

Climate Health WA Inquiry

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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.

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Funding, light efficiency and desflurane: three measures to green our hospitals
Executive Summary

Climate change is expected to cause an additional 250,000 deaths per year between 2030 and 2050, with direct costs to health in excess of \$4 billion USD per year (WHO 2018). The breadth of climate change's impacts is significant and indicates the importance of mitigation strategies from all stakeholders. Recognising the need for collective action to prevent this fate, the United Nations (UN) established the Paris Agreement which aims to strengthen the global response to climate change (United Nations Climate Change 2018). Australia has signed the agreement and announced its nationally determined contributions yet is not on track to achieving its 2030 target of 26-28% fewer emissions than the 2005 baseline (Australian Government Department of the Environment and Energy 2015). Australia's commitment extends to the healthcare sector which contributes approximately 7% of the nation's net emissions. As an immediate responder to the effects of climate change, it is critical that the health industry establishes strategies to mitigate their contributions to climate change. Many evidence-based strategies have been implemented globally which provide a sturdy platform for domestic interventions, including a funding scheme to enable new investment. Two simple, yet effective strategies include investment in energy-efficient LED lighting systems (National Health Service Sustainable Development Unit 2019) and environmentally responsive anaesthetic gas selection (The Lancet 2017) in hospitals. Both measures show evidence for the reduction in energy consumption and carbon dioxide emissions, respectively, which will reduce financial and environmental burdens associated with hospital lighting and surgical procedures. Meanwhile, the United Kingdom have established an interest-free Government loan scheme to facilitate investment in ecofriendly infrastructure. These interventions will individually and collectively help to

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decrease energy expenditure, hospital contributions to climate change, and people's future health statuses.

Background

Climate change is everyone's business; both the causal responsibility and adaptation befalls all people, industries and countries. The United Nations (UN), through its recently devised Paris Agreement, has outlined a quantitative ambition to limit the global temperature rise to within two degree Celsius above pre-industrial levels (UN Climate Change 2018). Australia has signed this agreement and established its nationally determined contributions (NDCs), outlining a target of 26-28% less greenhouse gas emissions than the 2005 benchmark emissions by 2030 (United Nations Framework Convention on Climate Change [UNFCCC] 2015). Currently, Australia is not on track to achieve its 2030 targets which implies the need for additional interventions and/or additional sectoral accountability (Climate Works Australia 2018).

As the global temperature increases, so too do the rates of extreme weather events and sea level elevation, whilst water scarcity grows in significance (United Nations Water 2019). Many direct effects on health are evident and include the rising incidence of water-borne diseases, trauma and disease from extreme weather events or natural disasters and heat-related illness (World Health Organisation [WHO] 2018). More insidious, indirect health effects of climate change include food insecurity leading to malnutrition (National Institute of Environmental Health Sciences [NIEHS] 2019), compromised healthcare due to power outages (Union of Concerned Scientists 2014) and a climate refugee crisis placing strain on health care systems worldwide (United Nations High Commissioner for Refugees [UNHCR] 2019).

Some of the most significant health effects of climate change are those concerned with air pollution, food insecurity, shelter resilience and safe drinking water (WHO 2018). An extra 95,000 deaths due to child undernutrition, 60,000 from malaria, 48,000 as a result of diarrhoea and 38,000 through heat exposure in the elderly will occur each year between 2030 and 2050 (WHO 2018). The health sector is a primary responder to the impacts of climate change, and this necessitates action and leadership on their part to address climate change.

In the United Kingdom (UK), the National Health Service (NHS) has established a Sustainable Development Unit (SDU) which aims to strengthen the sustainability of their country's health system and mitigate their greenhouse gas emissions, including carbon dioxide emissions (CO₂e). The SDU, through the British Government's Salix Finance, has utilised their country's interest-free funding scheme to provide the necessary capital for hospitals to invest in sustainable infrastructure. The loans are paid off through the financial savings incurred by switching to more efficient technology; one example of which is the transition to LED lighting.

The hospital operating room (OR) is a resource intensive subsector of the healthcare

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system requiring high amounts of energy and waste volumes. As a significant contributor to greenhouse gas emissions, ORs are in a unique position to exemplify carbon footprint minimisation strategies. MacNeill, Lillywhite and Brown (2017) describe the extent of emissions by certain anaesthetic gases used in the OR and the potential reduction in greenhouse gas emissions if hospitals were to substitute such substances. Desflurane, a volatile anaesthetic gas, was preferentially used by two hospitals (Vancouver General Hospital [VGH] and University of Minnesota Medical Centre [UMMC]) within the study, with the third hospital (John Radcliffe Hospital [JRH]) using a substitute gas with similar function. The results were significant, demonstrating a 10-fold greater CO₂e profile due to anaesthetic gases at VGH and UMMC compared to JRH with its substitute, despite JRH's larger case volume.

