Knowing the value of knowledge:

Emerging approaches to evaluating research through end user perspectives

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Overview

- How is research commonly valued and are these methods appropriate for government?
- Research on research:
  - *Measuring Research Outcomes:* Best practice review

- Practical application to planning evaluation of a current research program

With thanks to Georgina Kelly, Executive Director Science, Department of Planning, Industry and Environment

Value of research:

academia and government

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Who we are & why we care

- Strategic Evaluation & Statistics team
  - NSW Department of Planning, Industry and Environment
  - We provide frameworks, guidance and support to fulfil legal requirements for evaluation and enable good practice

- Evaluate on behalf of the Climate Change Fund (*Energy and Utilities Administration Act 1987*)

- Government – delivers programs + oversees evaluation + evaluation end-user
  - Responsible for ‘value’ to NSW – public good
  - Evaluations should link to decisions on future funding

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What does evaluation look like for government ‘research’ programs

Academic value … *implies*

Bigger pool of knowledge

Knowledge is the domain of researchers

Measure: citations, impact

Knowledge is valued: when it is communicated
Citations & impact are a reasonable proxy for quantity & quality of interest

Journal articles

End-users will read journals

Research

Knowledge generation is the domain of specialists

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Example journal article: first paper produced by the research case study

https://link.springer.com/article/10.1007/s00382-011-1244-5

Springer Link

Climate Dynamics

September 2012, Volume 39, Issue 6, pp 1241–1258 | Cite as

Evaluating the performance of a WRF physics ensemble over South-East Australia

Authors | Authors and affiliations

Jason P. Evans, Marie Ekström, Fei Ji

Article

First Online: 19 November 2011

1 Shares | 1.6k Downloads | 106 Citations

Looked up September 2019 ~8 years of citations

Evaluating the performance of a WRF physics ensemble over South-East Australia

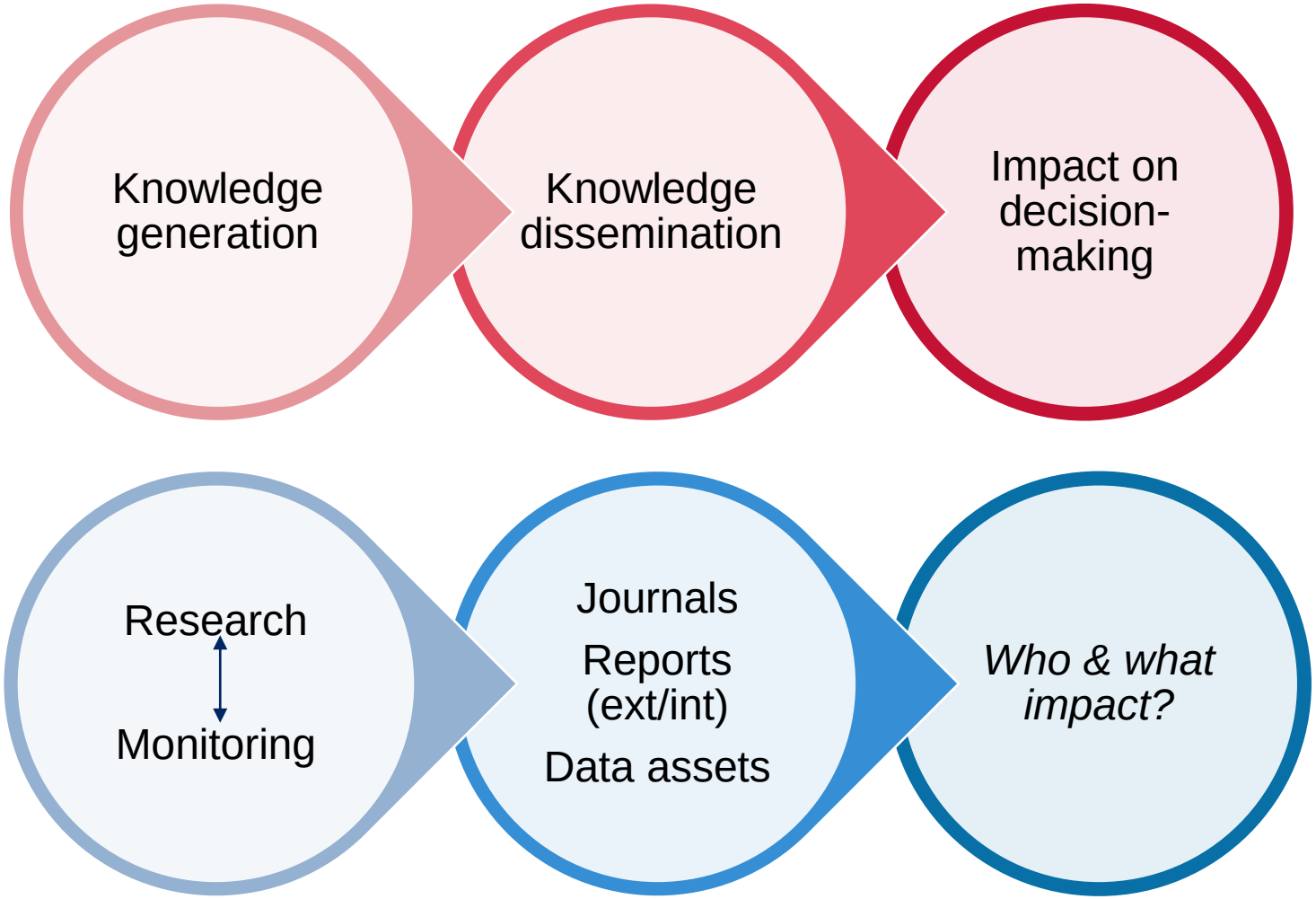
JP Evans, M Ekström, F Ji - Climate Dynamics, 2012 - Springer

