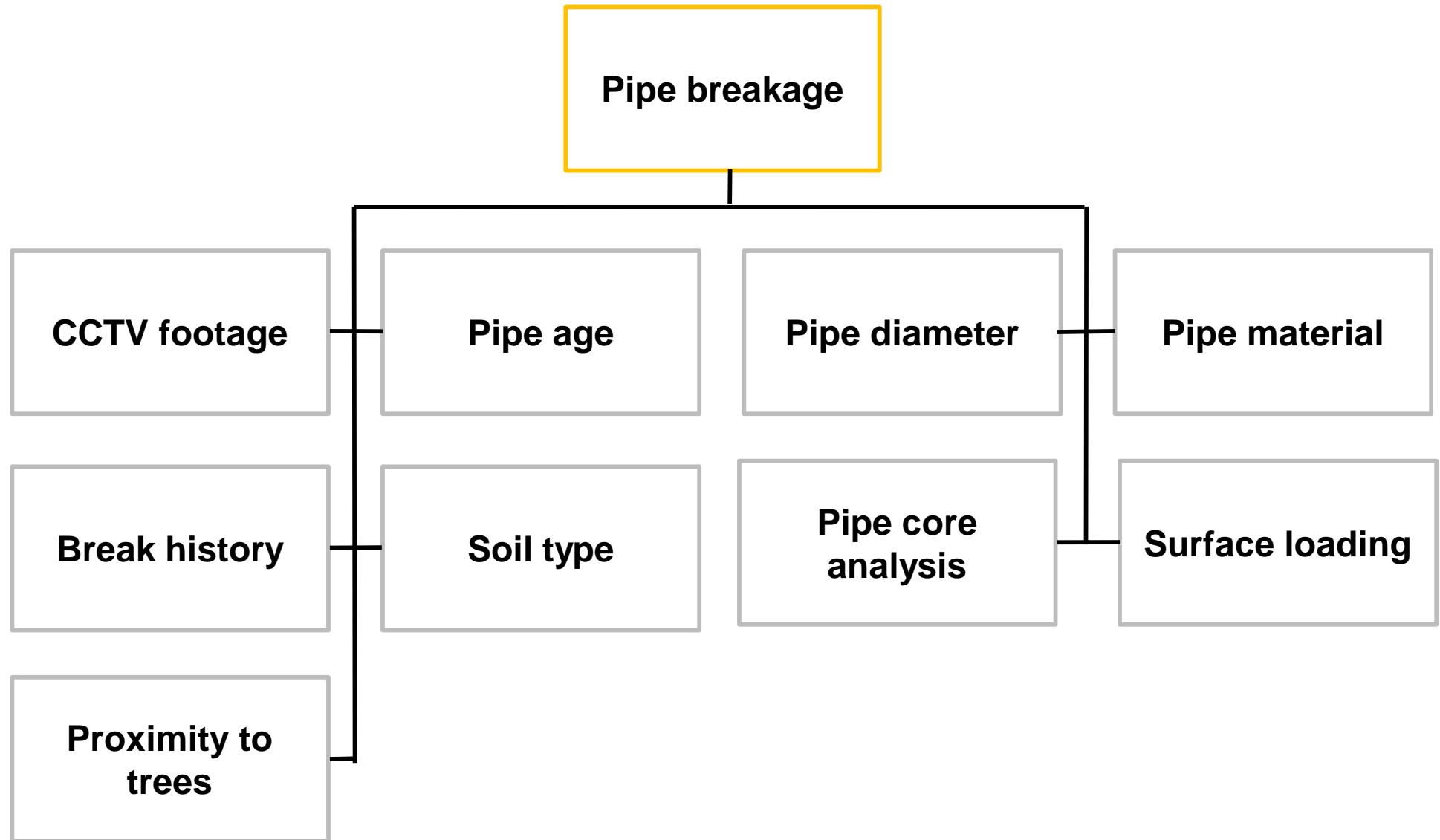
Exfiltration

Infiltration

Losing service







Industry survey

- Online survey
- 43 industry experts
- Feb 2017
- 13 questions
