

MONASH NET ZERO BEHAVIOUR PRIORITISATION

FULL LIST OF NET ZERO BEHAVIOURS IDENTIFIED IN EVIDENCE REVIEW

This document contains a full list of all ~239 behaviours identified through a systematic search and review. The behaviours are relevant to accelerating the transition to net zero at university campus precincts. The behaviours were clustered into a single description so that they could be effectively prioritised in the project.

For more information, read the project report, [Behaviour change to accelerate Net Zero transitions at Monash University](#), or contact project lead Dr Alexander Saeri (alexander.saeri@monash.edu).

This document may be useful for:

- Conducting a 'deep dive' into one or a few behaviours, by reading the reports and articles that mention it
- Mapping the evidence and gaps in evidence for different types of behaviours relevant to accelerating net zero transitions on campus

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STUDENT AND STAFF NET ZERO BEHAVIOURS

By Staff, we mean people employed by universities who do not hold a facilities, operations, or administration role. By Students, we mean people enrolled at universities, including undergraduate and postgraduate students.

Mobility

Behaviour cluster	Original behaviour in source	Source
Compress work or study into fewer days to reduce travel to / from campus	Compressed work week (e.g., 4 day weeks or 9 day fortnights)	Hosking et al (2010), p. 6. <i>Journal article</i>
Purchase carbon emissions offsets when booking air travel	Offset carbon emissions for flights	Monash University (2021), p. 14. <i>Monash report</i>
Remotely attend interstate or international events instead of air travel	Use telepresence / video-conferencing to replace business travel	ClimateWorks Australia (2020), p. 37. <i>Monash report</i>
	Attend conferences virtually	UNEP (2014), p. 60. <i>Public report</i>
	Reduce business air travel	Monash University (2021), p. 14. <i>Monash report</i>
Remotely attend university activities instead of travelling to / from campus	Use telepresence / video-conferencing to replace in-person work	ClimateWorks Australia (2020), p. 37. <i>Monash report</i>
	Study online	UNEP (2014), p. 52. <i>Public report</i>
	Reduce frequency of commute to campus	UNEP (2014), p. 60. <i>Public report</i>
	Use technology to attend work or class remotely	Monash University (2021), p. 14. <i>Monash report</i>
	Use video-conferencing instead of in-person attendance	UNEP (2013), p. 37. <i>Public report</i>
	Video-conference	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Working from home	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Behaviour cluster	Original behaviour in source	Source
Travel around campus using active transport (e.g., walking, cycling) instead of private vehicle	Cycle or walk when on campus	Monash University (2021), p. 22. <i>Monash report</i>
Travel around campus using an e-bike instead of private vehicle	Use e-bikes	C40 Cities (2021), p. 11; 20. <i>Public report</i>
	Use electric bikes on campus	ISCN (2018), p. 52-53. <i>Public report</i>
Travel between building floors using stairs instead of elevators	Use fewer elevators	ISCN (2013), p. 13. <i>Public report</i>
Travel to / from campus using active transport (e.g., walking, cycling) instead of private vehicle	Use active transport	C40 Cities (2021), p. 11. <i>Public report</i>
	Shift to walking	C40 Cities (2021). <i>Public report</i>
	Shift to cycling	C40 Cities (2021). <i>Public report</i>
	Shift to walking and cycle	C40 Cities (2021). <i>Public report</i>
	Travel using active transport	ClimateWorks Australia (2020), p. 37. <i>Monash report</i>
	Use alternative active transport (e.g., riding, walking)	Hosking et al (2010), p. 2. <i>Journal article</i>
	Use alternative active transport (e.g., riding, walking)	Hosking et al (2010), p. 3. <i>Journal article</i>
	Use alternative active transport (e.g., riding, walking)	Hosking et al (2010), p. 13. <i>Journal article</i>
	Use alternative active transport (e.g., riding, walking)	ISCN (2017), p. 12. <i>Public report</i>
	Increase bike usage	ISCN (2017), p. 23. <i>Public report</i>
	Bike ride to and on campus	ISCN (2015), p. 35. <i>Public report</i>
	Cycle or walk for commuting to campus	Monash University (2021), p. 30. <i>Monash report</i>
	Purchase a bicycle to commute to campus	Monash University (2021), p. 30. <i>Monash report</i>
	Cycle to and around campus	UNEP & GRIDArendal (2020), p. 30. <i>Public report</i>