Abstract When using the Weather Research and Forecasting (WRF) modelling system it is necessary to choose between many parametrisations for each physics option. This study examines the performance of various physics scheme combinations on the simulation of a …

☆ Cited by 157 Related articles Web of Science: 117

Which citations? Journal articles or all uses?

Evaluating outcomes and impact



Evaluation challenges in the public sector

- Government science has different needs and objectives compared with other research organisations, CCF funded especially
- Many stakeholders, many needs:
  - policy staff
  - program delivery teams
  - delivery support teams
  - program partners (research organisations, councils)
  - high level stakeholders (ministers, Premier)
  - people of NSW

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Research on research

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Whose best practice research to look at?

Source *Measuring Research Outcomes: Best Practice Review of Outcomes and Data Management* (ACIL Allen, 2017)

How to decide?

- Organisations with good *reputation*
- Recent research programs – *timely*
- *Relevant* to Office of Environment and Heritage (OEH)*

Who was chosen?

- Environment and Climate Change Canada (ECCC)
- EU's Horizon 2020
- National Climate Change Adaptation Research Facility
- National Environment Research Program (NERP)
- World Meteorological Organisation (WMO)

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*OEH became part of the Department of Planning, Industry and Environment on 1 July 2019

Fast forward: choosing organisations → KPIs

Research impact indicators proposed by stakeholder groups (1)

	Researchers	Senior science managers	Intermediaries	Science users
Citation indices	✓	✓		
Longevity of reports	✓	✓		
Demand and downloads of reports and assessments	✓			
Frequency at which datasets are requested	✓			
Number of media interviews	✓			
Stakeholder collaboration			✓	
Level of long-term stakeholder involvement and commitment				✓

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Research impact indicators proposed by stakeholder groups (2)

	Researchers	Senior science managers	Intermediaries	Science users
Extent of research influence in determining future research areas			✓	
Continued funding	✓	✓		
Uptake of research among stakeholders – solve related problems				✓
Increased awareness & public understanding of the issue	✓			✓
Stakeholder awareness of the issue			✓	

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Research impact indicators proposed by stakeholder groups (3)

	Researchers	Senior science managers	Intermediaries	Science users
Extent to which research is applied and acted on – degree to which research integrated into policy/programs/regulations	✓	✓	✓	✓
Feedback from decision makers – having information they need				✓
Positive change/action e.g. decreased use of regulated substance				✓
Demonstration of impact over longer time periods (metric not defined)			✓	

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What this means in practice

As science competes with other areas in society for public money, it is also faced with the challenge of demonstrating its value to society.

Basic research in particular undergoes close scrutiny for this purpose: scientists can appreciate its value to society, but politicians can hardly do so.

