28 April 2021

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Government Architect NSW
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12 Darcy Street
Parramatta, NSW 2150

By email: designandplacesepp@planning.nsw.gov.au

Dear Ms Galvin

Design and Place SEPP Explanation of Intended Effect

1. We are pleased to provide this submission to the Government Architect NSW (**GANSW**) on the Explanation of Intended Effect (**EIE**) on the proposed Design and Place State Environmental Planning Policy (**Design and Place SEPP**).

2. We are a community group that participates in the public consultation process in relation to proposals that are likely to have an impact on climate change and threatened species.

3. We strongly support efforts to clarify and strengthen NSW's planning framework to deliver robust environmental outcomes. In considering the adequacy of the Design and Place SEPP, we consider that GANSW should have careful regard to:

    a. net zero buildings;

    b. embodied carbon;

    c. waste management; and

    d. biodiversity conservation.

4. We do not support the proposal to transferring existing provisions that limit the ability of councils to set higher Building and Sustainability Index (**BASIX**) targets to the Design and Place SEPP. These provisions remove the ability of councils to set bold energy efficiency targets and slow down the uptake of advanced technology and design practices.

5. In this submission, we provide an analysis of the recommendations made by the International Governmental Panel on Climate Change (**IPCC**)'s Fifth Assessment Report (**AR5**) on buildings [1] to provide context to our recommendations and to

[1] Lucon O., D. Ürge-Vorsatz, A. Zain Ahmed, H. Akbari, P. Bertoldi, L. F. Cabeza, N. Eyre, A. Gadgil, L. D. D. Harvey, Y. Jiang, E. Liphoto, S. Mirasgedis, S. Murakami, J. Parikh, C. Pyke, and M. V. Vilariño, 2014:

underscore the importance of adopting state-of-the-art performance standards in new and retrofit buildings.

6. In light of the urgency of the climate crisis, the severity of the waste management problem in NSW and the deteriorating state of biodiversity, we oppose the use of a principle-based planning system in relation to energy efficiency targets, minimum waste management requirements and biodiversity conservation.

7. We hope that the analysis and discussion in this submission assists GANSW in ensuring that NSW's design framework is fit for purpose for the future.

Summary of Recommendations

Recommendation 1: Amend proposed design consideration 17 to include a requirement for all new buildings to be net zero by 2030 and all existing buildings to be net zero by 2040.

Recommendation 2: Amend the benefits listed for proposed design consideration 17 to include a phased plan for reaching net zero for all buildings with mandatory targets.

Recommendation 3: Design criteria requiring rooftop solar photovoltaics to be installed in all new residential and commercial buildings from 2021.

Recommendation 4: Whole life carbon assessments to be completed at the early design stages, to be submitted as part of pre-application enquiries and full planning submissions for all developments.

Recommendation 5: Whole life carbon evaluation of retrofit compared to demolition and redevelopment.

Recommendation 6: Amend proposed design criteria 6 to include embodied carbon targets for certain categories of developments such as state significant projects.

Recommendation 7: Carbon limits for key materials in public projects and global warming potential caps for each of these products.

Recommendation 8: Insert new design criteria for designing for deconstruction and disassembly. For example:

> **- Designing for the end of life of a building to take into consideration that many layers of a building have different life-spans. In order of decreasing life-span: Site, Structure, Skin, Services, Space Plan and Stuff. Design should be for "slippage" so removal of short life-span layers can occur**

Buildings. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

without disturbing longer life-span layers. Consider an end-of-life destination for each layer.

- For ease of separation and deconstruction, fixing components together by reversible means. Consider mechanical fixings; avoid gluing and composite materials. Consider using a type of mortar that allows bricks and blocks to be easily dismantled.

-Designing for replacement ease at the smallest level. For instance, selecting floating carpet tiles that adhere with tabs ensures that damaged tiles can be individually replaced; some carpet manufacturers blend in tiles from another dye lot so attic stock won't be required.

-Design incorporating "material passports" by providing information about building materials that will allow for easier reuse later. The information may be available in a BIM data model and can also be physically attached to the materials.

Recommendation 9: Insert new design criteria for reused material selection. This should include:

-An initial site visit where all materials and structures, if any, should be assessed for their potential for reuse. Then aim to reuse them at their highest capacity.

-Consideration of use of reclaimed components (eg raised floors, kitchens, furniture systems, doors and carpet) and reclaimed materials—such as bricks and lumber—especially if they're local.

-Consideration of re-use of excavation material and balance cut and fill on-site.

-Specifications to be written allowing contractors to substitute approved reclaimed components and materials.

Recommendation 10: Insert new design principle which is to "Design Places that enable a circular economy".

Recommendation 11: Insert new design criteria for material flows in buildings. This should include:

-Planning for tenant disposal and separation including waste stream types and quantities, location of waste stations, types of bins and signage.

-Planning for movement of recyclables and waste to central storage including frequency, transport containers and route. This should include safe vertical transfer methods and consideration of chutes and sorters, including organic chutes.

-Planning for waste storage including calculating area required, volume reduction equipment, location, layout, accessibility and time restrictions.

-Planning for collection – such as where bags or containers will be set out on the curb and, if containers are used, areas for washing containers. If compactor containers are used, consider collection vehicle access and ceiling height.

Recommendation 12: Amend Design Principle 5 to "Design resilient and diverse places enduring communities and habitats".

Recommendation 13: Insert new design principle as follows: "Principle 6. Design places that conserve and enhance biodiversity with no net loss to biodiversity and, where feasible, a net biodiversity gain.

Recommendation 14: A qualified ecologist to be required for all open space greater than 1000 m^2 and for master planning of all precincts and significant developments.

Recommendation 15: Amend consideration 7, which states that "the precinct retains, where possible, and provides additional green infrastructure" by removing the phrase 'where possible'.

Recommendation 16: Amend consideration 7, which requires "replacing any removed moderate or significant trees with at least two trees or precinct DCP/council replacement rate, whichever is higher" with "projects must provide a net biodiversity gain". This should also apply to the (1) site analysis and (3) design statement.

Recommendation 17: In situ retention of all remnant vegetation.

Recommendation 18: An urban greening factor to be applied to development proposals.

Recommendation 19: Methods for calculating performance-based metrics of street intersection density and block sizes will be set out in the guide to be applied only where streets do <u>not</u> impact patch sizes of habitat for threatened species and result in further fragmentation of habitat.

Recommendation 20: Street density planning guidelines must incorporate principles from the Koala Planning Guidelines by the Australian Koala Foundation to mitigate impacts on koalas.

Recommendation 21: Amend the benefits of proposed design consideration 7 to acknowledge the use of trees for shade to reduce energy consumption and improve the livability of urban areas.

Recommendation 22: The proposed urban design guide to require net biodiversity gains and to secure ongoing management of these areas to ensure positive conservation management and that the desired outcome is achieved.

Table of Contents

PART 1: Climate Change

1. Emission pathways

1.1 2018 IPCC Special Report

8. The IPCC is the United Nations (**UN**) body for assessing the science related to climate change. Its assessment reports are published every 6-7 years and provide comprehensive scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options.

9. In 2018, the IPCC released the Special Report on Global Warming of 1.5 °C (Special **Report**). It found that limiting global temperature rise to below 1.5ºC will require global net CO_2 emissions to reach net zero by 2050 (see Fig 1 below).[2]

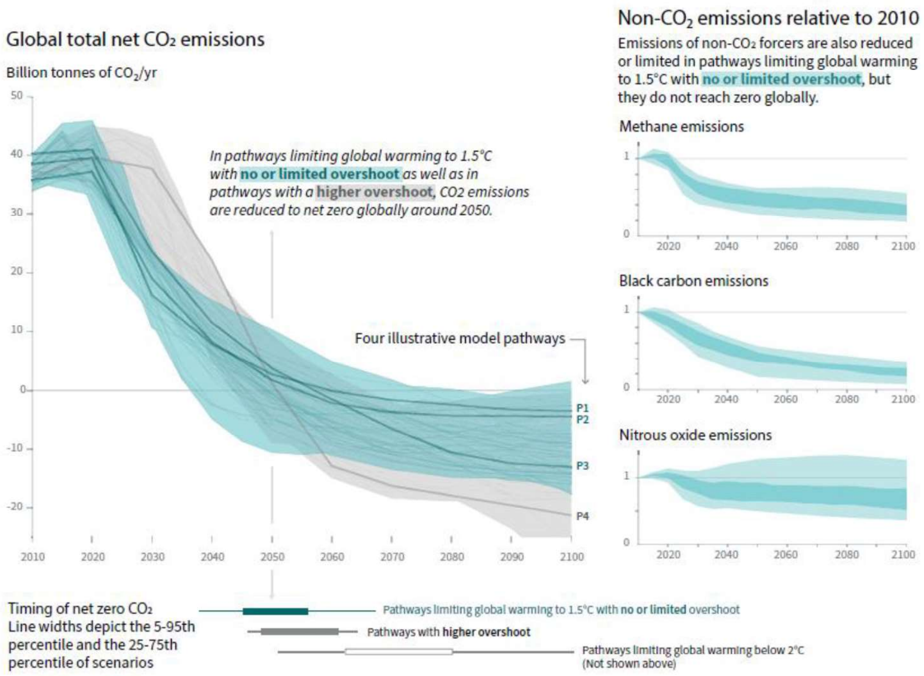

Figure 1: Global CO_2 emission pathway characteristics consistent with limiting global warming to1.5ºC[3]

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[2] IPCC, 2018: Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)].
[3] Ibid 15.