Behaviour cluster	Original behaviour in source	Source
Travel to / from campus using carpooling instead of private vehicle	Carpool to campus	UNEP (2014), p. 37. <i>Public report</i>
	Carpool	Hosking et al (2010), p. 7. <i>Journal article</i>
	Carpool to campus	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Travel to / from campus using public transport instead of private vehicle	Use public transport	C40 Cities (2021), p. 11. <i>Public report</i>
	Shift to public transport	C40 Cities (2021). <i>Public report</i>
	Travel using public transport	ClimateWorks Australia (2020), p. 37. <i>Monash report</i>
	Use public transport for commuting to campus	Monash University (2021), p. 14. <i>Monash report</i>
	Increase public transport usage	UNEP & GRIDArendal (2020), p. 29. <i>Public report</i>
Travel to / from regional events using bus or rail instead of air travel	Reduce 'non-essential' flights	Monash University (2021), p. 14. <i>Monash report</i>
	Avoiding the use of air travel for short trips	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Purchase energy-efficient appliances and equipment when replacing old ones	Purchase energy efficient appliances when replacing old appliances	Klemm et al (2020), p. 14. <i>Monash report</i>
	Purchase electric vehicle when replacing car	Monash University (2021), p. 33. <i>Monash report</i>
Monitor electricity use with a smart meter	Monitor electricity use with a smart meter	Klemm et al (2020), p. 14. <i>Monash report</i>

Energy

Behaviour cluster	Original behaviour in source	Source
Enable energy-saving features on computers and other equipment instead of the default settings	Utilise computer energy-saving mode	ISCN (2013), p. 13. <i>Public report</i>
	Default to eco settings on appliances and electronics	UNEP & GRIDArendal (2020), p. 11. <i>Public report</i>
Keep building windows closed while air conditioning / heating is on	Exhibit energy-efficient ventilation behaviour	Akhatova et al (2022), p. 22-23. <i>Journal article</i>
	Keep windows closed when heating is on	ISCN (2013), p. 4. <i>Public report</i>
Rearrange work areas to maximise thermal comfort (e.g., avoid direct sunlight in summer)	Use natural light instead of artificial light	UNEP (2014), p. 101. <i>Public report</i>
	Use individual heat controls	ISCN (2013), p. 4. <i>Public report</i>
	Assess use of space to optimise work locations for comfort (e.g., avoid working in direct sunlight during summer)	Klemm et al (2020), p. 27. <i>Monash report</i>
Set the temperature of air-conditioning in buildings and rooms to be energy-efficient (e.g., 18C in winter, 25C in summer) instead of the default settings	Change temperature of air-conditioning on campus to be more energy efficient	ISCN (2016), p. 33. <i>Public report</i>
Share energy-intensive equipment instead of purchasing your own	Sharing expensive and embodied energy intensive equipment	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Shift the time of day that energy intensive equipment and services are used (e.g., lab equipment, refrigeration, HVAC), to match renewable generation periods or off-peak periods	Shift the use of HVAC from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Monitor energy supply and personal consumption to respond to constraints in the system, e.g. by changing appliance or battery use	Klemm et al (2021), p. 5. <i>Monash report</i>
	Shift the use of household appliances (e.g. dishwasher, washing machine, cooking) from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>

Behaviour cluster	Original behaviour in source	Source
	Shift the use of IT/Internet/technology (e.g. laptops, computers, printers, phones, modem, TV screens) from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Shift the use of refrigeration from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Change when charging EVs from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Shift energy consumption patterns to use renewable energy	Klemm et al (2020), p. 14. <i>Monash report</i>
	Shift energy consumption patterns to reduce demand on grid	Klemm et al (2020), p. 14. <i>Monash report</i>
Switch off computers and other equipment after use instead of leaving them switched on	Avoiding standby modes of office computers and machinery	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Switch off lights in empty rooms instead of leaving them on	Turning off lights in unoccupied offices	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Turn off electrical appliances when not in use	Turn off electrical appliances when not in use	Klemm et al (2020), p. 14. <i>Monash report</i>
	Switch off technology when not in use	UNEP (2013), p. 45. <i>Public report</i>
Use digital documents instead of printed documents	Using digital resources such as online and paperless communication	ISCN (2016), p. 43. <i>Public report</i>
Use laptop computer instead of desktop computer	Use laptops instead of desktop computers and servers	ISCN (2013), p. 13. <i>Public report</i>
Use weather forecast to plan an energy-efficient day (e.g., clothes, travel mode)	Occupants engage with weather forecast (or observe conditions) to plan energy consumption patterns	Klemm et al (2021), p. 5. <i>Monash report</i>
	Engage in self-regulation activities to maintain comfort	Klemm et al (2020), p. 14. <i>Monash report</i>
When on campus, work or study in large shared spaces (e.g., library) instead of small private spaces (e.g., office)	Studying in shared spaces (eg library)	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Food and waste

Behaviour cluster	Original behaviour in source	Source
Purchase plant-based food on campus instead of animal-based food	Consume plant-based products	ClimateWorks Australia (2020), p. 58. <i>Monash report</i>
Sort recyclables and food waste on campus instead of putting it in general rubbish	Recycle materials (metal, plastics)	ClimateWorks Australia (2020), p. 46. <i>Monash report</i>

FACILITIES, ADMINISTRATION, AND OPERATIONS STAFF NET ZERO BEHAVIOURS

By Facilities, Operations, and Administration Staff, we mean people employed by universities who hold a facilities, operations, or administration role and make decisions on behalf of / that affect other people at universities.