- Likert scale

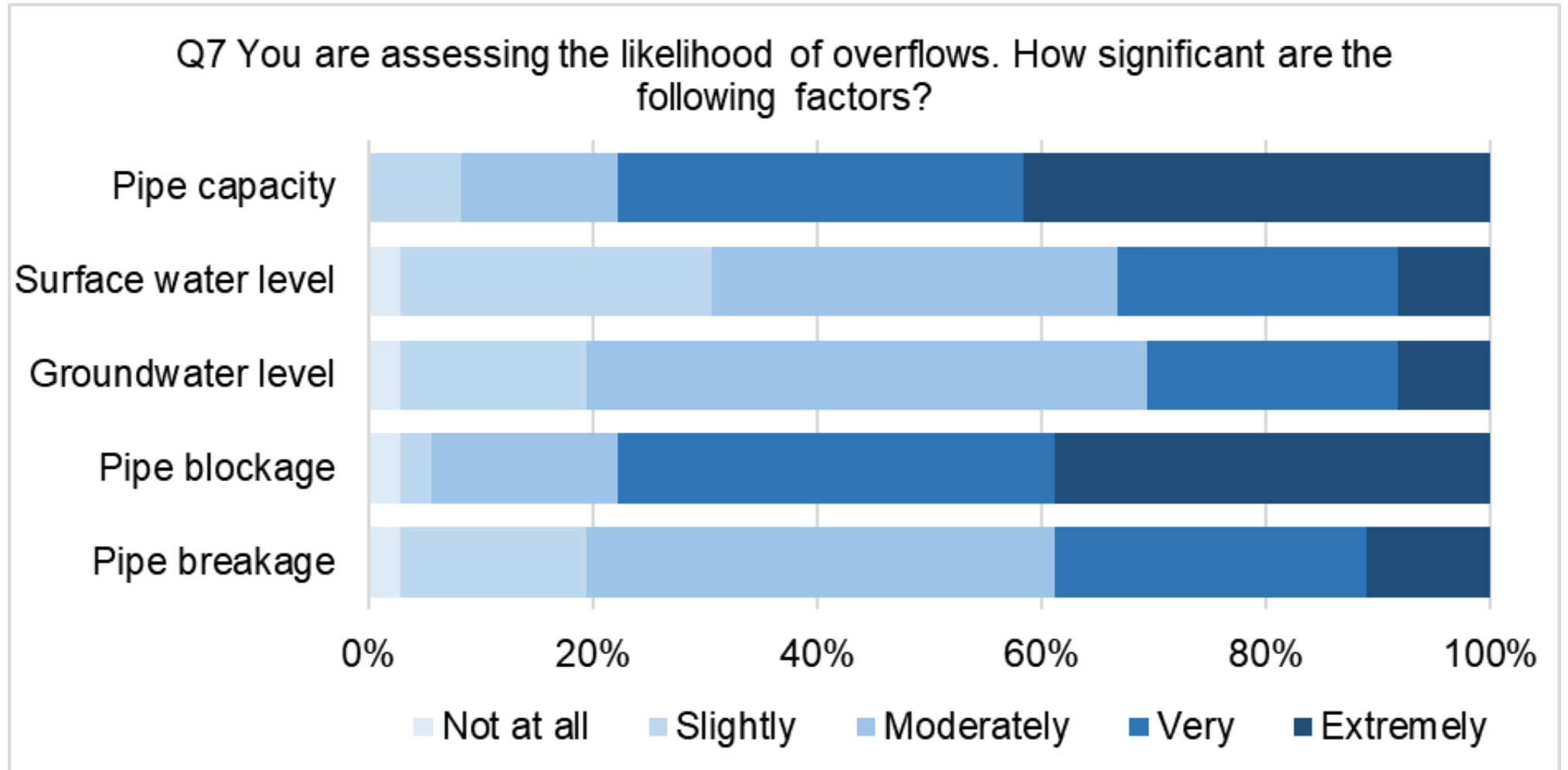
Likert Scale	
Extremely significant	5
Very significant	4
Moderately significant	3
Slightly significant	2
Not at all significant	1