1.2 2020 UNEP Emissions Gap Report

10. In 2020 United Nations Environment Programme (**UNEP**) published the 2020 Emissions Gap Report (**EGR**),[4] which is a yearly review of the difference between where greenhouse emissions are predicted to be in 2030 and where they should be to avoid the worst impacts of climate change.

11. The EGR found that the 1.5ºC pathways that achieve net zero emissions by 2050 only have a 66% probability of stabilising global temperatures at 1.5ºC (see Figure 2 below).

Scenario (rounded to the nearest gigaton)	Number of scenarios in set	Global total emissions in 2030 [$GtCO_2e$]	Estimated temperature outcomes			Closest corresponding IPCC SR1.5 scenario class	Emissions Gap in 2030 [$GtCO_2e$]		
			50% probability	66% probability	90% probability		Below 2.0°C	Below 1.8°C	Below 1.5°C in 2100
2010 policies	6	64 (60–68)							
Current policies	8	59 (56–65)					17 (15–22)	24 (21–28)	34 (31–39)
Unconditional NDCs	11	56 (54–60)					15 (12–19)	21 (18–25)	32 (29–36)
Conditional NDCs	12	53 (51–56)					12 (9–15)	18 (15–21)	29 (26–31)
Below 2.0°C (66% probability)	29	41 (39–46)	Peak: 1.7–1.8°C In 2100: 1.6–1.7°C	**Peak: 1.9–2.1°C In 2100: 1.8–1.9°C**	Peak: 2.4–2.6°C In 2100: 2.3–2.5°C	Higher 2°C pathways			
Below 1.8°C (66% probability)	43	35 (31–41)	Peak: 1.6–1.7°C In 2100: 1.3–1.6°C	**Peak: 1.7–1.8°C In 2100: 1.5–1.7°C**	Peak: 2.1–2.3°C In 2100: 1.9–2.2°C	Lower 2°C pathways			
Below 1.5°C in 2100 and peak below 1.7°C (both with 66% probability)	13	25 (22–31)	Peak: 1.5–1.6°C In 2100: 1.2–1.3°C	**Peak: 1.6–1.7°C In 2100: 1.4–1.5°C**	Peak: 2.0–2.1°C In 2100: 1.8–1.9°C	1.5°C with no or limited overshoot			

Figure 3: Global total GHG emissions in 2030 under different scenarios (median and 10th to 90th percentile range), temperature implications, and the resulting emissions gap (based on the pre-COVID-19 current policies scenario)[5]

12. We support the NSW Government's target of achieving net zero by 2050. However, we consider that a 66% chance of stabilising global temperatures is too low and stronger action is needed to reach net zero as soon as possible, including significant reform of planning laws.

[4] United Nations Environment Programme (2020), *Emissions Gap Report 2020*. Nairobi, 27.
[5] Ibid 26.

2. Emission trends

2.1 Global GHG emissions

13. Instead of declining, global GHG emissions rose in 2017, 2018 and 2019. Global GHG emissions reached a record high of 52.4 $GtCO_2e$ (range: ±5.2) without land-use change (LUC) emissions and 59.1 $GtCO_2e$ (range: ±5.9) when including LUC (see Figure 3 below).[6] In 2020, the Earth's CO_2 levels reached 412.5 parts per million- the highest concentration of CO_2 in the atmosphere for 3.6 million years.

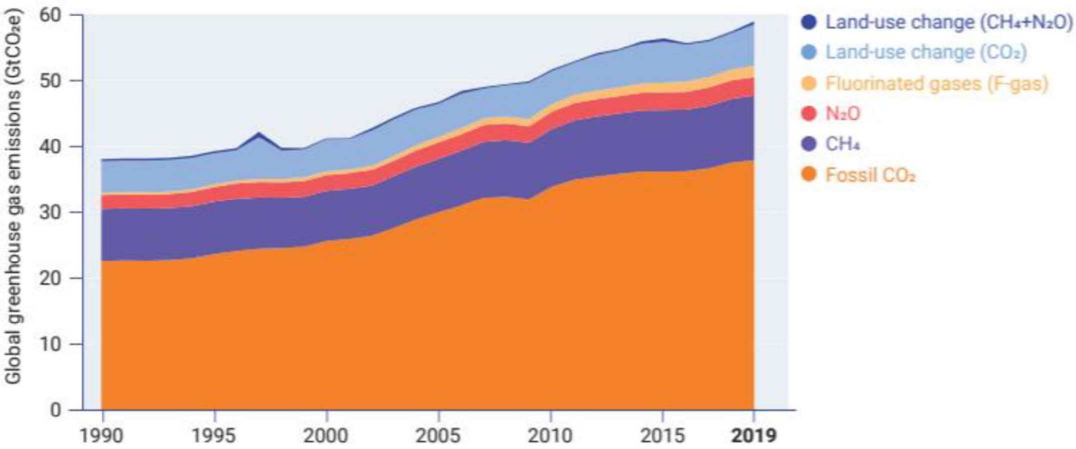


Figure 3: Global GHG emissions from all sources from 1990-2019[7]

14. The gap between the current pathway of global emissions and what is needed to stabilise global temperatures continue to increase (see Figure 4 below).

[6] Ibid xiv.
[7] Ibid vii.

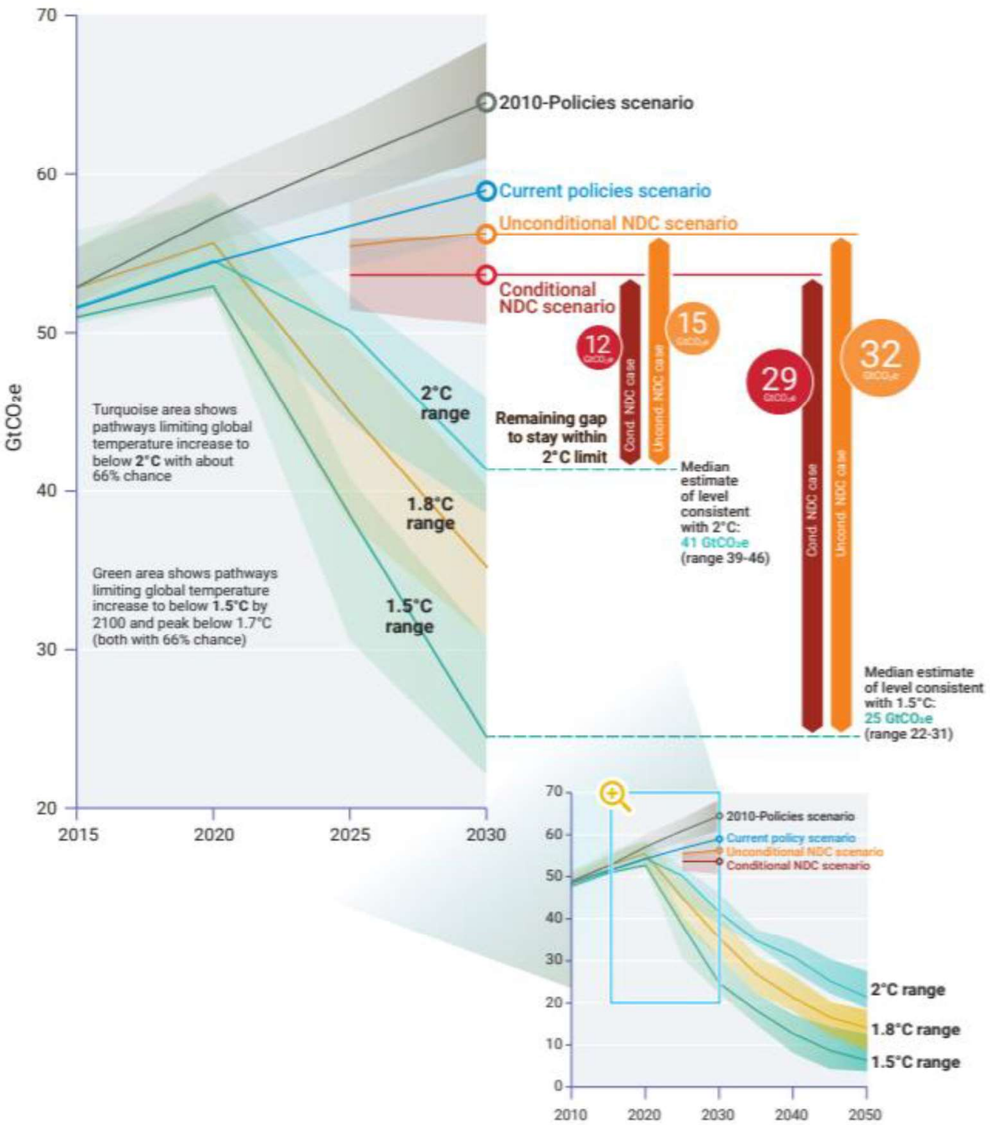


Figure 4: Global GHG emissions under different scenarios and the emissions gap[8]