Mobility

Behaviour cluster	Original behaviour in source	Source
Compress work or study into fewer days to reduce travel to / from campus	Compressed work week (e.g., 4 day weeks or 9 day fortnights)	Hosking et al (2010), p. 6. <i>Journal article</i>
	Transition to a four-day workweek	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Conduct regular maintenance to optimise fleet motor vehicle fuel efficiency	Regular maintenance to optimise motor vehicle fleet fuel efficiency.	UNEP (2014), p. 61. <i>Public report</i>
	Regular maintenance to optimise motor vehicle fleet fuel efficiency.	UNEP (2013), p. 46. <i>Public report</i>
Create or manage a program to INCREASE active transport (e.g., walking, cycling) use when staff / students travel to / from campus	Introduce bike sharing stations across campus	ISCN (2014), p. 5. <i>Public report</i>
	Provide students with a free bike sharing service	ISCN (2017), p. 23. <i>Public report</i>
	Introduce bicycle sharing program	ISCN (2015), p. 35. <i>Public report</i>
	Provide partial reimbursements or discounts to staff and students on new bike purchases	Monash University (2021), p. 30. <i>Monash report</i>
	Secure, undercover bike racks, and shower facilities, lockers and bike repair workshop for cyclists.	UNEP (2013), p. 46. <i>Public report</i>
	Make it easier to cycle around campus	UNEP & GRIDArendal (2020), p. 12. <i>Public report</i>
	Provide maps of good bicycle routes to and around campus	UNEP & GRIDArendal (2020), p. 30. <i>Public report</i>
	Hold events at which people can get their bikes fixed for use the following term	UNEP & GRIDArendal (2020), p. 33. <i>Public report</i>
	Building cycle lanes	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Behaviour cluster	Original behaviour in source	Source
	Creating a programme for lending bikes	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Increasing the number of parking spaces for bicycles	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Create or manage a program to INCREASE electric vehicle use when staff / students travel to / from campus	Provide EV charging infrastructure	C40 Cities (2021). <i>Public report</i>
	Offer free or priority parking for EVs	C40 Cities (2021). <i>Public report</i>
	Installing charging facilities for electric vehicles	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Use electric scooters within the university	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Create or manage a program to INCREASE public transport (e.g., bus, train) use when staff / students travel to / from campus	Provide shuttle busses	ISCN (2017), p. 23. <i>Public report</i>
	Provide easily understandable navigation signs to public transport such as coloured lines along walking paths	Ly et al (2017), p. 36. <i>Public report</i>
	Provide information (in form of maps, directions) on immediate surroundings and nearby stops	Ly et al (2017), p. 36. <i>Public report</i>
	Offer interest-free loans for public transport passes	UNEP & GRIDArendal (2020), p. 29. <i>Public report</i>
	Transportation subsidy programme	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Providing university buses or sign an agreement with the service providers	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Encourage students and staff to replace their own vehicles (automobile and motorcycle) by bicycles or public transport (bus, metro or train)	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Create or manage a program to INCREASE staff / students remotely attending interstate or international events instead of air travel	For events not held on campus, require attendees to make the case to go in person.	UNEP & GRIDArendal (2020), p. 11. <i>Public report</i>
	Acquisition and promotion of video conferencing technology to staff and students	UNEP (2014), p. 60. <i>Public report</i>
	Acquisition and promotion of video conferencing technology to staff and students.	UNEP (2013), p. 46. <i>Public report</i>

Behaviour cluster	Original behaviour in source	Source
	For meetings, conferences and events on your campus, make remote dial-in the default option for attendees who do not live nearby	UNEP & GRIDArendal (2020), p. 11. <i>Public report</i>
Create or manage a program to REDUCE private vehicle use when staff / students travel to / from campus	Provide an online database that matches students up with others who live in their area to carpool	UNEP (2014), p. 37. <i>Public report</i>
	Provide incentives for staff committing to forego use of private commuter transport.	UNEP (2014), p. 61. <i>Public report</i>
	Create carpooling programs	UNEP (2014), p. 61. <i>Public report</i>
	Organise a car-free day	UNEP (2014), p. 147. <i>Public report</i>
	Restricting parking	Hosking et al (2010), p. 3. <i>Journal article</i>
	Introduce car sharing network	ISCN (2014), p. 5. <i>Public report</i>
	Regulate price and amount of parking	Ly et al (2017), p. 6. <i>Public report</i>
	Regulate and restrict parking	Ly et al (2017), p. 6. <i>Public report</i>
	Reduction of car parking spaces and provision of dedicated spaces for car pool vehicles and electric vehicles (and also charging points).	UNEP (2013), p. 46. <i>Public report</i>
	Provide incentives to faculty and students to reduce car use	UNEP (2013), p. 78. <i>Public report</i>
	Introduce applications for parking cars on campus	UNEP & GRIDArendal (2020), p. 12. <i>Public report</i>
	Implementing the policy of charging for parking	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Regulating the entry to campus parking	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Users need to take a survey in order to receive a parking permit	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Provide student housing on campus to reduce commuting	Increase the proportion of student housing and related services provided on campus	UNEP (2014), p. 60. <i>Public report</i>