Question example

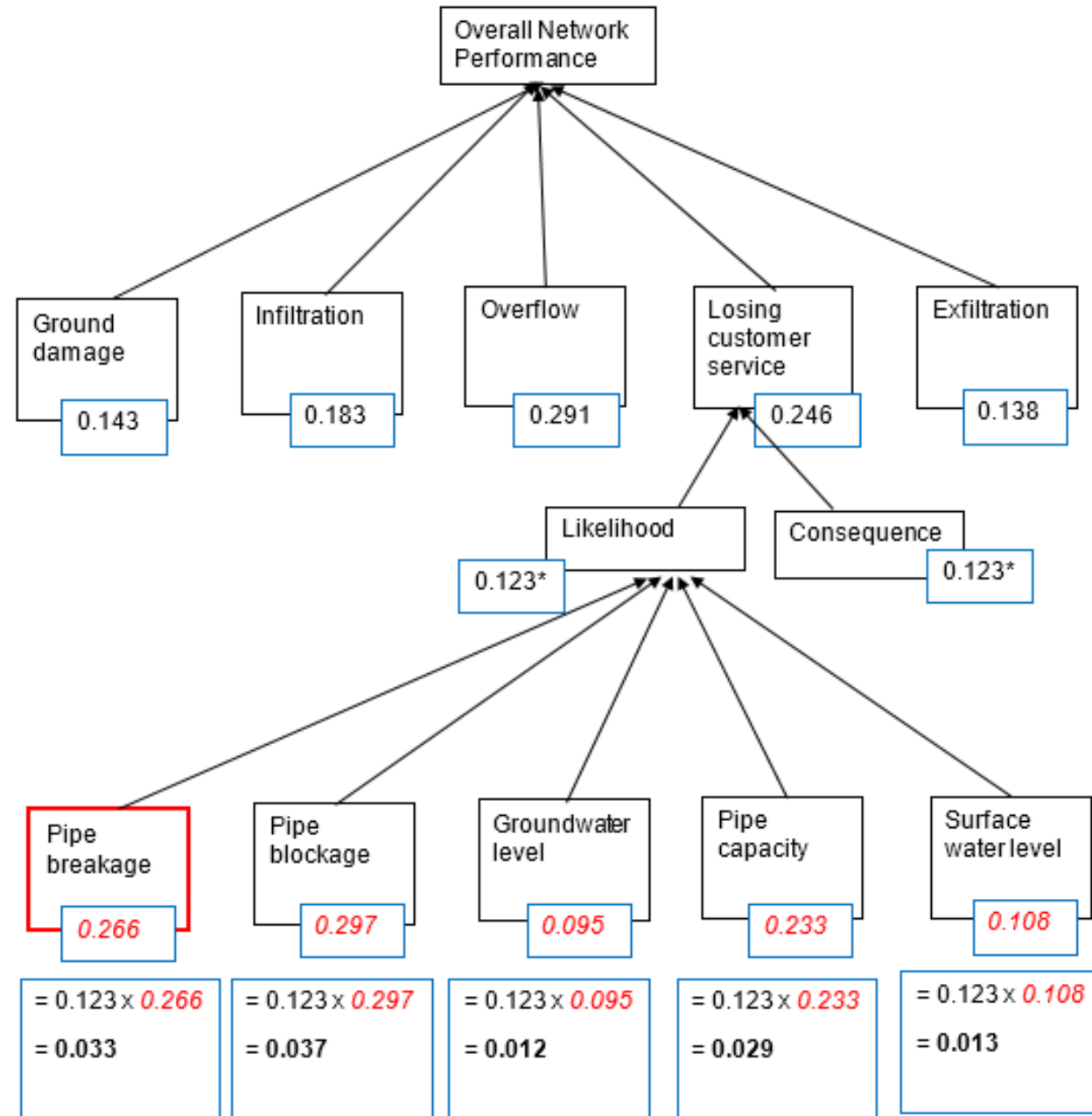
How significant are the following factors to you when assessing the likelihood of overflows?

