Problems, Decisions and the Challenges of an Uncertain Future

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MIRACLES YOU'LL SEE

IN THE NEXT FIFTY YEARS

By Waldemar Kaempffert
Science Editor, The New York Times

WHAT WILL the world be like in A.D. 2000? You can read the answer in your home, in the streets, in the trains and cars that carry you to your work, in the bargain basement of every department store. You don't realize what is happening because it is a piecemeal process. The jet-propelled plane is one piece, the latest insect killer is another. Thousands of such pieces are automatically dropping into their places to form the pattern of tomorrow's world.

The only obstacles to accurate prophecy are the vested interests, which may retard progress for economic reasons, tradition, conservatism, labor-union policies and legislation. If we confine ourselves to processes and inventions that are now being hatched in the laboratory, we shall not wander too far from reality.

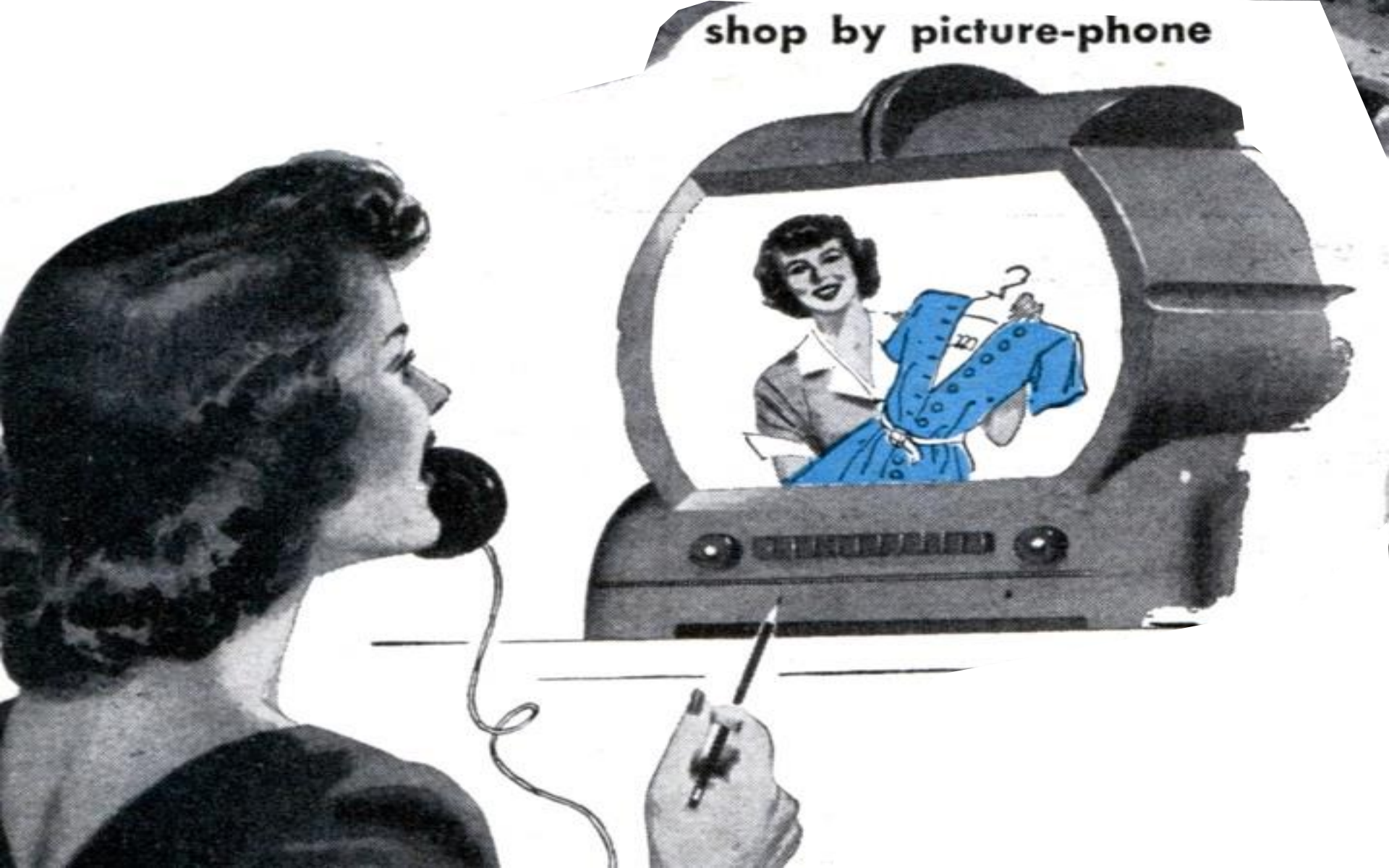
The best way of visualizing the new world of A.D. 2000 is to introduce you to the Dobsons, who live in Tottenville, a hypothetical metropolitan suburb of 100,000. There are parks and playgrounds and green open spaces not only around detached houses but also around apartment houses. The heart of the town is the airport. Surrounding it are business houses, factories and hotels. In concentric circles beyond these lie the residential districts.