Behaviour cluster	Original behaviour in source	Source
	Providing dormitories to reduce transportation needs	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Purchase carbon emissions offsets when booking air travel on behalf of other people	University managed revegetation program to offset emissions for air travel, and/or commitment to “third party” carbon credit / carbon offset program.	UNEP (2013), p. 46. <i>Public report</i>
	When booking flights, default carbon offsetting into the process	UNEP & GRIDArendal (2020), p. 11. <i>Public report</i>
Purchase electric vehicles for university fleet when replacing old ones	Use electric buses	C40 Cities (2021), p. 10. <i>Public report</i>
	Shift fleet vehicles to electric	C40 Cities (2021). <i>Public report</i>
	Purchase of fuel efficient vehicles for university fleet.	UNEP (2014), p. 61. <i>Public report</i>
	Purchase electric vehicles for university fleet when replacing vehicles	Monash University (2021), p. 33. <i>Monash report</i>
	Purchase of fuel efficient vehicles for university fleet.	UNEP (2013), p. 46. <i>Public report</i>
	Replacing petrol-driven vehicles with electric or natural gas vehicles	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Replacing petrol-driven vehicles with electric or natural gas vehicles	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Energy

Behaviour cluster	Original behaviour in source	Source
Appoint a person to be responsible for getting to net zero within the work team / business unit	Appoint persons responsible for sustainability	Hueske & Guenther (2020), p. 12. <i>Journal article</i>
Conduct environmental audits (e.g., assess building / equipment energy usage)	Require energy audits of buildings	C40 Cities (2019). <i>Public report</i>
	Conduct regular environmental audits	UNEP (2014), p. 36. <i>Public report</i>
	Conduct an energy assessment of the building/equipment/use of equipment and provide advice on how to optimise energy use.	Klemm et al (2020), p. 27. <i>Monash report</i>
	Conduct regular environmental audits	UNEP (2013), p. 21. <i>Public report</i>
Create guidelines for building occupants about what devices can be used and when	Set out guidelines for building occupants around what and when devices can be used	Klemm et al (2021), p. 5. <i>Monash report</i>
Create or manage a program to REDUCE energy use by providing feedback to staff / students	Provide staff energy conservation training	UNEP (2014), p. 51. <i>Public report</i>
	Pay-as-you-use schemes for electricity use in student residences	ISCN (2014), p. 13. <i>Public report</i>
	Provide feedback to the occupant group about their energy use to encourage energy shifting from peak to off-peak times	Klemm et al (2021), p. 5. <i>Monash report</i>
	Monitor staff / student electricity use and provide real-time information	Klemm et al (2020), p. 14. <i>Monash report</i>
	Provide information on peer transport choices	Ly et al (2017), p. 34. <i>Public report</i>
	Conduct energy awareness conservation training	UNEP (2013), p. 36. <i>Public report</i>
	Provide checklists of how to reduce energy consumption	UNEP & GRIDArendal (2020), p. 32. <i>Public report</i>
	Provide social comparisons of energy and water use	UNEP & GRIDArendal (2020), p. . <i>Public report</i>

