

## Climate Health WA Inquiry

### About your submission

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No

Yes

If yes, please identify the organisation: Faculty of Business & Law, Curtin University

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### Terms of Reference

You are encouraged to address at least ONE of the Terms of Reference as listed below. Please select which item/s you will address:

1. Establish current knowledge on the implications of climate change for health in Western Australia (WA) and recommend a framework for evaluating future implications.

2. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will protect the public from the harmful health impacts of climate change.

3. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will strengthen the preparedness and

resilience of communities and health services against extreme weather events, with a focus on the most vulnerable in the community.

4. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will reduce the contribution of WA health services to climate change and other detrimental impacts.

5. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will enable WA Health services to implement change, including energy efficiency, to a more sustainable model.

6. Evaluate the likely benefits (health and wellbeing, social and economic) arising from climate change mitigation strategies, with a focus on WA health services.

7. Define the role of the Department of Health in leading public policy on climate change and health.

8. Recommend the Terms of Reference, scope and preferred methods for undertaking a climate change vulnerability assessment for the health sector.

9. Recommend the Terms of Reference, scope and preferred methods for developing a Climate Change Adaptation Plan for the health sector.

#### **Submissions response field**

**Please type your response to the item(s) selected above into the field below. Alternatively you may provide your submission as a separate attachment (suggested maximum 5 pages).**

This is a joint submission of two researchers:

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Please see the attached document.

**Please complete this sheet and submit with any attachments to: Climate Health WA Inquiry**

**Title:** Investigating the impacts of climate change on Western Australia's farmers' mental health and its implications on food security using spatial information

**Background & problem statement:**

Farmers are a critical demographic in developed societies as they are our main producer of food. Very few members of society are entirely self-sufficient and so farmers, and the agri-food supply chain, are pivotal in ensuring food security. Farmers are key players in the provision of safe, sustainably produced, nutritious food to society.

It is common knowledge that global populations are growing at unprecedented rates and, while advances in agricultural technologies have facilitated the production of more food with fewer inputs, farmers remain an essential component of the food supply chain. This is unlikely to change in the short to medium term. As such, societies with advanced economies cannot access food without farmers. To exacerbate the problem of society's increasing demand for food, farms in Australia and other developed economies are larger and fewer in number than in the past so there is a marked problem in the supply of human capital that does not appear to be improving. For example, ABARES' (2018) most recent data shows that the number of agricultural establishments has decreased from 182,250 in 1974-75 to 88,073 in 2016-17. The same data set shows that owner/managers in rural employment have decreased from 248,900 in 1991-92 to 169,000 in 2017-18. As such, those with the skills to produce our food are in decline so threats to their wellbeing are important to manage.

Perhaps more importantly, not only are farmers our main producers of food, they also *decide* on *what* and *how* to grow their produce. As such, their abilities to make timely and rational decisions are vital to food security. This is exacerbated by the fact that such decisions are becoming more complex due to climate change which induces additional source of uncertainty in farm outputs. This increases stress and anxiety of farmers as decision makers and producers of food, and potentially reduce their abilities to make rational decisions.

The impact of climate change on the mental health of farmers and those in rural communities has received growing attention over the past 20 years. Much of the attention has focused on the Australian context (Brew et al., 2016; Berry et al., 2011; Dean & Stain, 2010; Alston & Kent, 2008; Morrissey & Reser, 2007), precisely because of our nation's extreme vulnerability to the effects of climate variability brought on by climate change (Berry et al., 2008). Bourque and Cunsolo Willox (2014) report that people in rural communities exposed to environmental degradation, persistent drought and weather disasters suffer disproportionately from psychological distress, anxiety, depression, feelings of hopelessness and an increased incidence of suicide. They also draw on the work of Berry et al. (2011), Brew et al. (2016) and Rayner et al. (2018), to argue that diminishing rural communities will worsen the situation by exacerbating loneliness and compounding the lack of immediate access to medical assistance. For farmers, Bourque and Cunsolo Willox (2014) suggest that climate change will further negatively impact their mental health by damaging production and therefore their livelihood, their ability to pay off debts and their ability to contribute to the community.

Farmers are a cohort particularly vulnerable to suicide in Australia (Page and Fragar, 2002) and in other parts of the developed world (McIntosh et al., 2012), the risk of

which is compounded by the effects of climate change. It is well known that farm businesses are particularly vulnerable to climate variability; and variability has dramatically increased as a result of climate change (Hughes, Lawson & Vale, 2017). This variability has resulted in a higher level of yield uncertainty, which research by Berry et al. (2008) has already identified as a major contributing factor in the decline of farmers' mental health. To make matters worse, rural areas are generally sparse and therefore the decline of farmers' mental health imposes additional stress to the health service to provide adequate care for those in need. This sparsity is also likely a factor in farmers' unwillingness to seek professional health. Given the stigma already associated with poor mental health, any threat that adds to the list of reasons for compromised mental health of anyone in remote locations needs to be taken seriously (Berry et al., 2011; Brew et al., 2016).