8 Ibid xx.

2.2 NSW GHG emissions

15. In contrast to the global trend of increasing GHG emissions, NSW's GHG emissions declined by 25% from 1990 to 2018. This decrease is mostly due to a reduction in the rate of land clearing. In contrast, emissions from stationary energy, that is energy that results from the generation of heat and electricity, increased from 1990-2018.[9]

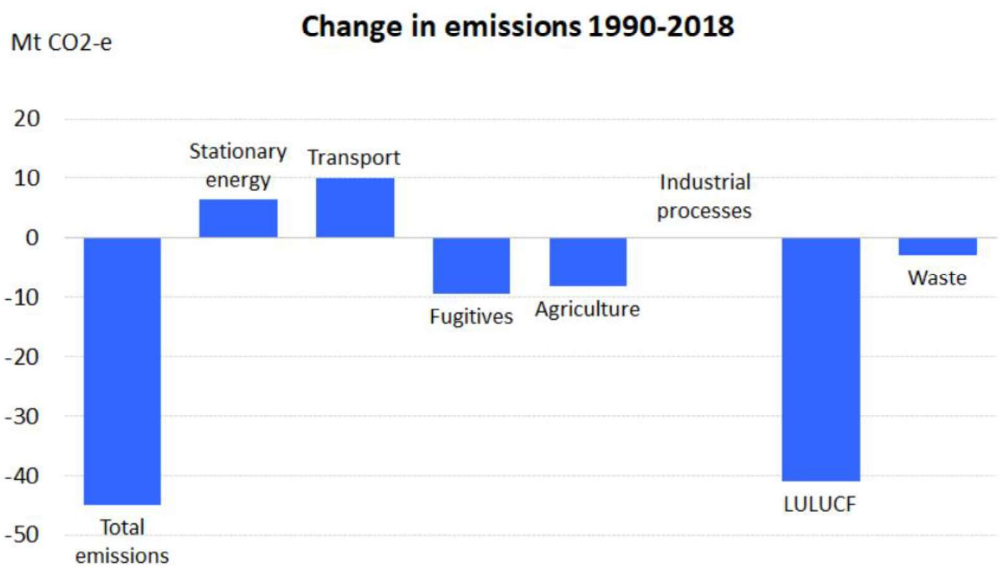


Figure 5: Change in NSW emissions from 1990-2018

16. This year, the NSW government reported that, without intervention, climate change emissions in NSW are likely to increase between 2020-2030 (see Figure 6 below).

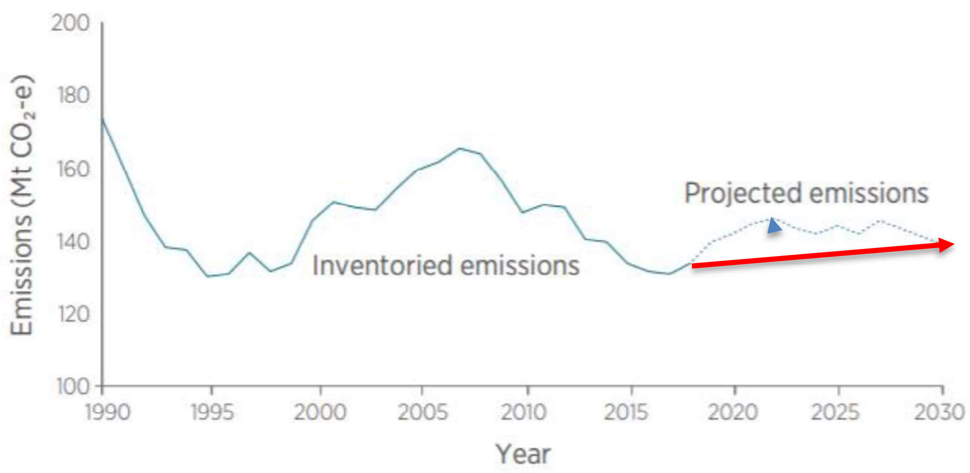


Figure 6: NSW total annual emissions to 2030 (MtCO2 -e = Megatonnes of carbon dioxide equivalent)[10] in mark-up

[9] < https://climatechange.environment.nsw.gov.au/About-climate-change-in-NSW/NSW-emissions>
[10] Department of Planning, Industry and the Environment, *Net Zero Plan Stage 1: 2020-2030* (March 2020) 11.

2.3 Policy implications

17. The current framework's failure to deliver deep cuts in GHG emissions from 1990-2018 is a strong indicator that current policies are out of date and require reform in order to bend the emissions curve.

18. Trend data of emissions from various sources indicate that emissions must be reduced in all sectors to achieve net zero (see Figure 6 below).

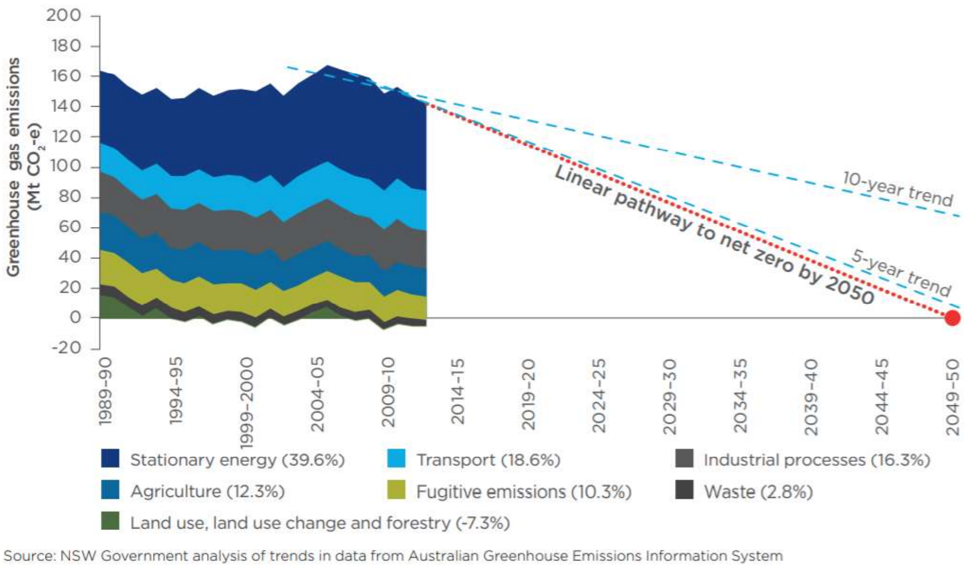
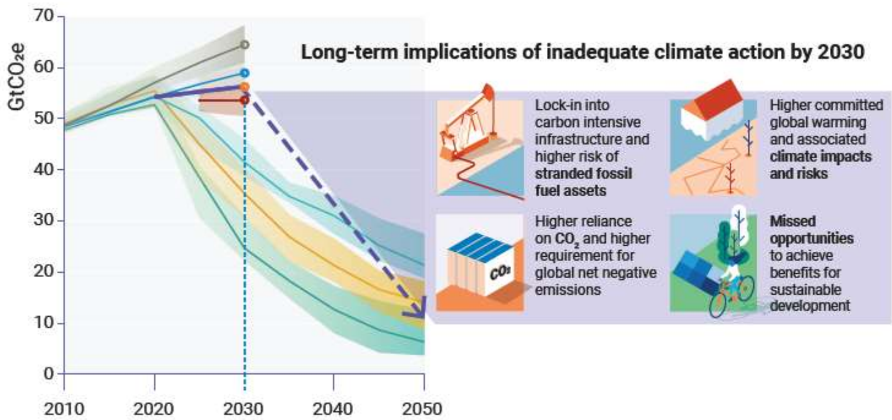


Figure 6: NSW pathways to net zero emissions[11]

19. The Design and Place SEPP should play a key role in encouraging the adoption of cost-effective best practices and technologies to meet the objectives of NSW's carbon emission reduction targets. Failure to do so will lock in carbon intensive infrastructure for decades to come.



[11] <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/emissions-fact-sheet-160612.pdf>

Figure 7: Long-term implications of not closing the emissions gap by 2030[12]

3. IPCC Fifth Assessment Report

3.1 Building emissions

20. The built environment is critical in responding to the climate emergency. Decarbonising this sector is one of the most effective ways to mitigate GHG emissions.