Behaviour cluster	Original behaviour in source	Source
Enable energy-saving features on computers and other equipment instead of the default settings	Ensure energy saving features are enabled.	UNEP (2014), p. 60. <i>Public report</i>
	Ensure energy saving features are enabled.	UNEP (2013), p. 45. <i>Public report</i>
	Default to eco settings on appliances and electronics	UNEP & GRIDArendal (2020), p. 11. <i>Public report</i>
Modify existing equipment to use less energy (e.g., disable heaters in kitchenettes)	Reduce flow-rate of fume hoods	ISCN (2014), p. 11. <i>Public report</i>
	Disable heaters in washroom and kitchenettes	ISCN (2014), p. 13. <i>Public report</i>
	Installing thermostatic valves on radiators	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Accurate maintenance of boilers/heating system	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Rearrange work areas to maximise natural light and reduce need for artificial lighting	Encourage staff and students to use natural light instead of artificial light	UNEP (2014), p. 101. <i>Public report</i>
	Use high levels of natural light	ISCN (2015), p. 17. <i>Public report</i>
	Maximizing natural lighting especially near book shelves and learning areas.	ISCN (2016), p. 43. <i>Public report</i>
Rearrange work areas to maximise thermal comfort (e.g., avoid direct sunlight in summer)	Assess use of space to optimise work locations for comfort (e.g., avoid working in direct sunlight during summer)	Klemm et al (2020), p. 27. <i>Monash report</i>
Require advanced reservation to heat and cool large spaces (e.g., auditoriums and lecture halls)	Require advanced reservation to heat and cool large spaces like auditoriums and big lecture halls	UNEP (2014), p. 101. <i>Public report</i>
Restrict heating and cooling operation to ordinary work hours	Limit heating and cooling to certain hours of service	UNEP (2014), p. 101. <i>Public report</i>
Restrict heating and cooling operation to ordinary work hours	Modifying the electrical circuits to switch on only the required lamps	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Restrict lighting operation to ordinary work hours	Only turn lights on during evening working hours	UNEP (2014), p. 101. <i>Public report</i>
	Reducing opening hours	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Behaviour cluster	Original behaviour in source	Source
Set the temperature of air-conditioning in buildings and rooms to be energy-efficient (e.g., 18C in winter, 25C in summer) instead of the default settings	Pre-setting the temperature in shared spaces (e.g., the library)	ISCN (2016), p. 43. <i>Public report</i>
Shift the time of day that energy intensive equipment and services are used (e.g., lab equipment, refrigeration, HVAC), to match renewable generation periods or off-peak periods	Shift the use of HVAC from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Identify energy consumption activities and assess which are essential (e.g. in peak times) and which are more flexible (e.g. could take place in off-peak times)	Klemm et al (2021), p. 5. <i>Monash report</i>
	Shift the use of refrigeration from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Shift the use of lab equipment from peak to off-peak energy consumption periods	Klemm et al (2021), p. 5. <i>Monash report</i>
	Amending the operational schedule for high energy consumption activities (e.g. lab equipment, computer equipment)	Klemm et al (2021), p. 5. <i>Monash report</i>
	Encourage / direct / support other building occupants to shift energy-consumption patterns from peak to off-peak	Klemm et al (2021), p. 5. <i>Monash report</i>
	Shift energy consumption patterns to reduce demand on grid	Monash University (2020), p. 7. <i>Monash report</i>
Test that equipment is functioning properly to minimise electricity loss	Test that equipment is functioning properly to minimise electricity loss	Klemm et al (2020), p. 27. <i>Monash report</i>
Turn off electrical appliances when not in use	Turn off electrical appliances when not in use	Klemm et al (2020), p. 14. <i>Monash report</i>
	Encourage staff and students to switch devices off when not in use	UNEP (2013), p. 45. <i>Public report</i>
Use digital documents instead of printed documents	Using digital resources such as online and paperless communication	ISCN (2016), p. 43. <i>Public report</i>

Food and waste

Behaviour cluster	Original behaviour in source	Source
Create or manage a program to increase staff / students plant-based food consumption	Make the most sustainable meal the default choice	UNEP & GRIDArendal (2020), p. 10. <i>Public report</i>
Purchase plant-based food on campus instead of animal-based food	Consume plant-based products	ClimateWorks Australia (2020), p. 58. <i>Monash report</i>
	Switching to/encouraging a more vegetable-based diet	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Sort recyclables and food waste on campus instead of putting it in general rubbish	Recycle materials (metal, plastics)	ClimateWorks Australia (2020), p. 46. <i>Monash report</i>

Retrofit and upgrade

Behaviour cluster	Original behaviour in source	Source
Assess plans for refurbishment and construction to ensure they meet energy efficiency standards	Energy efficiency standards for new construction and refurbishments.	UNEP (2014), p. 51. <i>Public report</i>
	Implement high energy efficiency standards in new buildings	OECD (2009), p. 38. <i>Public report</i>
	Energy efficiency standards for new construction and refurbishments.	UNEP (2013), p. 36. <i>Public report</i>
Convert light fittings to LED	Lighting – delamping, installation of high efficiency lighting fixtures, use of task lighting, lighting controls (timers/sensors).	UNEP (2014), p. 51. <i>Public report</i>
	Use LED lighting	ISCN (2014), p. 4. <i>Public report</i>
	Replace lightings with more efficient systems	ISCN (2017), p. 12. <i>Public report</i>
	Replace lights with energy efficient models (e.g., LEDs)	ISCN (2014), p. 15. <i>Public report</i>
	Use LED lighting	ISCN (2015), p. 17. <i>Public report</i>