(Bornmann 2012, 2017)

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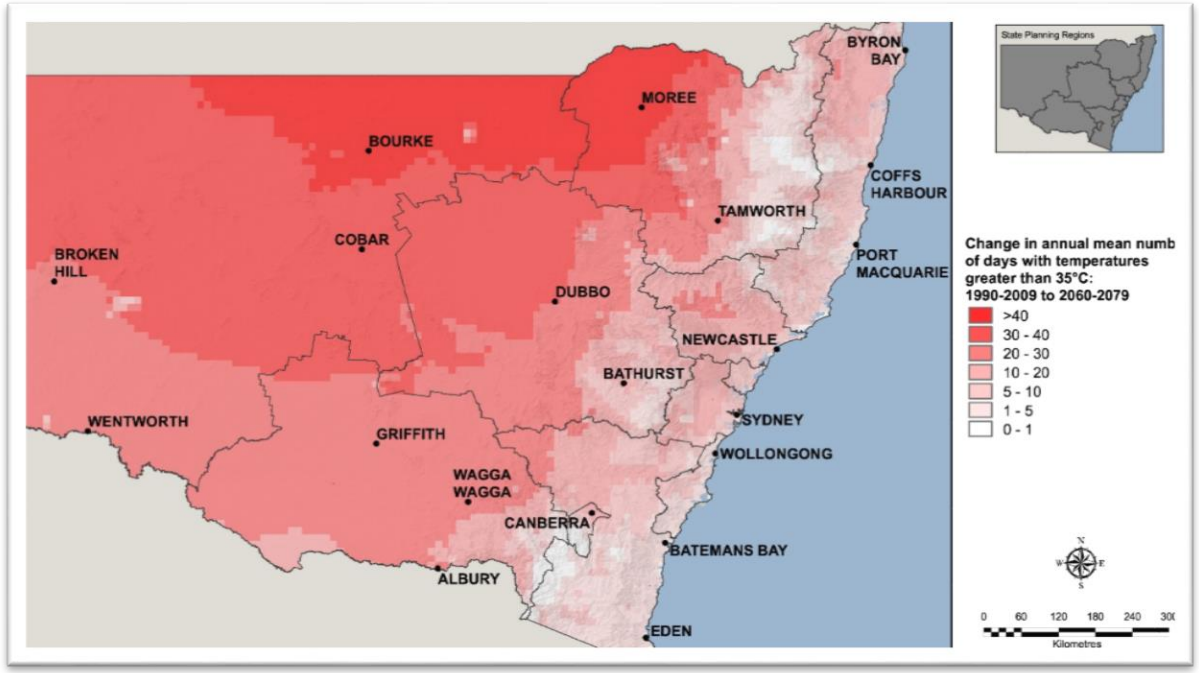
NARCliM case study

NSW and ACT Regional Climate Modelling (NARCliM) Project



climatechange.environment.nsw.gov.au

- Part of a broader research, climate risk identification and adaptation program being funded under the CCF
- Dataset of national significance, generates data for >100 meteorological variables
- Enhancements (v1.5 → v2.0): finer resolution and longer projections under 3 emissions scenarios

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NARCliM evaluation challenges

1. Evaluating end user satisfaction (before it's too late)
2. What is the counterfactual?
3. The research 'time lag': when will the benefits be realised?
4. How to handle an economic evaluation

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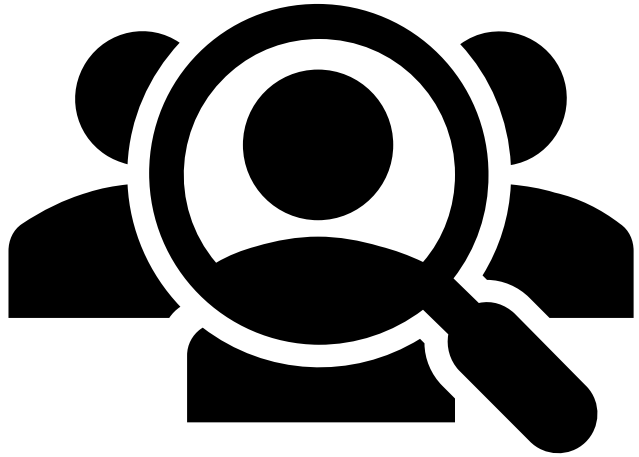
1. Understanding the end users of NARCliM