Recent research on Australia's cropping farm business performance has found that Western Australia's farming region has experienced the greatest decrease in total factor productivity across the nation. A study by Hughes, Lawson and Vale (2017) found that climate conditions from 2000–01 to 2014–15 lowered total factor productivity in Western Australia by an average of 7.7%. New South Wales was the next-worst affected area with an average of 6.5% loss of total factor productivity.

Against this background, climate change not only affects mental health and puts health services under pressure (Rural Doctors' Association, 2018), it also has a profound negative impact on farmers' ability to continue to produce food for an ever-increasing global population. If farmers are not sufficiently healthy to farm and make good business decisions, our food security is compromised. Western Australia is a particularly important case in point because, in addition to its main agricultural production area is experiencing the most severe outcomes of climate change (Hughes, Lawson and Vale, 2017), it is an export-orientated production environment that accounted for \$8.5 billion of agri-food, fibre and fisheries sales in 2016/17 to the major export destinations of China, Indonesia, Vietnam, Germany and Japan (DPIRD, 2018). As such, numerous communities outside Western Australia are reliant on its agricultural production. Table 1 demonstrates the alignment between the Climate Health WA Inquiries' Terms of Reference and the proposed research outcomes.

## **Research Design**

This project has two objectives. The first is to investigate possible links between climate change and mental health in rural areas. The second is to examine the additional stress, if any, that climate change imposes on mental health service delivery in rural areas.

The first objective will be achieved by examining the factors that affect overall mental health in rural areas. The extent to which climate change increases volatility in crop yield via its impact on rainfall and temperature, and the link between volatility and mental health, will form part of this analysis.

Secondary data for this study will be sourced from a range of publicly available databases including the Planfarm Bankwest Benchmarking series (for crop yield) and Bureau of Meteorology (for temperature and rainfall). The Mental Health Information System Ambulatory Data, SF36, NDSHS and HILDA will be consulted for data on mental health status across different regions in Western Australia.

The innovation of this project is that the impact of mental health on yield crop will be accommodated. Previous research has suggested that people who suffer from debilitating mental conditions often make poor decisions, which will affect crop yield and production. Failing to accommodate for this effect would induce endogeneity (or simultaneity bias) in typical least squares type estimators.

Table 1: Proposed research outcomes and their alignment with Climate Health WA Inquiries' Terms of Reference

<b>Research outcome</b>	<b>Climate Health WA Inquiries' Terms of Reference</b>
Produce evidence to support that climate change is having a negative impact on famers' mental health in the Western Australian agricultural region.	1. Establish current knowledge on the implications of climate change for health in Western Australia (WA) and recommend a framework for evaluating future implications.
Quantify the cost of mental health problems linked to climate change in Western Australia's food supply chain.	3. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will strengthen the preparedness and resilience of communities and health services against extreme weather events, with a focus on the most vulnerable in the community
Identify geographic areas where climate change and poor mental health are particularly correlated for effective allocation of health resources.	
Identify geographic areas where climate change and poor mental health are does not appear to be compromised to the same extent for further research to determine why these communities might be more resilient than others.	
	<p>4. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will reduce the contribution of WA health services to climate change and other detrimental impacts.</p> <p>5. Identify and recommend a program of work to manage the implications of climate change for health in WA, which will enable WA Health services to implement change, including energy efficiency, to a more sustainable model.</p> <p>7. Define the role of the Department of Health in leading public policy on climate change and health.</p> <p>8. Recommend the Terms of Reference, scope and preferred methods for undertaking a climate change vulnerability assessment for the health sector.</p>

The model to be considered in this project is:

$$y_{it} = \alpha_1 m_{it} + \alpha_2 d_{it} + \alpha_3 r_{it} + X_{it}\beta + u_i + \epsilon_{it}$$

$$m_{it} = \gamma_1 y_{it} + \gamma_2 \sigma_{it} + \gamma_3 w_{it} + Z_{it}\pi + v_i + \eta_{it}$$

Where:

$y_{it}$  denotes the yield in region  $i$  at time  $t$ .

$m_{it}$  denotes the mental health status in region  $i$  at time  $t$ .

$d_{it}$  denotes temperature in region  $i$  at time  $t$ .

$r_{it}$  denotes the amount of rainfall in region  $i$  at time  $t$ .

$\sigma_{it}$  denotes the volatility of yield in region  $i$  at time  $t$ .

$w_{it}$  denotes the wealth level in region  $i$  at time  $t$ .