Behaviour cluster	Original behaviour in source	Source
	Replace lights with LEDs	ISCN (2016), p. 43. <i>Public report</i>
	Use extremely low consumption led lamps	ISCN (2018), p. 54. <i>Public report</i>
	Convert light fittings to LED	Monash University (2020), p. 7. <i>Monash report</i>
	Use fluorescent light bulbs in place of incandescent ones	OECD (2009), p. 32. <i>Public report</i>
	Replacing lamps with more efficient types, such as LEDs	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Install renewable energy generation	Use photovoltaic systems	Akhatova et al (2022), p. 22-23. <i>Journal article</i>
Introduce minimum energy efficiency standards for energy intensive appliances and equipment	Introduce minimum energy efficiency standards for the highest emitting appliances and equipment.	C40 Cities (2019). <i>Public report</i>
	Adoption and implementation of IT purchasing standards (e.g. IEEE, EPEAT, etc.).	UNEP (2014), p. 60. <i>Public report</i>
	Adoption and implementation of IT purchasing standards (e.g. IEEE, EPEAT, etc.).	UNEP (2013), p. 45. <i>Public report</i>
Purchase energy-efficient appliances and equipment when replacing old ones	Buy energy-efficient appliances	Akhatova et al (2022), p. 22-23. <i>Journal article</i>
	Make the energy efficiency levels of buildings visible and accessible with energy performance certificates and labels, and with national or international green building rating and certification schemes.	C40 Cities (2019). <i>Public report</i>
	Purchase energy-efficient appliances when replacing	ClimateWorks Australia (2020), p. 46. <i>Monash report</i>
	Use more resource and energy efficient technologies in the facility management	Hueske & Guenther (2020), p. 12. <i>Journal article</i>
	Purchase energy efficient appliances when replacing old appliances	Klemm et al (2020), p. 14. <i>Monash report</i>
	Procurement of energy-efficient appliances	OECD (2009), p. 38. <i>Public report</i>

Behaviour cluster	Original behaviour in source	Source
Purchase renewable energy	Promote clean energy sources for heating and cooling buildings.	C40 Cities (2019). <i>Public report</i>
	Purchase 100% renewable energy	Monash University (2020), p. 7. <i>Monash report</i>
	Replace fossil fuel (eg gas) powered heating with electric heat pumps	Monash University (2020), p. 7. <i>Monash report</i>
	Replacement of fossil fuels by renewable energy	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Purchasing renewable energy. Renewable energy certificates (RECs)	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Use renewable energy sources, such as geothermal heating and cooling systems, solar photovoltaic systems or wind turbines on the roof	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Cogeneration	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Replace equipment and heating that uses fossil fuels (e.g., natural gas) with electric equipment and heating	Replace fossil fuel (eg gas) powered heating with electric heat pumps	ClimateWorks Australia (2020), p. 31. <i>Monash report</i>
	Replace fossil fuel (eg gas) powered equipment with electrical equipment	Monash University (2020), p. 7. <i>Monash report</i>
Replace equipment with more efficient equipment	Install energy-efficient heating, ventilation, and air-conditioning systems	ISCN (2016), p. 43. <i>Public report</i>
	Using a condenser boiler to increase performance	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Adapting the boilers to make them highly efficient	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Installing more efficient air conditioning equipment	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Replacing electrical appliances with other more efficient ones	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Retrofit buildings to add insulation between HVAC and some internal equipment / rooms	Retrofit buildings to add insulation	Monash University (2020), p. 7. <i>Monash report</i>
	Insulating certain building compartments from air conditioning	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Behaviour cluster	Original behaviour in source	Source
Retrofit buildings to reduce energy loss (e.g., insulation, weather sealing, thermal barriers, shading, paint)	Retrofit buildings to add insulation	ClimateWorks Australia (2020), p. 31. <i>Monash report</i>
	retrofit buildings to improve sealing	ClimateWorks Australia (2020), p. 31. <i>Monash report</i>
	Install electrochromic windows	ClimateWorks Australia (2020), p. 31. <i>Monash report</i>
	Building retrofitting – installation of external shading devices, sealing, insulation, double glazing, low emissivity window film, light coloured paint.	UNEP (2014), p. 51. <i>Public report</i>
	Use ventilated facades and thermal barrier coatings	ISCN (2018), p. 54. <i>Public report</i>
	retrofit buildings to improve sealing	Monash University (2020), p. 7. <i>Monash report</i>
	Building retrofitting – installation of external shading devices, sealing, insulation, double glazing, low emissivity window film, light coloured paint.	UNEP (2013), p. 36. <i>Public report</i>
	Applying window film to all glass-openings on buildings	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
	Improving the insulation system	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>

Sensors and automation

Behaviour cluster	Original behaviour in source	Source
Install an energy management system to automate the use of energy in a building	Use automatic energy efficient systems	ISCN (2015), p. 13. <i>Public report</i>
	Use energy monitoring systems	ISCN (2017), p. 53. <i>Public report</i>
	Use an energy management system to automate the flexible use of energy in line with supply patterns	Klemm et al (2021), p. 5. <i>Monash report</i>

