bushfire&natural HAZARDSCRC

INCLUDING THE INTANGIBLE BENEFITS OF BUSHFIRE MITIGATION IN ECONOMIC ANALYSES: A 'VALUE TOOL' FOR INFORMED DECISION MAKING

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THE UNIVERSITY OF WESTERN AUSTRALIA

PRIORITISING BUSHFIRE MITIGATION ACTIONS

1) Mitigation aims to protect the values affected by bushfires

2) Limited budgets and competing investments

3) We need to determine which management options offer the best value for money

EFFECTIVE PRIORITISATION

1) Need to weigh up all of the financial, environmental and social outcomes:

   a) What would happen if we didn't mitigate?
   b) How are the outcomes changed if we do?

2) Integrated economic assessments

   a) Benefit-cost analyses
   b) Trade-offs between the different, sometimes competing, outcomes

INTEGRATED ECONOMIC ASSESSMENTS

1) Tangible outcomes:

The financial or market-based cost and benefits of bushfire mitigation

2) Intangible outcomes:

The social and environmental, or "non-market", costs and benefits

Figure 2.2 **The economic costs of natural disasters**

Source: Adapted from BTE (2001).

INTANGIBLE COSTS AND BENEFITS

1) Not as well documented as tangible costs and benefits

2) To compare them to tangible market costs we need a comparable metric

3) Quantify them in financial equivalent terms: "Non-market valuation"

NON-MARKET VALUATION

1) Economic methodologies able to estimate monetary figures for non-market costs and benefits

2) Data collected by analysing related markets, or through surveys

3) Identifies "willingness to pay" for a change in provision of a non-market value

4) $ values can be used in benefit-cost analyses

CONDUCTING VALUATION STUDIES

1) Important for big/expensive investment decisions to have accurate information about non-market values, but…

   a) There are often multiple non-market values affected by a decision

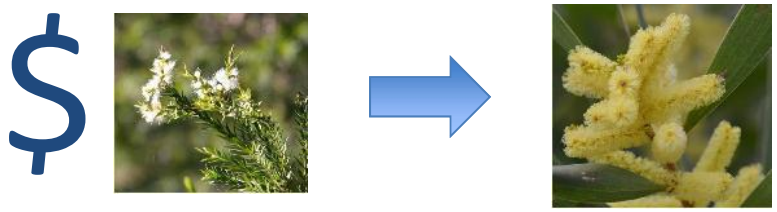
   b) Extensive research is needed to measure them all

   c) Already limited by resources, and original studies are expensive and time consuming

BENEFIT TRANSFER

1) An alternative to original valuation studies

2) Uses $ values estimated from original studies and applies them to similar policy contexts