Tottenville is as clean as a whistle and quiet. It is a crime to burn raw coal and pollute air with smoke and soot. In the homes electricity is used to warm walls and to cook. Factories all burn gas, which is generated in sealed mines. The tars are removed and sold to the chemical industry for their values, and the gas thus laundered is piped to a thousand communities.

The highways that radiate from Tottenville are much like those of today, except that they are broader with hardly any curves. In some of the older cities, difficult to change because of the immense investment in real estate and buildings, the highways are double-decked. The upper deck is for fast nonstop traffic; the lower deck is much like our avenues, with brightly illuminated shops. Beneath the lower deck is the level reserved entirely for business vehicles.

Tottenville is illuminated by electric "suns" suspended from arms on steel towers 200 feet high. There are also lamps which are just as bright and varicolored as those that now dazzle us on every Main

shop by picture-phone



No more bouts with the razor for man of tomorrow.
He'll whisk away whiskers with a chemical solution

Because everything in her home is waterproof, the housewife of 2000 can do her daily cleaning with a hose

Weak Signals and Wild Cards: Complex socio-technical systems

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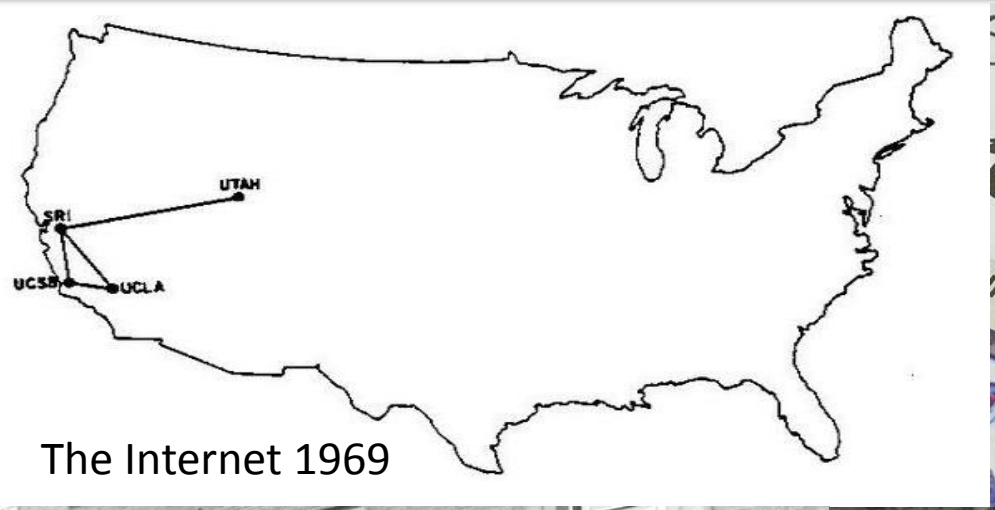
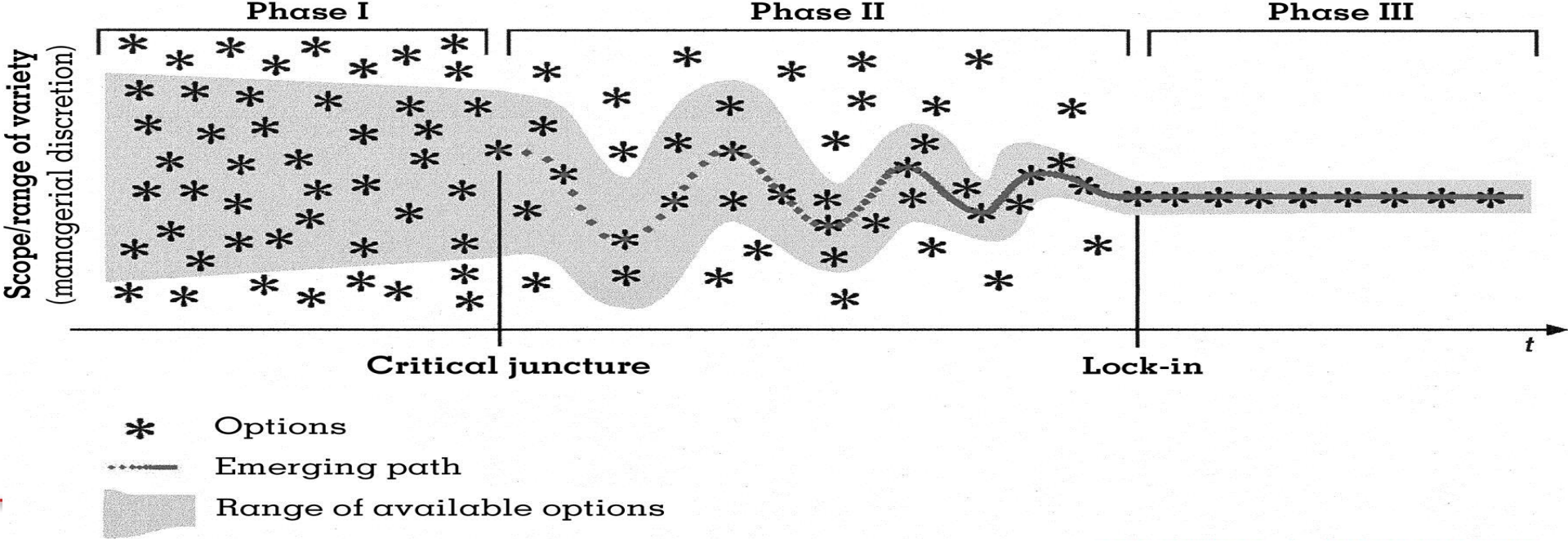