21. In 2010, buildings accounted for 32% of global final energy use and 19% of energy-related GHG emissions. AR5 estimated that global building energy use and related GHG emissions may double or triple by 2050 due to factors such as population growth and increasing wealth and lifestyle changes.[13]

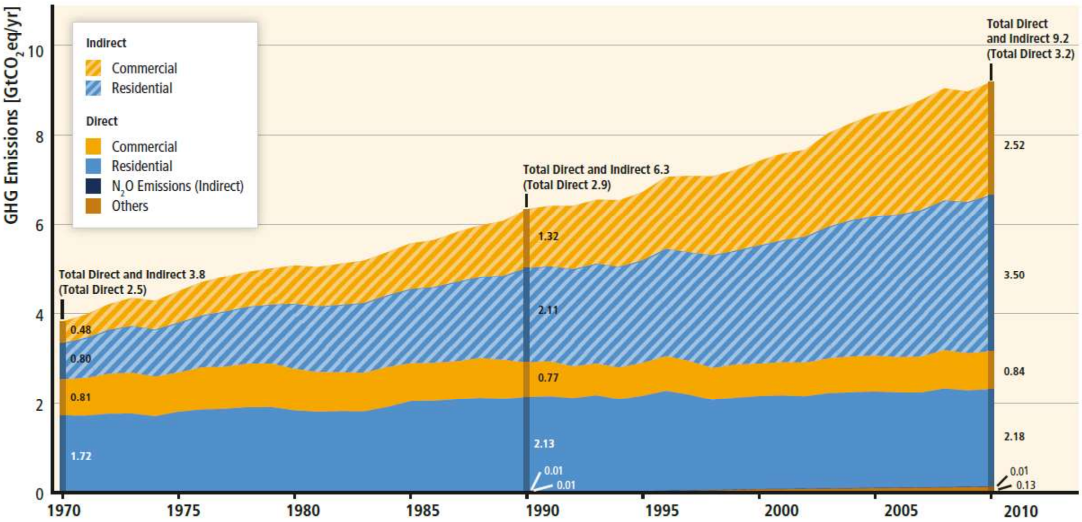


Figure 6: Direct and indirect emissions (from electricity and heat production) in the building subsectors[14]

22. Pacific OECD region (**POECD**)(including Australia) per capita energy consumption, in residential and commercial buildings was the third highest in the world, after North America (**NAM**) and Western Europe (**WEU**) (see Figure 7 below). For example, in the POECD, the annual per capita energy use in residential buildings was 5.4 MWh/cap/yr. This was more than double the annual per capita energy used in commercial buildings in South Asia (**SAS**) at 1.7MWh/cap/yr, Pacific Asia (PAS) at 2.1 MWh/cap/yr and Latin America and the Caribbean (**LAM**) at 1.9 MWh/cap/yr. Further, in the POECD, the annual per capita energy use in commercial buildings was 6.1 MWh/cap/yr. This was higher than annual per capita energy use in commercial buildings in WEU at 3.4 MWh/cap/yr and Eastern Europe (**EEU**) at 2.2 MWh/cap/yr.

[12] UNEP, above n4, 34.
[13] IPCC, above n1, 675.
[14] IPCC, above n1, 678.

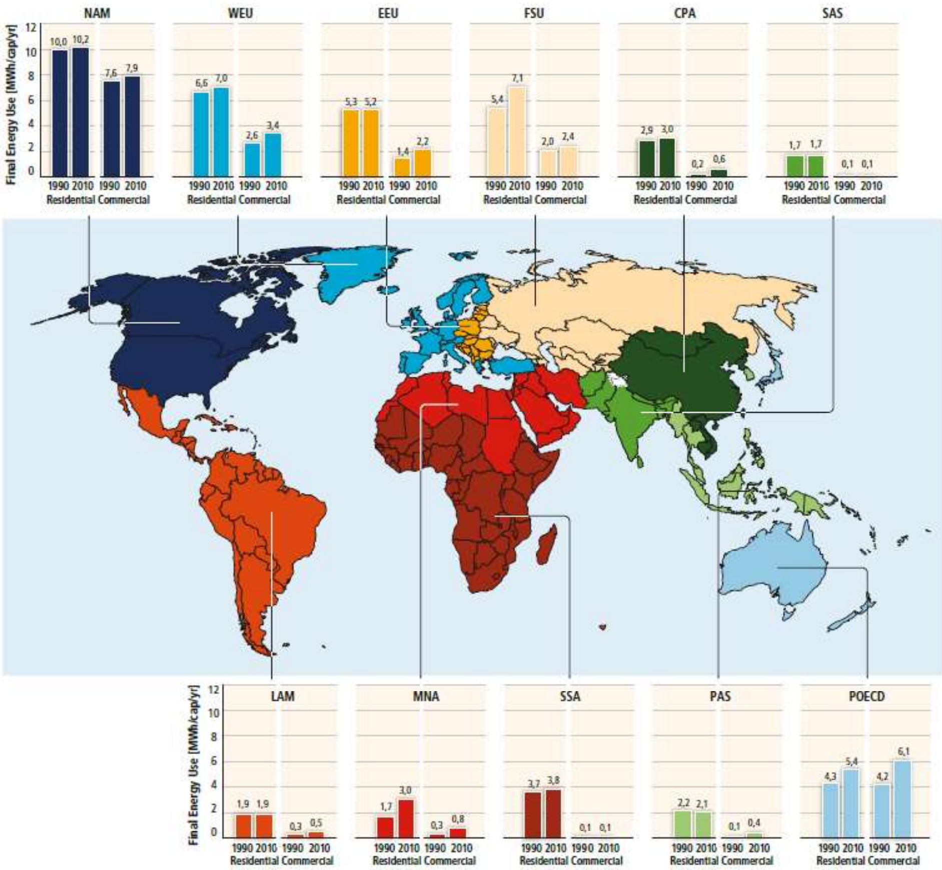


Figure 7: Annual per capita final energy use of residential and commercial buildings for eleven regions.[15]

23. In Australia, residential buildings account for approximately 20% of GHG emissions. In such buildings, the sources of the highest energy consumption are heating and cooling (40% of energy use); appliances and equipment (33%) and water heating (21%) (see Figure 8 below).

15 IPCC, above n1, 680.

Energy use in the Australian residential sector 1986–2020. Data are projected energy use for 2012

Household energy use	%
Heating and cooling	40
Water heating	21
Appliances and equipment including refrigeration and cooking	33
Lighting	6

Source: DEWHA. 2008

Figure 8: Department of Water, Environment, Heritage and the Arts (**DEWHA**) data for energy use in the Australian residential sector[16]

24. Commercial buildings account for approximately 10% of Australia's GHG emissions.[17] In such buildings, the sources of the highest energy consumption are heating, ventilation and air-conditioning (**HVAC**) (43%), lighting (26%) and equipment (20%).[18]

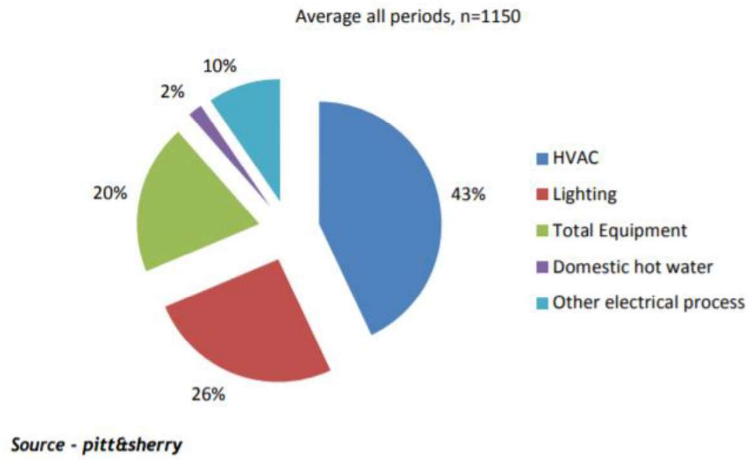


Figure 9: Offices (all), Electricity End Use Shares, 1999-2012[19]

25. Without intervention, energy consumption by buildings in the POECD region, including Australia, is projected to increase from the present to 2050.

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16 <https://www.yourhome.gov.au/energy>

17 <https://www.energy.gov.au/government-priorities/energy-productivity-and-energy-efficiency/commercial-buildings>

18 Commonwealth of Australia, "Baseline Energy Consumption and Greenhouse Gas Emissions in Commercial Buildings in Australia" (2012) 7.