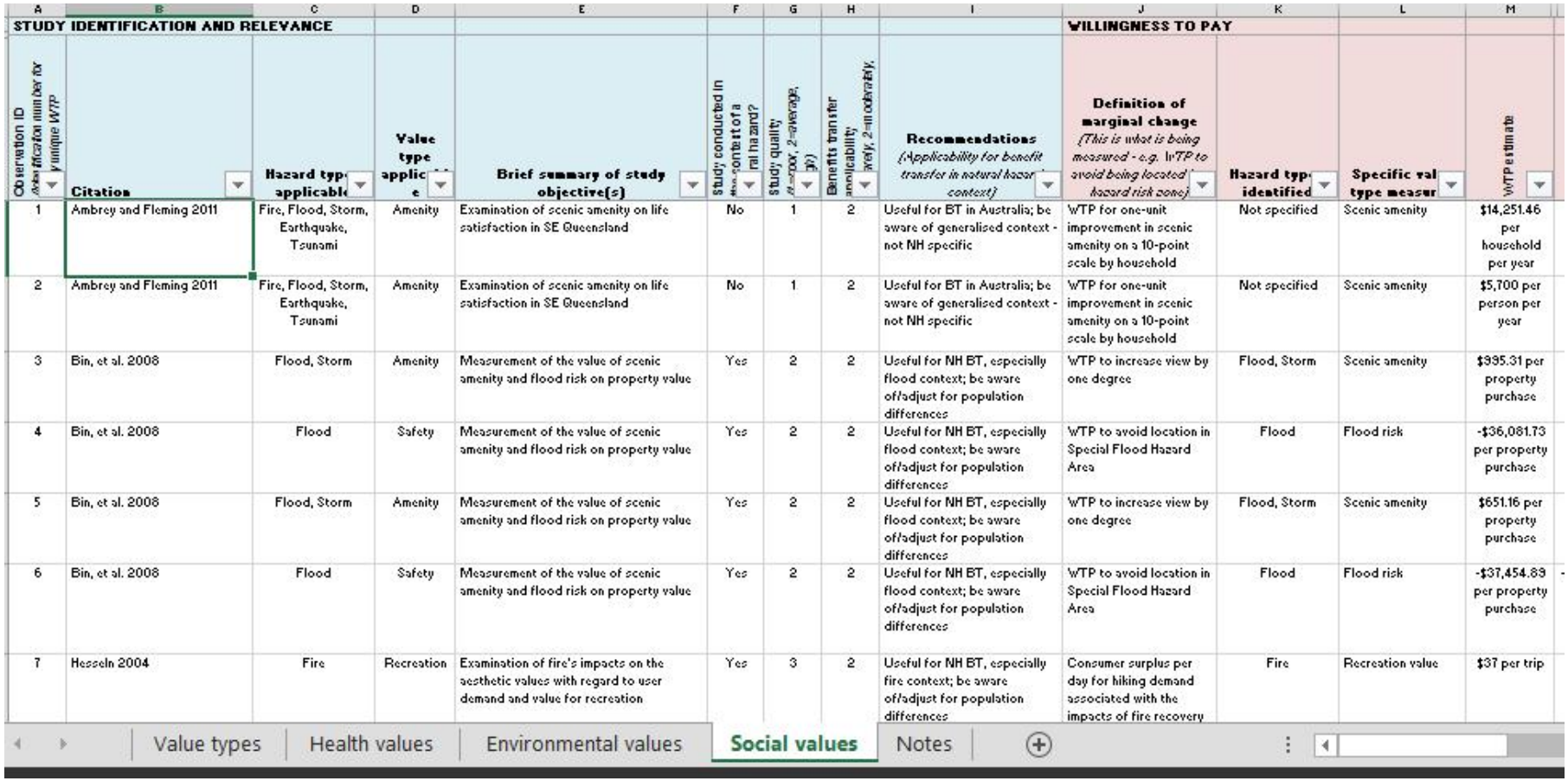


3) Can be complicated:
   a) Decision contexts are rarely the same
   b) There are not many original studies measuring willingness to pay for values affected by bushfire
   c) Leads to uncertainty in the transferred values

4) Uncertain information is better than no information

VALUE TOOL FOR NATURAL HAZARDS

A database of existing non-market values that can be used for benefit transfer



A	B	C	D	E	F	G	H	I	J	K	L	M
STUDY IDENTIFICATION AND RELEVANCE									WILLINGNESS TO PAY			
Observation ID (Identification number for every unique WTP	Citation	Hazard type applicable	Value type applicable	Brief summary of study objective(s)	study conducted in the context of a natural hazard?	study quality (1=poor, 2=average, 3=good)	Benefits transfer applicability (1=poorly, 2=moderately, 3=highly)	Recommendations (Applicability for benefit transfer in natural hazard context)	Definition of marginal change (This is what is being measured - e.g. WTP to avoid being located in hazard risk zone)	Hazard type identified	Specific value type measured	WTP estimate
1	Ambrey and Fleming 2011	Fire, Flood, Storm, Earthquake, Tsunami	Amenity	Examination of scenic amenity on life satisfaction in SE Queensland	No	1	2	Useful for BT in Australia; be aware of generalised context - not NH specific	WTP for one-unit improvement in scenic amenity on a 10-point scale by household	Not specified	Scenic amenity	$14,251.46 per household per year
2	Ambrey and Fleming 2011	Fire, Flood, Storm, Earthquake, Tsunami	Amenity	Examination of scenic amenity on life satisfaction in SE Queensland	No	1	2	Useful for BT in Australia; be aware of generalised context - not NH specific	WTP for one-unit improvement in scenic amenity on a 10-point scale by household	Not specified	Scenic amenity	$5,700 per person per year
3	Bin, et al. 2008	Flood, Storm	Amenity	Measurement of the value of scenic amenity and flood risk on property value	Yes	2	2	Useful for NH BT, especially flood context; be aware of/adjust for population differences	WTP to increase view by one degree	Flood, Storm	Scenic amenity	$935.31 per property purchase
4	Bin, et al. 2008	Flood	Safety	Measurement of the value of scenic amenity and flood risk on property value	Yes	2	2	Useful for NH BT, especially flood context; be aware of/adjust for population differences	WTP to avoid location in Special Flood Hazard Area	Flood	Flood risk	-$36,081.73 per property purchase
5	Bin, et al. 2008	Flood, Storm	Amenity	Measurement of the value of scenic amenity and flood risk on property value	Yes	2	2	Useful for NH BT, especially flood context; be aware of/adjust for population differences	WTP to increase view by one degree	Flood, Storm	Scenic amenity	$651.16 per property purchase
6	Bin, et al. 2008	Flood	Safety	Measurement of the value of scenic amenity and flood risk on property value	Yes	2	2	Useful for NH BT, especially flood context; be aware of/adjust for population differences	WTP to avoid location in Special Flood Hazard Area	Flood	Flood risk	-$37,454.89 per property purchase
7	Hesseln 2004	Fire	Recreation	Examination of fire's impacts on the aesthetic values with regard to user demand and value for recreation	Yes	3	2	Useful for NH BT, especially fire context; be aware of/adjust for population differences	Consumer surplus per day for hiking demand associated with the impacts of fire recovery	Fire	Recreation value	$37 per trip