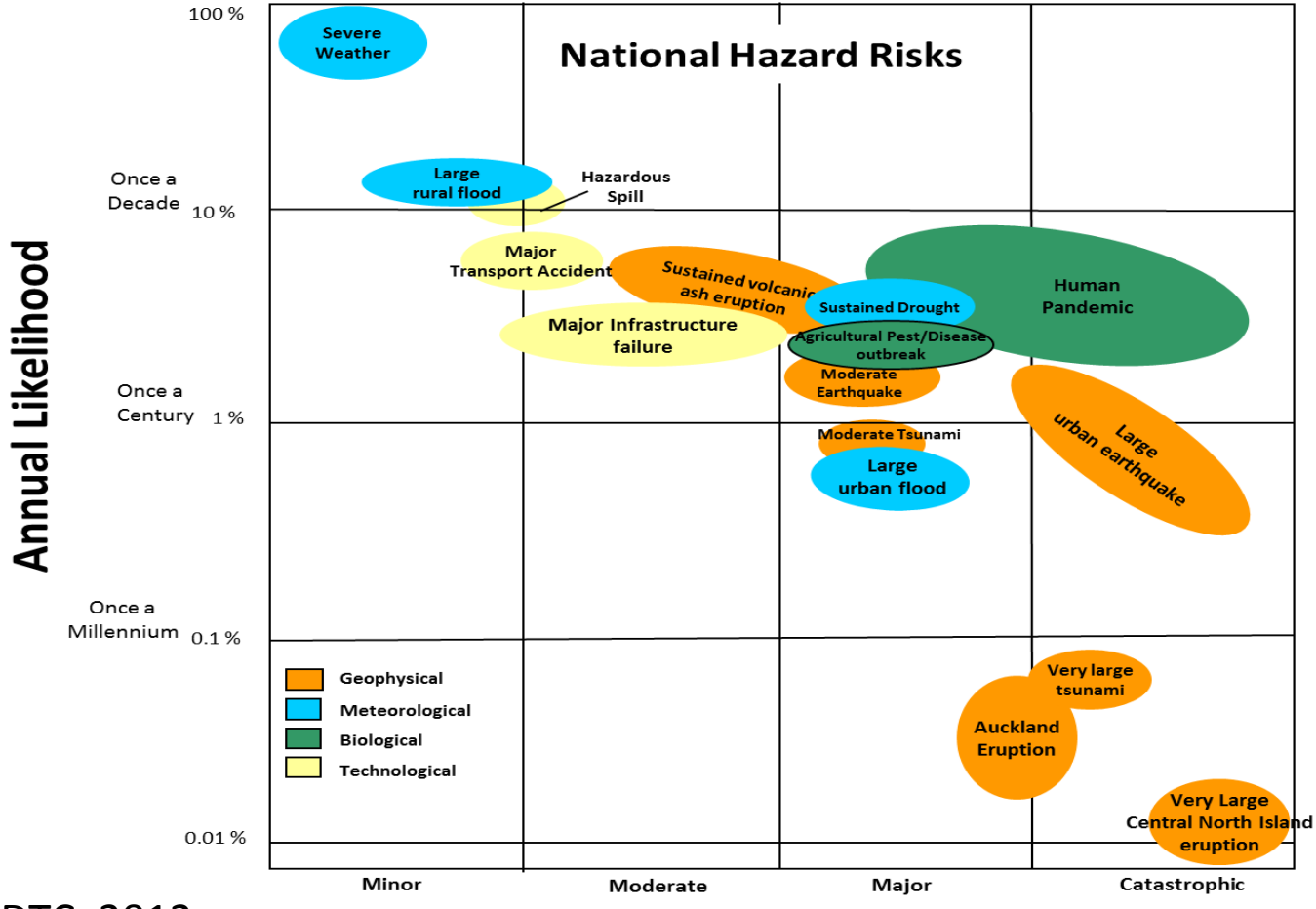
The Internet 1969

Even if we know we struggle to adapt: 'Path Dependence' and risk

- Not just about scientific uncertainty; What constrains our ability to act on what we know?



National Risk Register



Competing problems
Cascading problems

All risks have different costs, uncertainties, complexities, and path dependencies

This provides a major challenge to science & practice

DTC, 2012

Certainty: change in properties in England at risk of flooding over time

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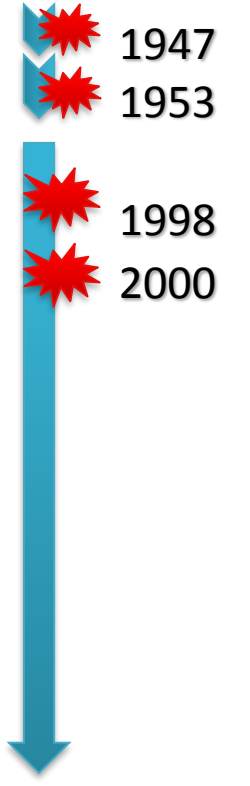