Behaviour cluster	Original behaviour in source	Source
	Installation of building management and control systems (BMCS) and sub-metering for major building energy uses, energy use displays.	UNEP (2013), p. 36. <i>Public report</i>
	Installing a general energy management system	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Install sensors / meters to provide feedback on the use of energy in a building	Use feedback devices (e.g., CO2 meter, smart meter)	Akhatova et al (2022), p. 22-23. <i>Journal article</i>
	Use smart digital systems to track energy usage	ISCN (2018), p. 53. <i>Public report</i>
	Install smart meters with feedback displays	UNEP & GRIDArendal (2020), p. 17. <i>Public report</i>
	Promoting digital reading	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Install sensors and automation for HVAC in building	Automate building systems to respond to user demand (e.g., lights and heating)	ClimateWorks Australia (2020), p. 31. <i>Monash report</i>
	Turning off air-conditioning units one hour after closing time	ISCN (2016), p. 43. <i>Public report</i>
	Regulating the number of air-conditioning units turned-on based on the number of users	ISCN (2016), p. 43. <i>Public report</i>
	Link air-conditioning to motion sensors	UNEP (2013), p. 68. <i>Public report</i>
Install sensors and automation for lighting in building	Install lighting sensors	UNEP (2014), p. 101. <i>Public report</i>
	Install daylight and motion sensors	ISCN (2014), p. 15. <i>Public report</i>
	Installing a presence detection control system or sensors	Valls-Val & Bovea (2021), p. 2533. <i>Journal article</i>
Permit electricity provider (e.g., microgrid operator) to remotely control building equipment	Provide consent for microgrid operator to remotely control selected electrical devices	Klemm et al (2021), p. 5. <i>Monash report</i>

REFERENCES

Access a [shared folder of reports](#) that includes most of the resources in this list

- Akhatova, A., Kranzl, L., Schipfer, F., & Heendeniya, C. B. (2022). Agent-Based Modelling of Urban District Energy System Decarbonisation—A Systematic Literature Review. *Energies*, 15(2), 554.
<https://doi.org/10.3390/en15020554>
- C40 Cities. (2021). *The Playbook for Zero Emissions Mobility: Latin America and the Caribbean*. C40 Cities.
<https://c40.my.salesforce.com/sfc/p/#36000001Enh/a/1Q000000YPxt/.RA0vmeuulzHf0eX27ztEiDb1MbfQaAOtmBeC.fn828>
- C40 Cities Climate Leadership Group. (2021a). *Five impactful actions cities can take to reduce building energy demand*. C40 Cities.
<https://www.c40knowledgehub.org/s/article/Five-impactful-actions-cities-can-take-to-reduce-building-energy-demand>
- C40 Cities Climate Leadership Group. (2021b). *How to achieve a walking and cycling transformation in your city*. C40 Cities.
<https://www.c40knowledgehub.org/s/article/How-to-achieve-a-walking-and-cycling-transformation-in-your-city>
- C40 Cities Climate Leadership Group. (2021c). *How to drive a modal shift from private vehicles to public transport, walking and cycling*. C40 Cities.
<https://www.c40knowledgehub.org/s/article/How-to-drive-a-modal-shift-from-private-vehicle-use-to-public-transport-walking-and-cycling>
- C40 Cities Climate Leadership Group. (2021d). *How to drive electric vehicle uptake in your city*. C40 Cities.
<https://www.c40knowledgehub.org/s/article/How-to-drive-electric-vehicle-uptake-in-your-city>
- ClimateWorks Australia. (2020). *Decarbonisation futures: solutions, actions and benchmarks for a net zero emissions Australia*. ClimateWorks Australia.
<https://www.climateworkscentre.org/resource/decarbonisation-futures-solutions-actions-and-benchmarks-for-a-net-zero-emissions-australia/>
- Corfee-Morlot, J., Kamal-Chaoui, L., Donovan, M. G., Cochran, I., Robert, A., & Teasdale, P.-J. (2009). *Cities, climate change and multilevel governance* (OECD Environment Working Papers). Organisation for Economic Co-Operation and Development (OECD).
<https://doi.org/10.1787/220062444715>
- Hosking, J., Macmillan, A., Connor, J., Bullen, C., & Ameratunga, S. (2010). Organisational travel plans for improving health. *Cochrane Database of Systematic Reviews*, 3, CD005575.
<https://doi.org/10.1002/14651858.CD005575.pub3>
- Hueske, A.-K., & Guenther, E. (2021). Multilevel barrier and driver analysis to improve sustainability implementation strategies: Towards sustainable operations in institutions of higher education. *Journal of Cleaner Production*, 291, 125899. <https://doi.org/10.1016/j.jclepro.2021.125899>
- International Sustainable Campus Network. (2013). *2013 WEF-ICSN Report: Signature Projects*. International Sustainable Campus Network.
- International Sustainable Campus Network. (2014). *2014 WEF-ICSN Report: Best Practice in Campus Sustainability*. International Sustainable Campus Network.
- International Sustainable Campus Network. (2015). *2015 WEF-ICSN Report: Developing Skills for Future Leaders*. International Sustainable Campus Network.
- International Sustainable Campus Network. (2016). *2016 WEF-ICSN Report: Demonstrating Sustainable Development in Higher Education*. International Sustainable Campus Network.
- International Sustainable Campus Network. (2017). *2017 WEF-ICSN Report: Educating for Sustainability*. International Sustainable Campus Network.
- International Sustainable Campus Network. (2018). *2018 WEF-ICSN Report: Educating with Purpose*. International Sustainable Campus Network.