Value types | Health values | Environmental values | Social values | Notes

NON-MARKET VALUES AFFECTED BY NATURAL HAZARDS

Health values	Environmental values	Social values
• Physical health • Mental health	• Ecosystems • Water quality	• Recreation • Amenity • Safety • Cultural heritage • Social disruption • Memorabilia • Animal welfare

USING THE VALUE TOOL DATABASE

1) Define the policy context

   Hazard/mitigation action, values affected, who is affected

2) Define the bounds of the benefit transfer – Guidelines

   Critical to understand the breadth of the existing non-market value literature on the relevant value types

3) Consult the database


Value Tool Guidelines – draft for comment

Abbie Rogers*, Fiona Gibson, Jacob Hawkins, Peter Boxall, Michael Burton, Robert Johnston, Marit Kragt, John Rolfe and David Pannell

Prepared for the Bushfire and Natural Hazards CRC

By

THE UNIVERSITY OF WESTERN AUSTRALIA

7th December, 2016

STEP 1: DEFINE THE POLICY CONTEXT

1) What is the natural hazard type?
   - Bushfire

2) Which non-market values are affected by the hazard type or its mitigation?

   - We'll focus on physical health
   - This process is repeated for each value type

DEFINE THE POLICY CONTEXT CONT'

1) What is the natural hazard type?
   - Bushfire

2) Which non-market values are affected by the hazard type or its mitigation?
   - Physical health

3) How are those values affected, in terms of the physical changes likely to occur?
   - A prescribed burning regime may result in reduced loss of life from an extreme bushfire

DEFINE THE POLICY CONTEXT CONT'

1) What is the natural hazard type?
   - Bushfire
2) Which non-market values are affected by the hazard type or its mitigation?
   - Physical health
3) How are those values affected, in terms of the physical changes likely to occur?
   - A prescribed burning regime may result in reduced loss of life from an extreme bushfire

4) What is the scale of the proposed change?
   - 5 lives saved under PB regime

DEFINE THE POLICY CONTEXT CONT'

1) What is the natural hazard type?
   - Bushfire
2) Which non-market values are affected by the hazard type or its mitigation?
   - Physical health
3) How are those values affected, in terms of the physical changes likely to occur?
   - A prescribed burning regime may result in reduced loss of life from an extreme bushfire
4) What is the scale of the proposed change?
   - 5 lives saved under PB regime

5) What are the socio-economic characteristics of the affected population?
   - Victorian population

STEP 2: CONSULT THE GUIDELINES

1) Physical health:

"There is a large literature on VSL which includes Australian studies, meta-analyses, and study contexts relevant to natural hazards.

Physical health values are well documented and readily applicable to benefit transfer."