Flood Events

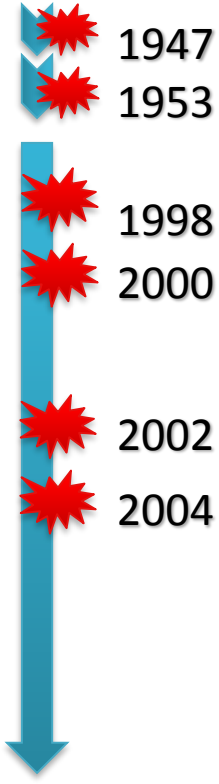


Year	Estimated properties at risk (23m total in 2011)			Total
	Rivers & Sea	Surface Water	Groundwater	
2001				
2004				
2009				
2015				

(White 2013; O'Hare, White and Connelly, 2017)

Certainty: change in properties in England at risk of flooding over time

Flood Events

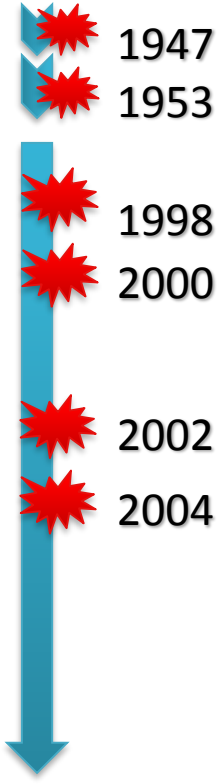


Year	Estimated properties at risk (23m total in 2011)			Total
	Rivers & Sea	Surface Water	Groundwater	
2001	1,724,225	0	0	1,724,225
2004				
2009				
2015				

(White 2013; O'Hare, White and Connelly, 2017)