19 Ibid 7.

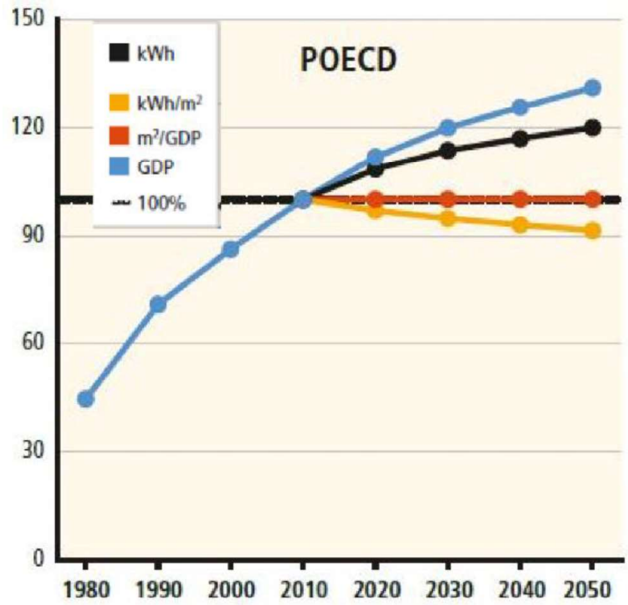

Figure 10: Extract showing trends in the drivers of heating and cooling thermal energy consumption of residential (first page) and commercial (this page) buildings in world regions (GEA RC11, see Annex II.2.4). Source: Ürge-Vorsatz et al. (2013) with projection data (2010 – 2050) from frozen efficiency scenario.[20]

26. Changing the trajectory of energy use in new and existing buildings is feasible in NSW because of important performance improvements and cost reductions in the relevant technologies. These developments are further discussed below.

3.2 Technological developments

27. AR5 estimates that large reductions in building energy use are now possible due to recent technological developments. <u>It is now possible to achieve 50% - 90% reductions in new buildings and 50-75% reduction in energy use in existing buildings.</u>[21]

28. Changes to system efficiency can result in the following significant reductions in end-use energy such as a 67% reduction in cooling energy, 40% reduction in hot water energy and a 90% reduction in heating energy (see Table 2 below).

29. Further, the energy performance of advanced buildings has significantly improved in recent years. These buildings typically involve a high-performance thermal envelope combined with mechanical ventilation with heat recovery. Such buildings are capable of providing a factor of 6-12 reduction in heating load in mild climates. In such climates, combining Passive House insulation with current design strategies can reduce cooling loads by a factor of 10 (from <30 kWh/M2/year to <3 kWh/m^2/yr) (see Table 3 below).[22]

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[20] Ürge-Vorsatz D., K. Petrichenko, M. Staniec, and E. Jiyong (2013). Energy use in buildings in a long-term perspective. *Current Opinion in Environmental Sustainability*. **5** (2) 141 – 151; IPCC, above n1, 685.
[21] IPCC, above n1, 686.
[22] IPCC, above n1, 688.

Table 2: Savings or off-site energy use reductions achievable in buildings for various end uses due to on-site active solar energy systems, efficiency improvements, or behavioural changes.[23]

End Use	On-site C-Free Energy Supply[(1)]	Device Efficiency	System Efficiency	Behavioural Change
Heating	20 %–95 % [(2)]	30 %[(3)]–80 %[(4)]	90 %[(5)]	10 %–30 %[(6)]
Hot water	50 %–100 % [(7)]	60 %[(8)]–75 %[(9)]	40 %[(10)]	50 %[(11)]
Cooling	50 %–80 % [(12)]	50 %[(13)]–75 %[(14)]	67 %[(15)]	50 %–67 %[(16)]
Cooking	0–30 % [(17)]	25–75 %[(18)]–80 %[(19)]		50 %[(20)]
Lighting	10–30 %	75 %[(21)]; 83 %–90 %[(22)]; 99.83 %[(23)]	80 %–93 %[(24)]	70 %[(25)]
Refrigerators		40 % [(25a)]		30 %[(26)]; 50 %[(27)]
Dishwashers		17+%[(27a)]		75 %[(28)]
Clothes washers		30 %[(28a)]		60 %–85 %[(29)]
Clothes dryers		50+%[(29a)]		10 %–15 %[(30)]–100 %[(31)]
Office computers & monitors		40 %[(31a)]		
General electrical loads	10 %–120 %[(32)]			

Notes: (1) Only active solar energy systems. Higher percentage contributions achievable if loads are first reduced through application of device, system, and behavioural efficiencies. Passive solar heating, cooling, ventilation, and daylighting are considered under Systemic Efficiency. (2) Space heating. Lower value representative of combi-systems in Europe; upper value is best solar district heating systems with seasonal underground thermal energy storage, after a 5-year spin-up (SAIC, 2013). (3) Replacement of 75 % efficient furnace/boiler with 95 % efficient unit (e.g., condensing natural gas boilers). (4) Replacement of 80 % efficient furnace or boiler with ground-source heat pump with a seasonal COP for space heating of 4 (from ground-source heat pumps in well-insulated new buildings in Germany (DEE, 2011). (5) Reduction from a representative cold-climate heating energy intensity of 150 kWh/m²/yr to 15 kWh/m²/yr (Passive House standard, Section 9.3.2). (6) Typical value; 2 °C cooler thermostat setting at heating season. Absolute savings is smaller but relative savings is larger the better the thermal envelope of the building (see also Section 9.3.9). (7) Water heaters. 50–80 % of residential hot water needs supplied in Sydney, Australia and Germany (Harvey, 2007), while upper limit of 100 % is conceivable in hot desert regions. (8) Replacement of a 60 % efficient with a 95 % efficient water heater (typical of condensing and modulating wall-hung natural gas heaters). (9) Table 9.4. (10) Elimination of standby and distribution heat losses in residential buildings (typically accounting for 30 % water-heating energy use in North America (Harvey, 2007) through use of point-of-use on- demand water heaters. (11) Shorter showers, switch from bathing to showering, and other hot-water-conserving behaviour. (12) Air conditioning and dehumidification. Range for systems from central to Southern Europe with a relatively large solar collector area in relation to the cooling load (Harvey, 2007). (13) Replacement of air conditioners having a COP of 3 (typical in North America) with others with a COP of 6 (Japanese units); Table 9.4. (14) Replacement of North American units with units incorporating all potential efficiency improvements; Table 9.4. (15) Reduction (even elimination) of cooling loads through better building orientation & envelopes, provision for passive cooling, and reduction of internal heat gains (Harvey, 2007). (16) Section 9.3.9. Fans during tolerable brief periods eliminating cooling equipment in moderately hot climates. (17) Cooking range, various ovens. (18) Range pertains to various kinds of ovens; Table 9.4. (19) Replacement of 10 %–15 % with 60 % efficient (traditional biomass) cookstoves (Rawat et al., 2010). (20) Same recipe with different cooking practices; Table 9.4/Section 9.3.9. (21) Replacement of 10–17 lm/W incandescent lamps with 50–70 lm/W compact fluorescent (Harvey, 2010). (22) Replacement of 15 lm/W incandescent lamps with (year 2030) LEDs, 100–160 lm/W (McNeil et al., 2005; US DOE, 2006). (23) Replacement of 0.25 lm/W kerosene lamps (Fouquet and Pearson, 2006) with future 150 lm/W LEDs. (24) Reduction from average US office lighting energy intensity of the existing stock of 73 kWh/m²/yr (Harvey, 2013) to 5–15 kWh/m²/yr state-of-art systems (Harvey, 2013). (25) Turning off not needed lights (6000 hours/yr out of 8760 hours/yr). (25a) Table 9.4 (26) 12.5 ft³vs 18.5 ft³ (350 litres, 350 kWh/yr vs 520 litres, 500 kWh/yr) refrigerator-freezers or 18.5 vs 30.5 ft³ (860 litres, 700 kWh/yr) (Harvey, 2010). (27) Elimination of a second ('beer') fridge. (27a) Table 9.4 (28) Fully loaded operation versus typical part-load operation (Table 9.4). (28a) by 2030 (Table 9.4). (29) Cold compared to hot water washing, based on relative contribution of water heating to total clothes washer energy use for the best US&EU models (Harvey, 2010). (29a) Table 9.4. (30) Operation at full load rather than at one-third to half load (Smith, 1997). (31) Air drying inside when there is no space heating requirement, or outside. (31a) Table 9.4. (32) Fraction of on-site electricity demand typically generated by on-site PV with low demand kept low through electricity-efficiency measures.

[23] IPCC, above n1, 687.

Table 2: Typical and current best case specific energy consumption (kWh / m2 / yr) for building loads directly related to floor area (Harvey, 2013)[24]

End Use	Climate Region	Residential		Commercial	
		Advanced	Typical	Advanced	Typical
Heating	Cold	15–30	60–200	15–30	75–250
Heating	Moderate	10–20	40–100	10–30	40–100
Cooling	Moderate	0–5	0–10	0–15	20–40
Cooling	Hot-dry	0–10	10–20	0–10	20–50
Cooling	Hot-humid	3–15	10–30	15–30	50–150
Ventilation	All	4–8	0–8	0–20	10–50
Lighting	All	2–4	3–10	5–20	30–80

Notes: Lighting energy intensity for residential buildings is based on typical modern intensities times a factor of 0.3–0.4 to account for an eventual transition to LED lighting. Definitions here for climate regions for heating: Cold > 3000 HDD; Moderate 1000–3000 HDD. Similarly for cooling: moderate < 750 CDD; hot-dry > 750 CDD; hot-humid > 750 CDD. HDD = heating degree days (K-day) and CCD = cooling-degree days (K-day). Energy intensity ranges for commercial buildings exclude hospitals and research laboratories.