2) Benefit transfer:

Recommend a 'unit value transfer'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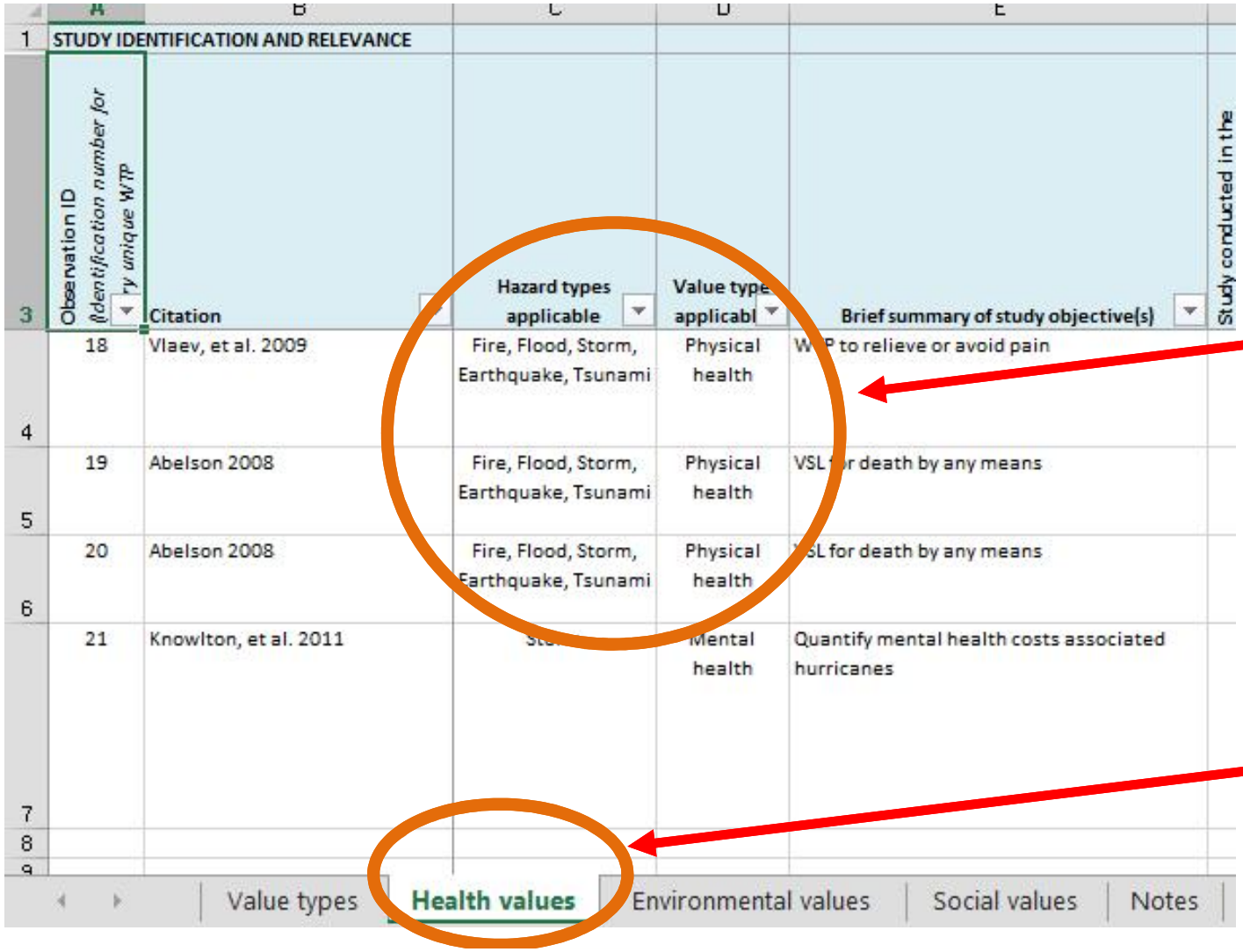
STEP 3: CONSULT THE DATABASE



	A	B	C	D	E	
1	STUDY IDENTIFICATION AND RELEVANCE					
3	Observation ID (Identification number for ry unique WTP	Citation	Hazard types applicable	Value type applicabl	Brief summary of study objective(s)	Study conducted in the
4	18	Vlaev, et al. 2009	Fire, Flood, Storm, Earthquake, Tsunami	Physical health	W P to relieve or avoid pain	
5	19	Abelson 2008	Fire, Flood, Storm, Earthquake, Tsunami	Physical health	VSL r death by any means	
6	20	Abelson 2008	Fire, Flood, Storm, Earthquake, Tsunami	Physical health	SL for death by any means	
7	21	Knowlton, et al. 2011		Mental health	Quantify mental health costs associated hurricanes	
8						