Certainty: change in properties in England at risk of flooding over time

Flood Events

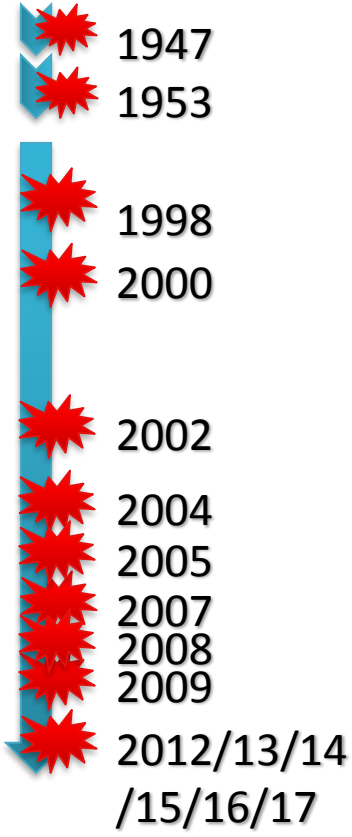


Year	Estimated properties at risk (23m total in 2011)			Total
	Rivers & Sea	Surface Water	Groundwater	
2001	1,724,225	0	0	1,724,225
2004	1,740,000	80,000	1,700,000	3,420,000
2009				
2015				

(White 2013; O'Hare, White and Connelly, 2017)

Certainty: change in properties in England at risk of flooding over time

Flood Events



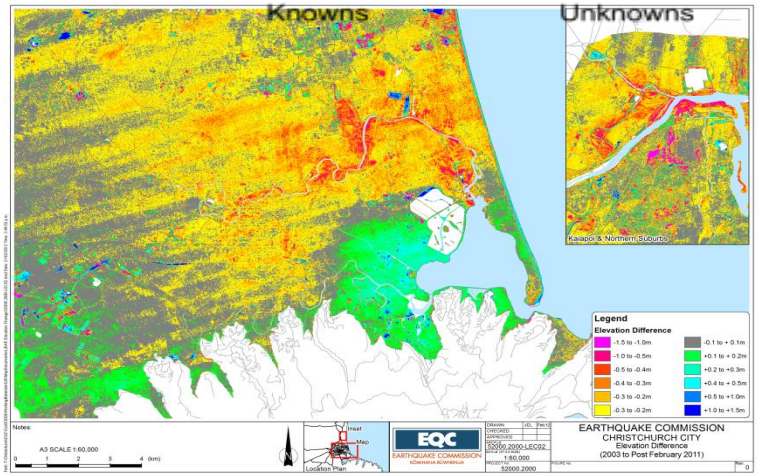
Year	Estimated properties at risk (23m total in 2011)			Total
	Rivers & Sea	Surface Water	Groundwater	
2001	1,724,225	0	0	1,724,225
2004	1,740,000	80,000	1,700,000	3,420,000
2009	2,400,000	3,800,000	1,700,000	6,800,000
2015	2,641,000	3,181,000	Between 122,000 and 290,000	6112,000

(White 2013; O'Hare, White and Connelly, 2017)

*The scientific manufacture of **UNcertainty…***

- Growing **complexity**
  - more data=same uncertainty? better knowledge of interactions but while models have got better, they are no better at predicting (Batty, 2015)
  - Advances in climate models, but uncertainty unchanged for 30 yrs (Roe and Baker 2007)
  - Cascading, dynamic effects: Earthquakes, causing landslides, due to sodden ground
  - Paradox of scientific investigation – maps or models presented as robust, then we flag up assumptions, limited lifespan and improve it, which proves it was imperfect and open to challenge...
- ALWAYS uncertainty: Question is how do we adapt to the future with limited knowledge

Known	Things we are aware of and understand	Things we are aware of but don't understand
Unknown	Things we understand but are not aware of	Things we are neither aware of nor understand



*The challenge of **manufacturing** certainty*

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- Political aim to **reduce** complexity
  - Certainty, clarity, permissive activities, and 'tick box' speed is key for investors
- Policy and practice needs to **manufacture** certainty
  - Need to compare value for money, defend in public, avoid liability and environment court
- Are these ways of working path dependencies that should be challenged?
- How does this approach limit our ability to transition to a different urban form and function?
- Hidden politics of risk will limit your ability to **develop sustainable and resilient communities**

How does NZ manufacture certainty?

Key science-practice tensions for future sustainable and resilient communities

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- Scientists manufacture **uncertainty** and **complexity**
  - PCE (2015): more time needed for complex issues to be debated
- Government and policy tries to manufactures **certainty** and **simplicity**
  - but 'false precision' (White 2013), 'stationarity is dead' (Milly et al 2008)?
  - Distil complex science into single lines – zoning, property rights, enforceability
- Scientists want **adaptability**, govt and investors want **certainty** and **fixity**
  - Investment, protection of use rights, infrastructure, property rights
  - To make current investment more certain we *transfer risk to future*
- The future will always be unknown and uncertain. But, we must act. Decisions today will have decades or centuries of consequences for risk.
- How can we adapt our practices/transform our communities to better cope with a turbulent world