Table 1 Annual greenhouse gas emissions from volatile anaesthetics

	Volume purchased (L/year)			CO ₂ e (kg/year)		
	VGH	UMMC	JRH	VGH	UMMC	JRH
Desflurane	535.7	532.8	0	1 983 073	1 972 412	0
Isoflurane	34.2	176.4	222	26 297	135 636	170 314
Sevoflurane	132	115.5	217	24 907	21 793	40 898
Total	2 034 277	2 129 841	211 212

CO₂e calculated using 100-year Global Warming Potential (GWP₁₀₀) values of 2540 for desflurane, 510 for isoflurane, and 130 for sevoflurane. ⁸ VGH=Vancouver General Hospital. CO₂e=CO₂e equivalents. UMMC=University of Minnesota Medical Center. JRH=John Radcliffe Hospital.

(MacNeill, Lillywhite and Brown 2017)

Australia's healthcare system contributes 7% of all greenhouse gas emissions, whilst the United Kingdom's healthcare system contributes just 4% (Malik, Lenzen, McAlister & Mcgain 2018). Evidence-based interventions seen in the UK, such as LED light transition and desflurane substitution, can be adopted by Australia to mitigate healthcare's contributions to climate change. With a proven funding mechanism for such measures there is little reason to avoid their implementation.

Recommendations

It is proposed that the Western Australian (WA) Government establish an interest free loan system, like that seen in the UK, to fund carbon reduction projects. A pilot program to assess the feasibility of such a loan system in funding interventions will be implemented at an elected WA public hospital in conjunction with the WA Department of Health, Department of Water and Energy Regulation and Department of Treasury and Finance.

1. WA Government establish an interest free loan system to fund investment in ecofriendly infrastructure hospitals, like the UK's Salix Finance.
2. Retrofit public hospitals with LED light systems.

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3. Mandate the substitution of desflurane to isoflurane or sevoflurane in public and private hospital operating rooms.

Recommendation 1: Establish an interest-free loan program for hospital investment in sustainable infrastructure

Sourcing the initial capital required to fund ecofriendly infrastructure can be challenging and impede efforts to reduce emissions. The UK has overcome this barrier since 2004 by providing a Government-funded, interest free loan system to the public sector to improve their energy efficiency, reduce CO₂e and minimise costs (NHS Estate Conference 2019). Since its inception, the UK Government's Salix Finance has invested £470 million and produced annual savings of £116 million (Efficient Power Solutions 2017). Their loans require no upfront cash repayment, instead collecting the loan's value through cost savings of those receiving the loan.

Salix funding is available to all public sectors, including health. Their NHS programme has an adherence criteria of 5 years payback, with a maximum of £120 cost per tonne of CO₂ over the lifetime of the project. The funding covers over 120 energy efficiency technologies including boilers, combined heat and power, LED and lighting upgrades, as well as heat recovery.

It is proposed that the Western Australian Treasury, in conjunction with the Department of Health, pool funding to pilot a similar funding scheme for hospital retrofitting. As described, the cost will be accounted for through energy expenditure savings, whilst producing long term co-benefits such as environmental sustainability. The timeline for payback is to be determined by the stakeholders including the Treasury, Department of Health and the hospital acquiring the retrofitting.

The success of this recommendation will be determined by two factors; firstly, whether the loan was paid off entirely through energy savings and secondly, whether there were associated reductions in CO₂e (both direct and indirect).

Recommendation 2: Retrofit public hospitals with LED light systems

In the UK, the Maidstone and Tunbridge Wells NHS Trust invested £740,000 of interest-free Salix funding to implement a site-wide LED lighting upgrade. This high-efficiency upgrade is expected to save £160,000 annually and reduce annual energy consumption by 1.27 million kWh (Sustainable Development Unit 2019).

It is proposed that Western Australian public hospitals undergo lighting surveys at each site to assess their capacity for LED lighting upgrades. With a projected 21.6% return on investment annually (Sustainable Development Unit 2019), these investments carry a significant financial incentive alongside their reduced carbon footprint.