Value types | Health values | Environmental values | Social values | Notes

(2) Select studies matching your hazard & value type

(1) Select the relevant value category

CONSULT THE DATABASE

A	B	J	K	L	AB	AC
STUDY IDENTIFICATION AND RELEVANCE		WILLINGNESS TO PAY			SAMPLE CHARACTERISTICS	
Observation ID *(Identification number for ry unique WTP*	Citation	Definition of marginal change *(This is what is being measured - e.g. WTP for reduced loss of life)*	Hazard types identified	Specific value type measured	Country/region studie	Country of source studi
18	Vlaev, et al. 2009	WTP to end a series of painful electrical shocks	Physical pain	Physical Health	University of London, UK	UK
19	Abelson 2008	Value of a statistical life	Not specified	Physical Health	Meta-analyses	Australia, US, Japan, Switzerland, UK, France, Sweden, NZ, Canada
20	Abelson 2008	Value of a statistical life year	Not specified	Physical Health	Meta-analyses	Australia, US, Japan, Switzerland, UK, France, Sweden, NZ, Canada

(3) Refine study selection:

- How well does the marginal change correspond to your policy context?
- How well do the sample characteristics match?

CONSULT THE DATABASE

A	B	J	K	L	M	P
STUDY IDENTIFICATION AND RELEVANCE		WILLINGNESS TO PAY				
Observation ID *(Identification number for ry unique WTP*	Citation	Definition of marginal change *(This is what is being measured - e.g. WTP for reduced loss of life)*	Hazard types identified	Specific value type measured	WTP estimate	WTP estimate *(2016 $AU)*
19	Abelson 2008	Value of a statistical life	Not specified	Physical Health	$3500000/life	$4,159,946

(4) Find the willingness to pay estimate in 2016 AUS$

CONDUCTING THE BENEFIT TRANSFER AGGREGATION

1) Willingness to pay for one human life

= $4,159,946 per Australian life saved

2) Our prescribed burning regime will save 5 lives

= $4,159,946 x 5

= $20,799,730 in non-market, physical health benefits

CASE STUDY APPLICATIONS

1) Mt Lofty Ranges (east of Adelaide)
   Prescribed burning in public and private land

2) Launceston (Tasmania)
   Flood mitigation

3) Brownhill-Keswick creeks catchment (Adelaide)
   Flood mitigation

A VALUE TOOL FOR BUSHFIRE MITIGATION DECISIONS

1) Accessible database of $ estimates for non-market values

2) Guidelines on conducting simple benefit transfers

3) Easier to account for *all* costs and benefits that affect bushfire mitigation decisions

4) Includes values for other natural hazard decision making

NEXT STEPS

1) Finalising the database & guidelines

2) Online presence
   a) Website housing the Value Tool
   b) Explanatory videos on how to use it