3.3 Policy implications

30. The Design and Place SEPP offers a unique opportunity to accelerate NSW's path to net zero emissions through the reduction of the energy consumption of buildings. The rationale for rapid decarbonisation of the buildings was stated by the IPCC as follows:

> "Buildings and their energy supply infrastructure are some of the longest-lived components of the economy. Buildings constructed and retrofitted in the next few years to decades will determine emissions for many decades, without major opportunities for further change. Therefore, the sector is particularly prone to lock-in, due to favouring incremental change (Bergman et al., 2008), traditionally low levels of innovation (Rohracher, 2001), and high inertia (Brown and Vergragt, 2008).
> …
> Without the highest achievable performance levels, global building energy use will rise (Ürge-Vorsatz et al., 2012a). This implies that a major reduction in building energy use will not take place without strong policy efforts, and particularly the use of building codes that require adoption of the ambitious performance levels set out in Section 9.3 as soon as possible. Recent research (Ürge-Vorsatz et al., 2012a) finds that by 2050 the size of the lock-in risk is equal to almost 80 % of 2005 global building heating and cooling final energy use (see Figure 9.12). This is the gap between a scenario in which today's best cost-effective practices in new construction and retrofits become standard after a transitional period, and a scenario in which levels of building energy performance are changed only to today's best policy ambitions. This alerts us that while there are good developments in building energy efficiency policies, significantly more advances can and need to be made if ambitious climate goals are to be reached, otherwise significant emissions can be 'locked in' that will not be possible to mitigate for decades."[25]

31. We agree with the IPCC and discuss key recommendations in the following sections.

[24] Harvey L. D. D. (2013). Recent Advances in Sustainable Buildings: Review of the Energy and Cost Performance of the State-of-The-Art Best Practices from Around the World. Social Science Research Network, Rochester, NY, 281 – 309 pp. Available at: http: / / papers.ssrn.com / abstract=2343677; IPCC, above n1, 688.
[25] IPCC, above n1, 697.

4. Net zero buildings

4.1 Context

32. Net-zero buildings (**NZEBs**) are often defined as buildings where actual, on-site renewable energy systems generate as much energy as is consumed by the building.[26] The definition of NZEBs may vary in different jurdisdictions. Typically, they refer to a "net balance of on-site energy or in terms of a net balance of primary energy associated with fuels used by the building and avoided through the net export of electricity to the grid".[27] NZEBs can be constructed or can be a result of retrofits of existing buildings.

33. Australia's first commercial NZEB is the Pixel Office Building (shown below). The building has a pixelated shade screen facade, double glazed windows, daylighting and natural ventilation to minimise the need for energy. Its entire energy needs are supplied by solar panels and wind turbines on its roof (see Figures 11-12 below). It was built a decade ago and provides proof-of-concept that such buildings are achievable. AR5 found that "recent developments in technology and know-how enable construction and retrofit of very low and zero-energy buildings, often at little marginal investment cost, typically paying back well within the building lifetime (*robust evidence, high agreement*)."[28]

Figure 11: Pixel Office Building by Studio 505, Australia's first NZEB office building

4.1 Global response

34. The World Green Building Council's (**WGBC**) Net Zero Carbon Buildings Commitment requires signatories to require all new buildings to operate at net zero carbon by 2030

[26] IPCC, above n1, 689.
[27] IPCC, above n1, 689.
[28] IPCC, above n1, 675.

and all buildings to operate at net zero carbon by 2050. A growing number of cities and countries have signed this commitment, including:

a. Baden-Württemberg;

b. California;

c. Capetown;

d. Catalonia;

e. Copenhagen;

f. Helsinki;

g. London;

h. Los Angeles;

i. Medellin;

j. Melbourne;

k. Navarra;

l. Oslo;

m. Paris;

n. Scotland;

o. Sydney;

p. Tokyo;

q. Toronto;

r. Vancouver; and

s. Washington DC.

35. Some jurisdictions have more ambitious targets than the WGBC's Net Zero Carbon Buildings Commitment. For example, California's Energy Efficiency Strategic Plan requires all new residential construction to be zero net energy (**ZNE**) by 2020 and all new commercial construction to be ZNE by 2030. It also requires 50% of commercial buildings to be retrofitted to ZNE by 2030 and 50% of new major renovations of state buildings to be ZNE by 2025.[29]

[29] <www.cpuc.ca.gov/ZNE>

4.3 Recommendations:

Recommendation 1: Amend proposed design consideration 17 to include a requirement for all new buildings to be net zero by 2030 and all existing buildings to be net zero by 2040.

Recommendation 2: A phased plan to reach net zero for all buildings.

Recommendation 3: Design criteria requiring rooftop solar photovoltaics to be installed in all new residential and commercial buildings from 2021.

5. Embodied carbon

5.1 Context

36. "Embodied carbon" refers to "carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure."[30] It includes emissions released during the manufacturing, transportation, operation and end of life of all built assets, and comprises approximately 11% of global GHG emissions.[31]

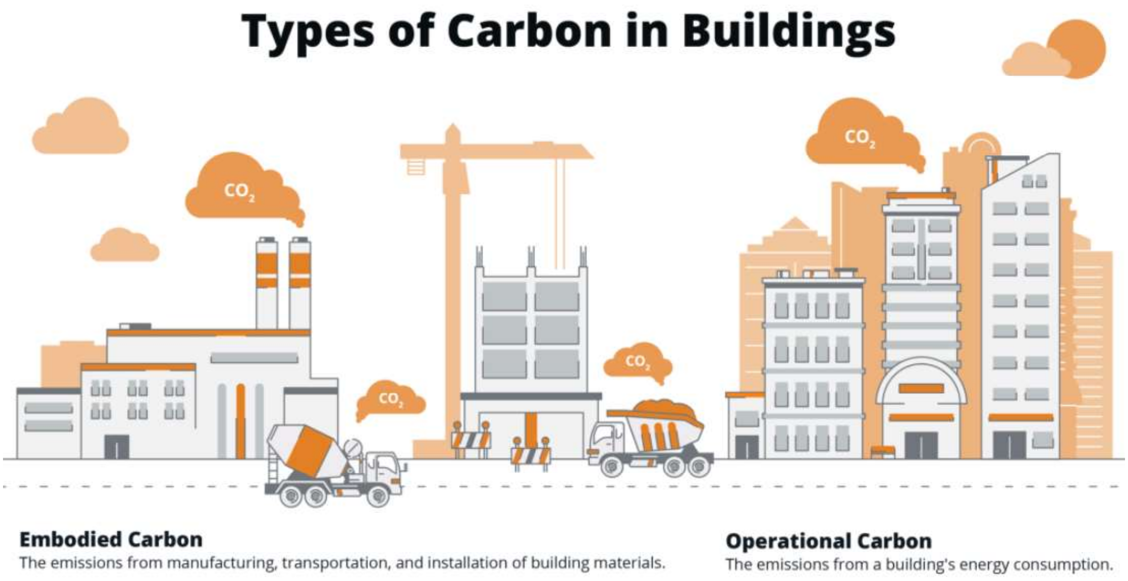


Figure 12: Illustration of embodied carbon and operational carbon[32]

37. The total carbon emissions of a building are spread over a 60-year lifespan. In Figure 13 below, the pink bar in the left side of the graph shows how significant the upfront carbon emissions from extraction, maintenance and construction are when compared

[30] World Green Building Council, *Bringing embodied carbon upfront* (September 2019).
[31] Ibid 8.
[32] <https://www.carboncure.com/concrete-corner/what-is-embodied-carbon/>

to yearly carbon emissions from a building. It also shows how embodied carbon is emitted throughout the entire life-cycle of building. Together, the combined embodied carbon and operational carbon related to energy use over the 60-year lifespan of a building comprise the "Whole Life-Cycle Carbon Emissions" of a building.[33]