The Department of Health, alongside the Department of Water and Energy Regulation should liaise with hospital executives to oversee the establishment of LED light transition. Additional consultation may be necessary between hospital

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Executives and the Department of Treasury and Finance, as they are the government department responsible for the interest-free capital distribution.

Funding for the LED lighting will be sourced solely from the interest-free capital fund controlled by the Department of Treasury and Finance and Department of Health.

Assessing the impacts of the LED lighting upgrade will occur via two streams of measurement. Firstly, a quantitative analysis of the reduction in energy expenditure by the hospital. Secondly, a quantitative analysis of CO₂e spared through the reduction in energy consumption. Both statistics should be available from the energy provider for each hospital and/or region.

The success of this intervention will be evaluated by the required time for loan repayment through energy savings. An evidence-based goal should be determined prior to establishment of the LED lighting which specifies the magnitude of the loan, the projected savings in energy expenditure per annum, and therefore the expected timeline by which the loan will be repaid. If successful, this pilot intervention will provide the basis for other hospitals to adopt a similar policy to save costs and shelter the environment from harmful gas emissions.

Recommendation 3: Mandate anaesthetic drug transition from desflurane to isoflurane or sevoflurane

Preferential use of alternative volatile anaesthetic agents has the potential to drastically reduce theatre greenhouse gas emissions (MacNeill A, Lillywhite R & Brown C 2017). A recent study from the MacNeill A, Lillywhite R & Brown C (2017) identifies the impact of surgery on the global climate through its carbon emissions and includes two hospitals from North America and one from the United Kingdom (UK). Published in the Lancet, the study outlines the significant contribution of a volatile anaesthetic gas called desflurane to theatre emissions. Of the three hospitals included in the study, the two North American hospitals utilise desflurane whilst the UK hospital does not. Consequently, the overall carbon footprint at the two North American hospitals amounts to 2000 tonnes of CO₂e – ten times the emissions from the UK site.

Theatre is one of the most resource-intensive areas of the hospital and it is anticipated that emissions reduction strategies in these areas will have the greatest effect on CO₂e.

To achieve a seamless transition from current anaesthetic gases to more ecofriendly gases will require consultation with hospital Executives and heads of relevant departments. Beyond the consultation, this intervention presents an opportunity to educate staff on the impacts of their decisions regarding treatment protocol, and the opportunity costs to the environment incurred through their choices.

Transitioning from the use of desflurane to isoflurane or sevoflurane requires no exceptional funding beyond that which is already used to supply the volatile anaesthetic gases. However, desflurane is found to have superior clinical properties

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to both sevoflurane and isoflurane through reduced extubation time and shorter emergence times, respectively (Jimral, Kumra, Narani, Sood 2011). As such, there is a clinical impact which must be considered with desflurane substitution.

It is paramount that adequate measurement of greenhouse gas emissions ensues for this intervention. It is proposed that the pilot hospital consult with Greenhouse Gas (GHG) Protocol's Corporate Accounting and Reporting Standard to guide their inventory development process (Greenhouse Gas Protocol, 2019) prior to initiating the intervention. From there, Global Warming Potential (GWP100) values can be assigned to the emissions of ORs at the pilot site (Greenhouse Gas Protocol, 2019)

To evaluate the adherence of operating rooms to the outlined anaesthetic gases, it is necessary for documentation in all procedures to outline the type of volatile anaesthetic gas used and in what amount. Quarterly assessment of documentation is proposed to ensure continued adherence and quality of data. It may be required by the hospital to nominate an individual with this task, or it may be an independent employee of the WA Government who is responsible.

Limitations

This proposal recognises the need for a baseline comparison figure regarding energy consumption and CO₂e. Therefore, it is recommended that the elected piloting hospital has the infrastructure required to measure and quantify energy consumption and CO₂e to allow for comparison and evaluation of the interventions.

Conclusion

Climate change is predicted to end the lives of an additional 250,000 people per year between 2030 and 2050 and produce over \$4 billion USD per year in preventable costs (WHO 2018). Australia has signed the Paris agreement but is not on track to achieving its 2030 targeted emissions (Australian Government Department of the Environment and Energy 2015). Australia's healthcare sector contributes 7% of the nation's net emissions and is an immediate responder to the effects of climate change. This strong link demonstrates the important role the health industry has in mitigating their contributions to climate change. Two evidence-based strategies used in the UK to reduce greenhouse gas emissions include investment in energy-efficient LED lighting systems (National Health Service Sustainable Development Unit 2019) and environmentally responsive anaesthetic gas selection (The Lancet 2017). Both measures show evidence for the reduction in energy consumption and CO₂e, which will reduce financial and environmental burdens associated with hospital lighting and surgical procedures. Coupled with a proven financing mechanism, these interventions have the potential to initiate healthcare change for the environment which will ultimately save money, lives and our planet.