3) Training workshops (e.g. ANHMC)
   30th October 2017
   West Perth, WA

JOIN US AT THE ANHMC WORKSHOP IF YOU WOULD LIKE TO KNOW MORE

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Veronique Florec

Jacob Hawkins

THANK YOU

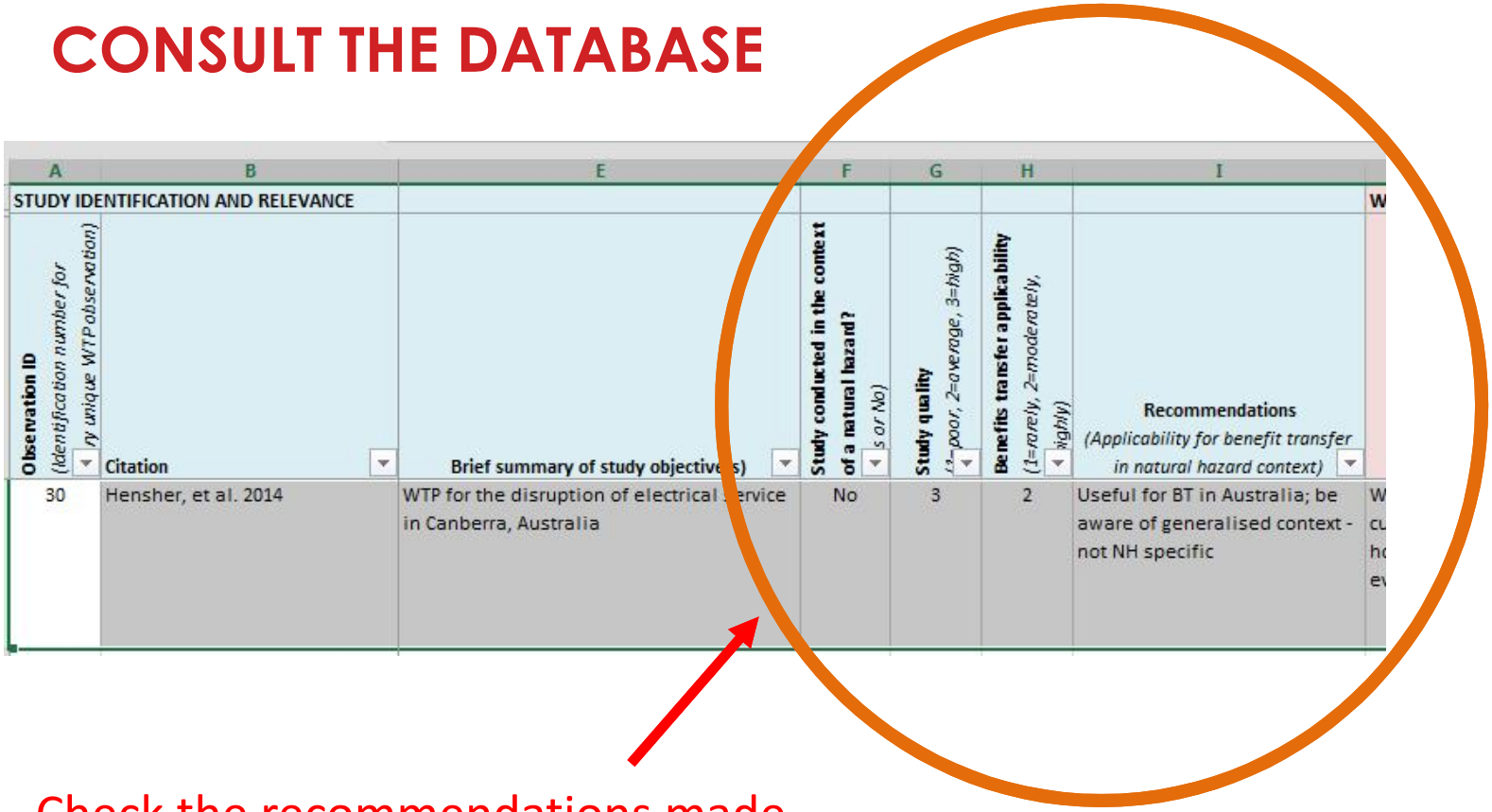
TRADE-OFF: INCOMPLETE OR UNCERTAIN INFORMATION

1) Better to include information with uncertainty than to ignore it completely (Pannell & Gibson 2016):
   a) Investigated variables used in decision metrics for environmental project prioritisation
   b) Environmental outcomes were better with uncertain information compared to incomplete information

→ Values from benefit transfer are worth including in benefit-cost analyses

Pannell, D.J. and Gibson, F.L. 2016. Environmental cost of using poor decision metrics to prioritize environmental projects. *Conservation Biology*, 30(2): 382-391.

CONSULT THE DATABASE



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STUDY IDENTIFICATION AND RELEVANCE						
Observation ID *(identification number for ry unique WTPobservation)*	**Citation**	**Brief summary of study objective s)**	**Study conducted in the context of a natural hazard?** *s or No)*	**Study quality** *1=poor, 2=average, 3=high)*	**Benefits transfer applicability** *(1=rarely, 2=moderately, igh)*	**Recommendations** *(Applicability for benefit transfer in natural hazard context)*
30	Hensher, et al. 2014	WTP for the disruption of electrical ervice in Canberra, Australia	No	3	2	Useful for BT in Australia; be aware of generalised context - not NH specific

Check the recommendations made about the study