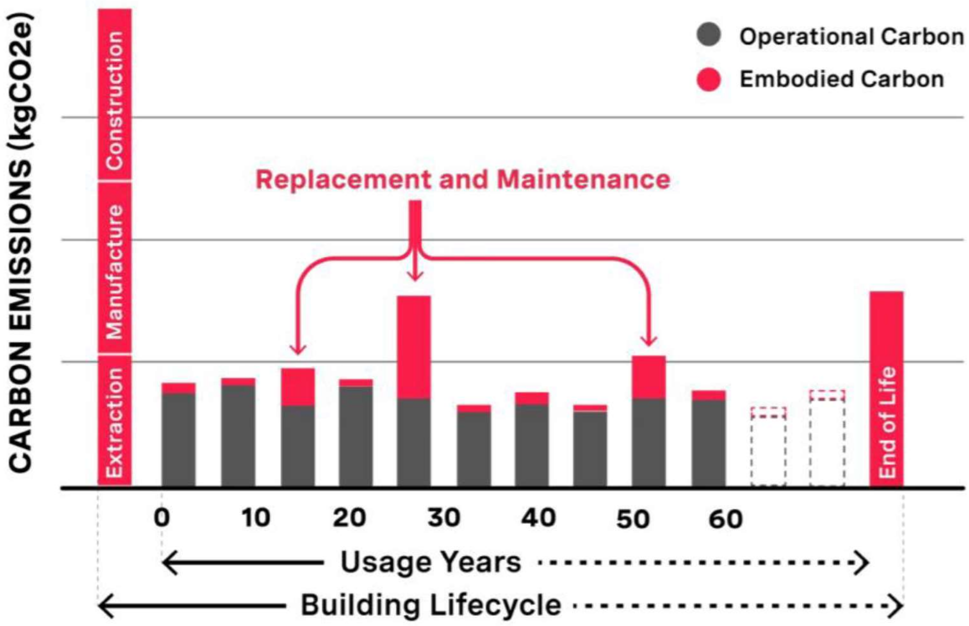


Figure 13: Embodied carbon emissions as a percentage of total building emissions - in red. Source: Graphics based on data from Sturgis Carbon Profiling / RICS[34]

38. <u>The WGBC estimates that "upfront carbon", which are CO_2 emissions released before the building or infrastructure is used, will comprise half of the entire carbon footprint of new construction between now and 2050.</u>[35] Earlier this year, the Architects Climate Action Network (**ACAN**) released a study on embodied carbon, which was endorsed by the University of Bath entitled "The Carbon Footprint of Construction" (**ACAN Study**). It found that 75% of a building's total emissions from a 60-year timeframe can come from embodied carbon (see Figure 14 below).

[33] Ibid 12.
[34] Architects Climate Action Network, *The Carbon Footprint of Construction* (February 2021) 11.
[35] Ibid 8.

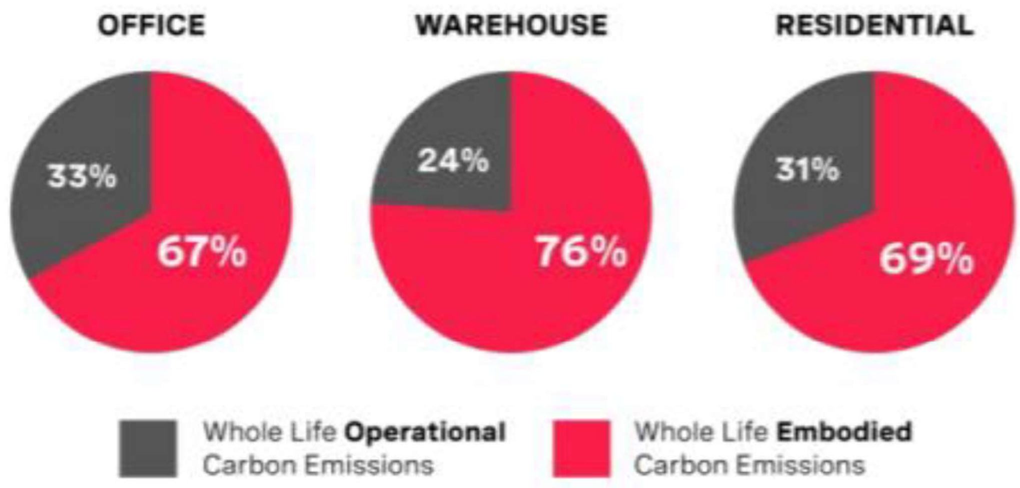


Figure 14: Indicative carbon emissions throughout the lifecycle of a building. Source: Graphic developed from work by LETI18[36]

5.2 Design

39. Design can reduce embodied carbon from buildings by addressing CO_2 emissions from (1) the construction, repair, maintenance demolition, disposal and reuse of materials and (2) improving operational efficiency by reducing the use of mechanical and electrical (**M&E**) systems.[37]

40. In relation to (1) design choices on structure, façade and finishes can make an impact on CO_2 emissions. In relation to (2), design choices on the operational efficiency, building envelope composition and M&E systems can also reduce CO_2 emissions.[38]

41. Materials with high embodied carbon content should be used where necessary and otherwise designed out. Conversely materials with low or negative embodied carbon such as bio-based materials (eg softwood timber, plywood, cross laminated timber and plant fiber insulation) should be used to remove carbon from the atmosphere.[39] Figure 13 below shows examples of the embodied carbon content of different materials.

[36] Ibid 12.
[37] Ibid 17.
[38] Ibid 17.
[39] Ibid 17.

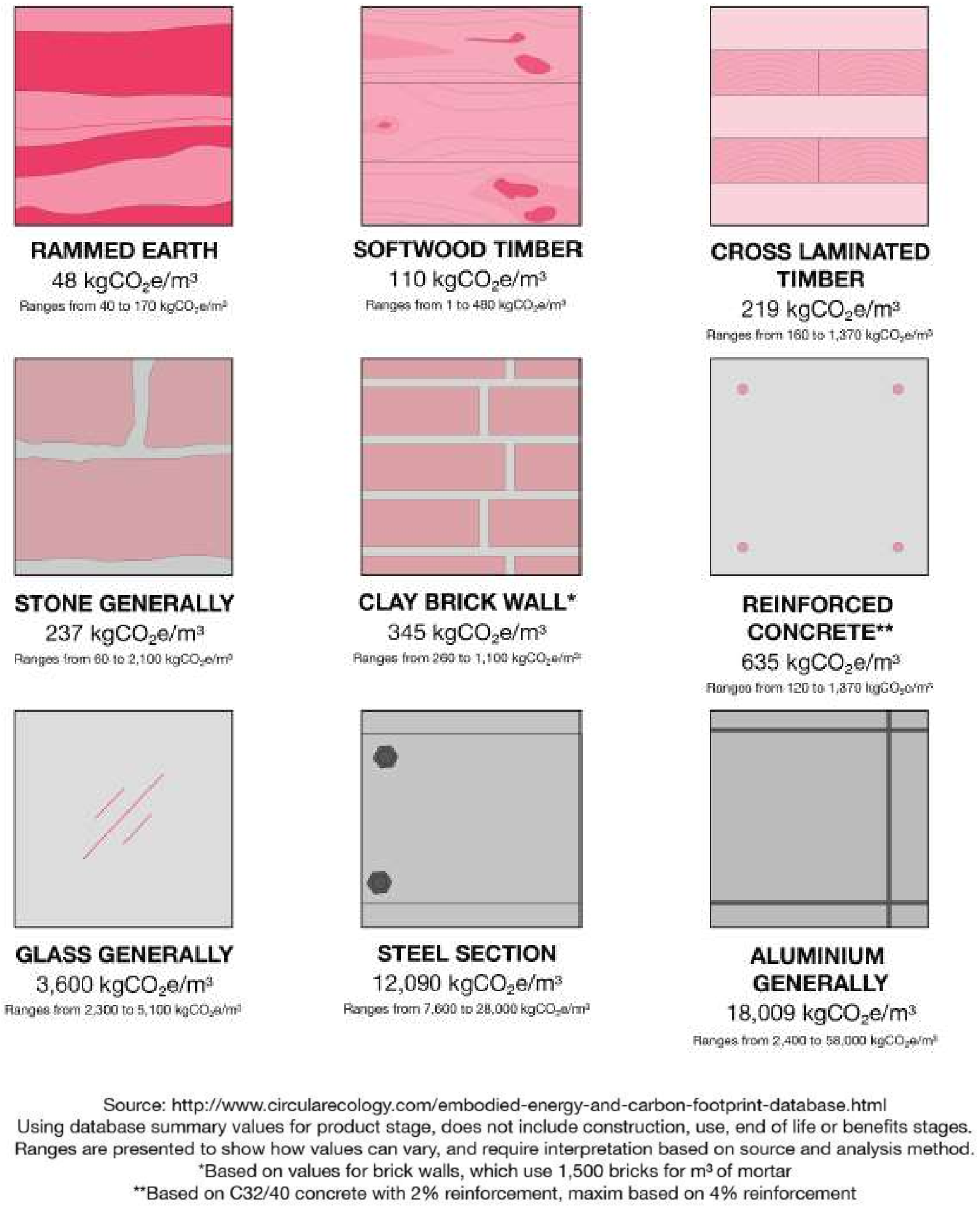


Figure 14: The relative carbon emissions of different materials. Source: Graphic based on illustration and research by Ciaran Mal[40]

[40] Ibid 19.

5.3 EIE comments

42. We support s3.2.1 of the EIE, which requires a design statement for all development, that includes embodied carbon.

43. We also support A.2.5, which proposes amendments to the Apartment Design Guide (**ADG**), which updates design objectives and guidance and introduces the environmental performance of materials as a new design criteria.