- Klemm, C., Tull, F., & Smith, L. (2021a). *Behaviour in Microgrids: Stakeholder Dialogue Summary and Impact-Likelihood Matrix*. BehaviourWorks Australia, Monash University.
- Klemm, C., Tull, F., & Smith, L. (2021b). *Identifying and targeting human behaviour in Microgrids. Literature and Practice Review*. BehaviourWorks Australia, Monash University.
- Ly, K., Sati, S., & Singer, E. (2017). *A Behavioural Lens on Transportation Systems*. University of Toronto. [https://www.rotman.utoronto.ca/-/media/files/programs-and-areas/bear/white-papers/bear-transportation-systems-\(3\).pdf](https://www.rotman.utoronto.ca/-/media/files/programs-and-areas/bear/white-papers/bear-transportation-systems-(3).pdf)
- Monash University. (2020). *Monash Net Zero Initiative*. Monash University.
- Monash University. (2021). *Net Zero Transport Strategy: Roadmap of Initiatives*. Monash University.
- United Nations Environment Programme. (2013). *Greening Universities Toolkit: Transforming universities into green and sustainable campuses*. uncclearn.org.
- United Nations Environment Programme. (2014). *Greening universities Toolkit V2.0: Transforming universities into green and sustainable campuses*. United Nations Environment Programme. <https://www.unep.org/resources/toolkits-manuals-and-guides/greening-universities-toolkit-v20>
- United Nations Environment Programme, & GRID-Arendal. (2020). *The Little Book of Green Nudges: 40 nudges to spark sustainable behaviour on campus*. stg-wedocs.unep.org. <https://stg-wedocs.unep.org/handle/20.500.11822/33578>
- Valls-Val, K., & Bovea, M. D. (2021). Carbon footprint in Higher Education Institutions: a literature review and prospects for future research. *Clean Technologies and Environmental Policy*, 23(9), 2523–2542. <https://doi.org/10.1007/s10098-021-02180-2>

MORE INFORMATION

About the project

A net zero university precinct is one in which the buildings, transportation, and other infrastructure do not generate more greenhouse gas emissions than the amount that is removed from the atmosphere. In order to achieve net zero, universities must adopt new technologies and behaviours to reduce emissions.

Monash University, Australia, committed to net zero emissions (scope 1 and 2) by 2030. The [Monash Net Zero Initiative](#) seeks to realise that commitment through deep decarbonisation including technology development & deployment and behaviour change.

However, at Monash University and in other university campuses, as well as university-scale urban districts and precincts, it is not clear "who needs to do what differently" to get to net zero. It's also not clear which behaviours are the most important to focus on in order to achieve net zero. This research project identifies and prioritises net zero behaviours on university campuses. The results of this research will help universities and other university-scale urban districts and precincts to focus their efforts on the most important behaviours in order to achieve net zero.

Primary project outputs

- [Read the project report](#), *Behaviour change to accelerate Net Zero transitions at Monash University*, which describes why we conducted this research project, what we found, and our recommendations
- [View the list of behaviours used in the project](#) to understand and prioritise actions to accelerate net zero transitions at university campus precincts
- [Access the interactive prioritisation matrix](#), which visualises the *impact*, *ease*, and *current participation* for each net zero behaviour based on surveys of Monash staff and students, and experts in net zero

Other project outputs

- [Read the preregistered research protocol](#) that describes our search strategy and selection process leading to this long list of behaviours

- [View reports and articles](#) identified as relevant to net zero behaviours on campuses and urban districts / precincts
- [Explore the full list of every net zero behaviour](#) (n ~ 239) identified through the evidence review, their source report / article, and how they were clustered into a list used in this project
- [Download the survey materials](#) to replicate and adapt our work in your context
- [Access the anonymised aggregate survey data](#) and data dictionary to conduct secondary analysis or modelling of prioritisation results in your context