$X_{it}$  and  $Z_{it}$  are two vectors of other covariates that may be relevant for yield and mental health status, respectively.

$u_i$  and  $v_i$  are two unobserved random variables aiming to capture the heterogeneity across regions.

$\epsilon_{it}$  and  $\eta_{it}$  are the two idiosyncratic errors for yield and mental health status, respectively.

The parameter vector can be consistently estimated by Hausman-Taylor type estimator. The link between climate change and farmers' mental health can be established by testing the statistical significance using the parameter estimates, specifically,  $\alpha_1$ ,  $\alpha_3$ , and  $\gamma_1$ .

The second objective will be examined by considering the relation between the numbers of mental health patients and yield using standard Poisson type model. Depending on the types of demographic data, the Poisson type model has the ability to capture the relation between factors such as yield, wealth, climate and other socio-economic factors with the probability of the number of mental health patients in a region. This provides further evidence on the possible linkage between climate change and mental health via the channel of food production.

## References

ABARES (2018). *Agricultural commodities and trade data*, Australian Bureau of Agricultural and Resource Economics and Sciences, Available from: <http://www.agriculture.gov.au/abares/research-topics/agricultural-commodities/agricultural-commodities-trade-data#2018> accessed 5 July, 2019.

Alston, M., & Kent, J. (2008). The Big Dry: The link between rural masculinities and poor health outcomes for farming men. *Journal of Sociology*, 44(2), 133-147.

Berry, H. L., Hogan, A., Owen, J., Rickwood, D., & Fragar, L. (2011). Climate change and farmers' mental health: risks and responses. *Asia Pacific Journal of Public Health*, 23(2\_suppl), 119S-132S.

Berry, H. L., Kelly, B. J., Hanigan, I. C., Coates, J. H., McMichael, A. J., Welsh, J. A., & Kjellstrom, T. (2008). *Rural mental health impacts of climate change*.

Commissioned report for the Garnaut Climate Change Review. Canberra: The Australian National University.

Brew, B., Inder, K., Allen, J., Thomas, M., & Kelly, B. (2016). The health and wellbeing of Australian farmers: a longitudinal cohort study. *BMC Public Health*, 16(1), 988.

Dean, J. G., & Stain, H. J. (2010). Mental health impact for adolescents living with prolonged drought. *Australian Journal of Rural Health*, 18(1), 32-37.

DPIRD (2018). *Western Australia's Agrifood | Fibre | Fisheries | Forestry Industries 2018*, Department of Primary Industries and Rural Development, Available from: <https://www.agric.wa.gov.au/sites/gateway/files/Western%20Australia%27s%20Agrifood%2C%20Fibre%2C%20Fisheries%20and%20Forestry%20Industries%202018%20-%20PDF.pdf>, accessed 5 July, 2019.

Hughes, N., Lawson, K. & Vale H. (2017). *Farm performance and climate: Climate-adjusted productivity for broadacre cropping farms*, Australian Bureau of Agricultural and Resource Economics and Sciences, Report 17.4, Available from: [http://data.daff.gov.au/data/warehouse/9aas/2017/FarmPerformanceClimate/FarmPerformanceClimate\\_v1.0.0.pdf](http://data.daff.gov.au/data/warehouse/9aas/2017/FarmPerformanceClimate/FarmPerformanceClimate_v1.0.0.pdf) accessed on 5 July, 2019.

McIntosh, W.L, Spies, E., Stone, D.M., Lokey, C.N., Trudeau, A.T. & Bartholow B. (2012) *Suicide Rates by Occupational Group — 17 States*, MMWR Morbidity and Mortality Weekly Report, 65:641–645. DOI: <http://dx.doi.org/10.15585/mmwr.mm6525a1>external icon.

Page, A. N., & Fragar, L. J. (2002). *Suicide in Australian farming, 1988–1997*. Australian & New Zealand Journal of Psychiatry, 36(1), 81-85.

Rayner, V., Snodgrass, W., Rice, S. & Purcell, R. (2018). *Evaluation of 'Rural Minds': A mental health promotion program for rural and remote agricultural communities (2018 Report)*, Rural and Remote Mental Health, Available from: <https://www.rrmh.com.au/wp-content/uploads/2019/02/Rural-Minds-Report.pdf>, accessed 8 July, 2019.

Rural Doctors' Association (2018). *Accessibility and quality of mental health services in rural and remote Australia: Submission 79*, Rural Doctors Association, Available from: <https://www.rdaa.com.au/documents/item/471>, accessed 15 July, 2019.

Morrissey, S. A., & Reser, J. P. (2007). Natural disasters, climate change and mental health considerations for rural Australia. *Australian Journal of Rural Health*, 15(2), 120-125.