- Evidence that the *outputs* are serving their intended purpose/s to deliver *outcomes*
- To best meet end user needs, we can't simply evaluate at the 'end'
- Importance of co-design in parallel with program delivery
- Evaluation activities are embedded in program design to align with end user requirements



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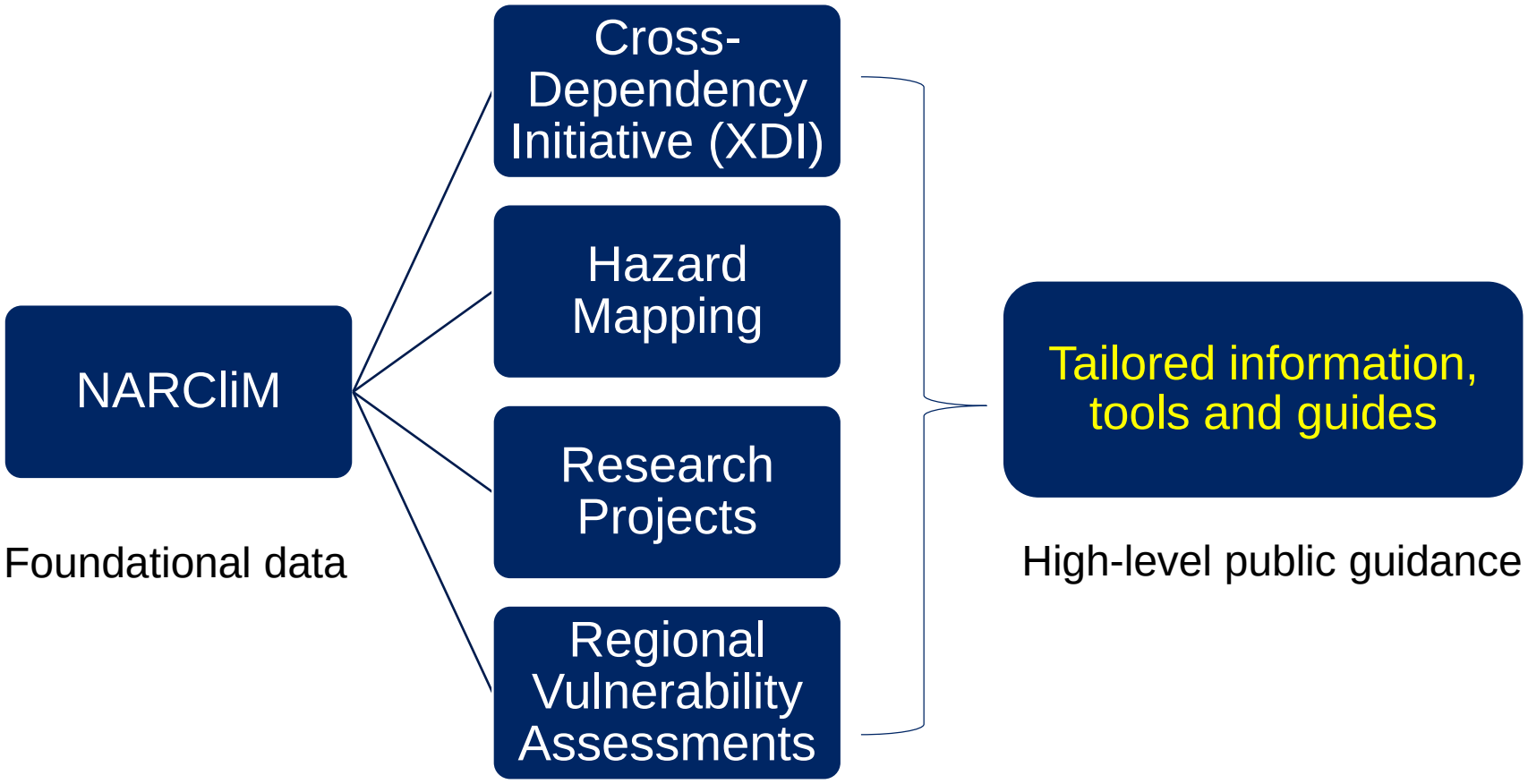
2. What is the counterfactual?