	Not at all significant	Slightly significant	Moderately significant	Very significant	Extremely significant
Risk of pipe breakage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk of pipe blockage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Groundwater level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Surface water level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pipe capacity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Results



Analysis



Analysed results

Factor	Overall significance
Overflow	0.414
Losing customer service	0.346
Pipe capacity	0.159
Pipe blockage	0.155
Infiltration	0.135

Top 5
out of 34

What I found – *as a method to document intuition*

Benefits

- Prioritise
- Identify factors to include
- Targeted data collection

What I found – *as a method to document intuition*

Benefits -continued

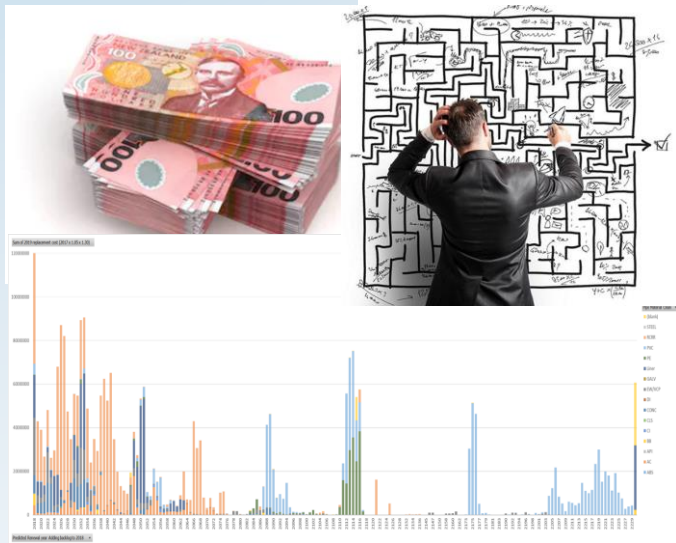
- Apply across a network
- Repeatable framework
- Documentation trail
- Shortlist

What I found – *as a method to document intuition*

Next steps – for you

- Use the model and results
- Follow the process
- Document the expertise you have

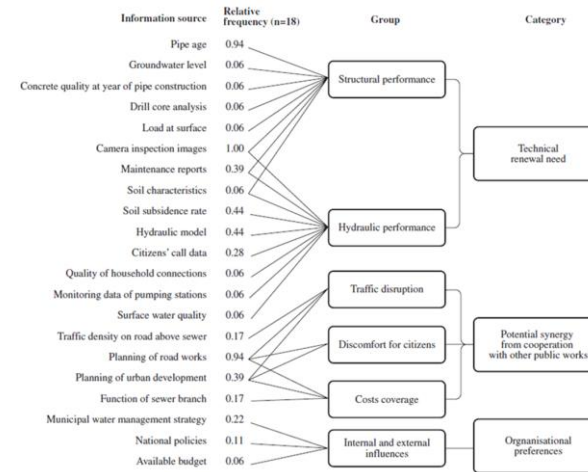
Closing remarks



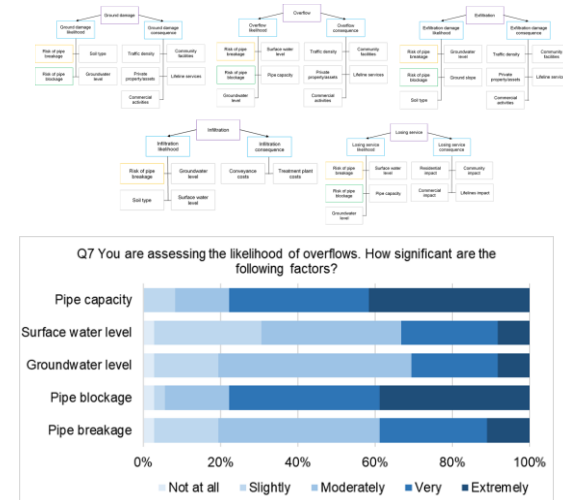
Big and
complex



Use
intuition



Write it
down



This
method