References

Climate Works Australia 2018, 'Australia not on track to reach 2030 emissions

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reduction target but potential is there: report', viewed 22 August 2019, <<https://www.climateworksaustralia.org/story/media-release/australia-not-track-reach-2030-emissions-reduction-target-potential-there-report>>.

Efficient Power Solutions 2017, 'The EPS guide to Salix funding; everything you need to know', viewed 22 August 2019, <efficientpowersolutions.uk/news/eps-guide-salix-funding-everything-need-know/>.

Greenhouse Gas Protocol 2019, 'Calculation tools', viewed 29 August 2019, <<https://ghgprotocol.org/calculation-tools>>.

Greenhouse Gas Protocol 2019, 'Global warming potential values', viewed 29 August 2019, <http://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf>.

Intergovernmental Panel on Climate Change 2014, 'Summary for policymakers of IPCC special report on global warming of 1.5° approved by governments', viewed 1 August 2019, <https://www.ipcc.ch/site/assets/uploads/2018/11/pr_181008_P48_spm_en.pdf>.

Jindal R, Kumra V, Narani K, Sood J 2011, 'Comparison of maintenance and emergence characteristics after desflurane or sevoflurane in outpatient anaesthesia'. *Indian Journal of Anaesthesia* 55(1): 36-42. Viewed 23 August 2019. Doi: 10.4103/0019-5049.76604

MacNeill A, Lillywhite R and Brown C 2017, 'The impact of surgery on global climate: a carbon footprinting study of operating theatres in three health systems', *The Lancet*, viewed 1 August 2019, <[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30162-6/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30162-6/fulltext)>.

Malik A, Lenzen M, McAlister S and MCGain F 2018, 'The carbon footprint of Australian healthcare', *The Lancet: Planetary Health* 2(1): 27-35, viewed 29 August 2019, available from: <[https://doi.org/10.1016/S2542-5196\(17\)30180-8](https://doi.org/10.1016/S2542-5196(17)30180-8)>.

National Health Service Estate Conference 2019, 'Salix Finance', viewed 22 August 2019, <<https://nhsestatesconference.co.uk/sponsor/salix-finance/>>.

National Institute of Environmental Health Services 2010, 'A human health perspective on climate change', viewed 27 August 2019, <https://www.niehs.nih.gov/health/materials/a_human_health_perspective_on_climate_change_full_report_508.pdf>.

Sustainable Development Unit 2019, 'LED lighting upgrade offers Trust big savings and carbon reduction', viewed 1 August 2019, <<https://www.sduhealth.org.uk/resources/case-studies.aspx>>.

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Sustainable Development Unit 2019, 'How interest free funding will help Trust save over £9m', viewed 1 August 2019, <<https://www.sduhealth.org.uk/resources/case-studies.aspx>>.

Union of Concerned Scientists 2014, 'Power failure: how climate change puts our energy at risk – and what we can do', viewed 27 August 2019, <<https://www.ucsusa.org/sites/default/files/legacy/assets/documents/Power-Failure-How-Climate-Change-Puts-Our-Electricity-at-Risk-and-What-We-Can-Do.pdf>>.

United Nations Climate Change 2018, 'The Paris Agreement', viewed 1 August 2019, <<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>>.

United Nations High Commission for Refugees 2019, 'Climate change and disaster displacement', viewed 27 August 2019, <<https://www.unhcr.org/climate-change-and-disasters.html>>.

United Nations Framework Convention on Climate Change 2015, 'Australia's Intended Nationally Determined Contribution to a new climate change agreement', viewed 1 August 2019, <<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Australia%20First/Australias%20Intended%20Nationally%20Determined%20Contribution%20to%20a%20new%20Climate%20Change%20Agreement%20-%20August%202015.pdf>>.

United Nations Water, 'Water and climate change', viewed 29 August 2019, <<https://www.unwater.org/water-facts/climate-change/>>.

World Health Organisation 2018, Climate change and health, viewed 1 August 2019, <<https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>>.

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