3. The research ‘time lag’

NARCliM expansion and enhancement: 2018-2022

2014 → Early 2020 → Mid 2022

NARCliM 1.0 12 models	NARCliM 1.5 9 models	NARCliM 2.0 (TBC)
1990-2009, 2020-2039, 2060-2079 (& 1950-2009 NCEP-forced simulations)	1950-2100 (& 1981-2010) ERA-Interim forced simulations)	1950-2100 (+ reanalysis simulations) Bespoke regional simulations
Grid: 50km & 10km	**Grid:** 50km & 10km	**Grid:** finer resolution & multi-domain (TBC)
4 **CMIP3** global climate models	3 **CMIP5** global climate models	**CMIP6** global climate models
3 regional models per GCM (**WRF3.3**)	3 per GCM – same RCMs as for NARCliM1.0 (**WRF3.6.0.5**)	Currently testing new physics (**WRF4.02+**)
Future: SRES A2	**Future:** RCP4.5 & RCP8.5	**Future:** (TBC)
Example uses: regional climate snapshots, near versus far future climate analyses for temperature, heat, snow, fire, rainfall, etc.	**Example uses in addition to NARCliM:** climate extremes, thresholds for impacts, compare with non-climate datasets.	**Example uses in addition to previous iterations:** hazards over cities, coastal changes, impacts of ocean warming on NSW climate.

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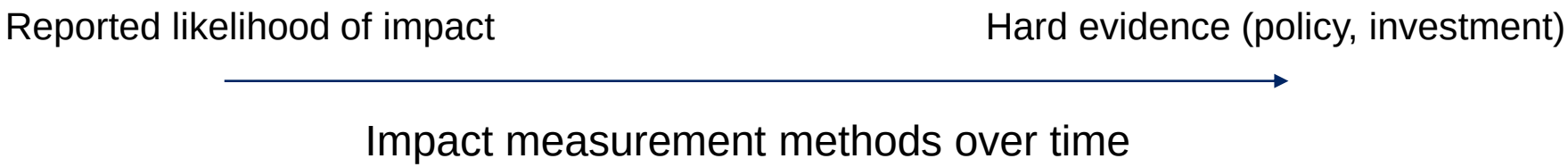
3. The research ‘time lag’

- A common evaluation problem for research and ‘knowledge generation’ programs/projects
- Difficult to manage in an evaluation (and is commonly a source of worry for those delivering)
- Considering the evidence along an impact timing continuum



4. Economic evaluation

- Typically, research knowledge and research outcomes can be difficult to monetise
- Cost effectiveness analysis (CEA) as a scoping tool that provides a ‘baseline’
- Options:
  - evidence of co-financing through partnerships
  - willingness to pay
  - compare with a commercial product
  - case studies

- Likely will be a combination of approaches

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NARCliM: measures and indicators

Measures

- Quality / effectiveness
- Access
- Use (uptake of knowledge)
- Impact (decision-making, behaviour change)

Indicators

- Citations statistics
- Collaborations, partnerships, in-kind contributions
- ‘Altmetrics’ (page hits, downloads, access requests, social media)
- Case studies
- End user satisfaction
- Reported influence on key decision-maker behaviours
- Evidence of policy changes, investments, decision-making

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NARCliM: lessons learned

- Trying to work out the counterfactual can be overwhelming – best to break it down to the main contributions of the program **as they relate to end users and likely impact on decision-making**
- Importance of **evaluating the vehicle** for the research/knowledge ‘product’ as this is integral to its end user engagement, its use and ultimately realising its impact
- **Co-designing evaluation** with delivery teams leads to better understanding of evaluation ‘entry points’ while building internal capacity for monitoring and evaluation
- These challenges **build the case for ex post evaluation** – including evaluation well beyond implementation

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Conclusions

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Conclusions

- Evaluation of scientific research should consider social dimensions that are pivotal to achieving outcomes – end users are integral to measuring outcomes
- Value is always conservative – knowledge is not used up when you give it away, unlike say grant funds, so value can continue to grow over time
- Different metrics have their uses. Citations are fine for their purpose.
- Don’t forget to think outside the box when identifying stakeholders, users, and knowledge

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