5.3 Recommendations

44. Given the urgency of reducing carbon emissions in NSW, we make the following recommendations:

    Recommendation 4: Whole life carbon assessments to be completed at the early design stages, to be submitted as part of pre-application enquiries and full planning submissions for all developments.

    Recommendation 5: Whole life carbon evaluation of retrofit compared to demolition and redevelopment.

    Recommendation 6: Amend proposed design criteria 6 to include embodied carbon targets for certain categories of developments such as state significant projects.

    Recommendation 7: Carbon limits for key materials in government projects.

PART 2: Waste Management

6. Challenges

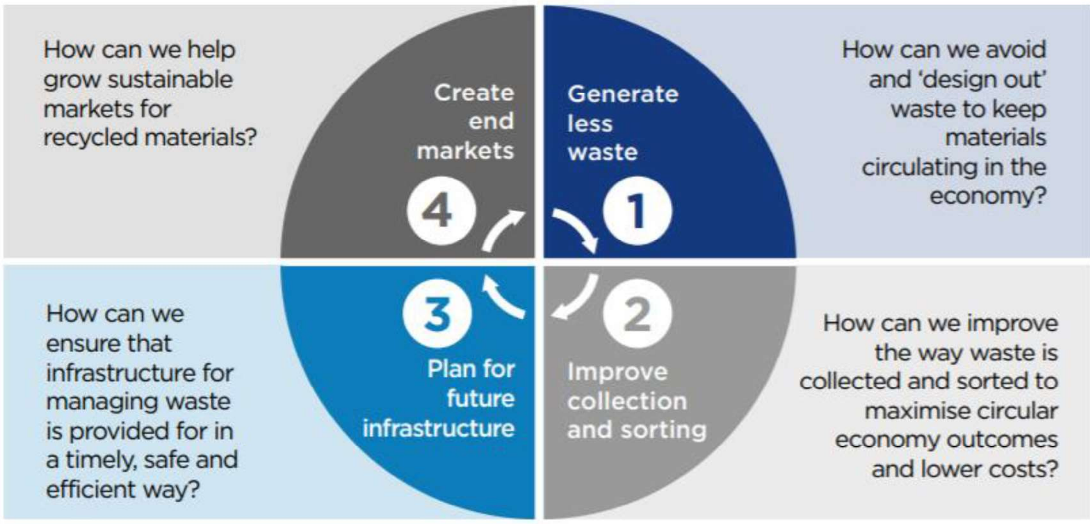
45. Earlier this year, the NSW government published an Issues Paper - "*Cleaning Up Our Act: The Future for Waste and Resource Recovery in NSW*". In the Issues Paper, the NSW government set out some of key challenges for waste management as follows:

    a. Waste generation is expected to increase from over 21 million tonnes per annum to 31 million tonnes. This growth rate is higher than the rate of population;

    b. NSW is unlikely to meet its target of 75% of waste from landfills by 2021. In 2017–18, only 65% of waste was recovered with 35% disposed in landfill; and

    c. There is a risk that NSW's waste systems will not be able to cope and that landfills will reach capacity in the next 10-15 years.[41]

46. The NSW Government seeks to align its future waste management strategy with a transition to a circular economy. The Issues Paper set out how this alignment could be achieved in Figure 15 below.



[41] State of NSW, *Cleaning Up Our Act: The Future for Waste and Resource Recovery in NSW* (March 2021) 4.

Direction 1: **Generate less waste** by avoiding and 'designing out' waste, to keep materials circulating in the economy.

Option 1.1: State-wide targets

Option 1.2: Designing out waste

Option 1.3: Awareness and behavioural change

Option 1.4: Targets for government agencies

Option 1.5: Regulatory safeguards

Direction 2: **Improve collection and sorting** to maximise circular economy outcomes and lower costs.

Option 2.1: Recovering food and garden organics

Option 2.2: Standardise collection systems for households and businesses

Option 2.3: Network-based waste drop-off centres

Option 2.4: Waste benchmarks for the commercial sector

Option 2.5: Innovation and 'waste-tech'

Option 2.6: Joint local council procurement

Option 2.7: Combining commercial and industrial waste collection services

Option 2.8: Economic incentives and the waste levy

Direction 3: **Plan for future infrastructure** by ensuring the right infrastructure is located in the right place and at the right time.

Option 3.1: Long-term waste and resource recovery infrastructure needs

Option 3.2: Place-based development

Option 3.3: Making it easier to do business

Option 3.4: Innovative financing models

Direction 4: **Create end markets** by fostering demand for recycled products in NSW (particularly glass, paper, organics, plastics and metals) so that recovered materials re-enter our economy and drive business and employment opportunities.

Option 4.1: Recycled content in government procurement

Option 4.2: Standards for recycled content and materials

Option 4.3: Match suppliers with markets

Option 4.4: Best-practice regulatory environment for energy from waste projects

The implementation and progress of the four directions will be underpinned by an Implementation Framework that sets out the information and monitoring and reporting arrangements for the strategy.

Figure 15: Alignment of 20-Year Waste Strategy directions with a circular economy approach

47. The following sections discuss how the Design and Place SEPP has a critical role in implementing Directions 1, 2 and 3.

7. Construction and Demolition Waste

7.1 Context

48. Construction and demolition (**C&D**) is the source of the highest amount of waste in NSW. In 2018, 12.8MT of C&D waste was generated compared to 4.2 MT of municipal solid waste, and 4.4 MT of commercial and industrial waste (see Figure 16 below).[42]

[42] Ibid 9.

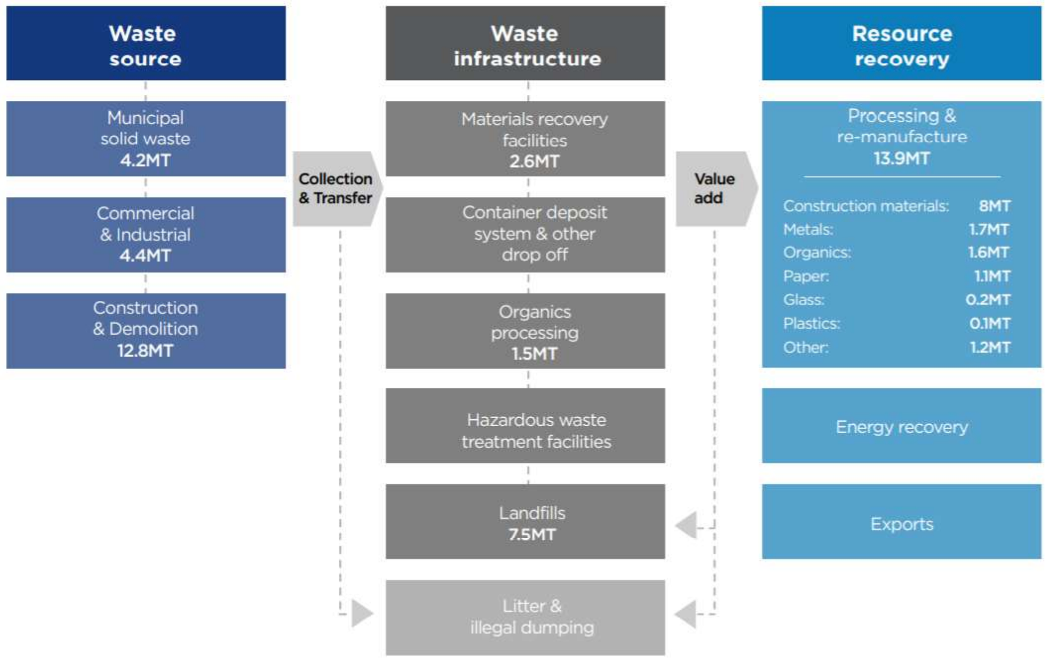


Figure 16: NSW waste flows 2017-2018

7.3 Zero waste construction

49. The Zero Waste Design Guidelines, which were written by the American Institute of Architects, New York, state that "waste is a design flaw".[43] This is because a significant amount of waste can be designed out of the construction process through material optimization by reducing the amount of materials within the building and the waste produced during construction and material selection by reusing materials and choosing materials with recycled content. Further, buildings should be designed for deconstruction of materials and components at end of life.

7.4 EIE Comments

50. Given the importance of the design process in reducing construction waste, it is concerning that the EIE is, for the most part, silent on this matter. We consider that the Design and Place SEPP must incorporate design principles that address material optimization and selection to reduce waste.

[43] <https://www.zerowastedesign.org/01-context/environmental-issues-of-cradle-to-grave-consumerism/>

7.4 Recommendations

Recommendation 8: Insert new design criteria for designing for deconstruction and disassembly. For example:

- Designing for the end of life of a building, to take into consideration how many layers of a building have different life-spans. For example, these are building layers in order of decreasing life-span: Site, Structure, Skin, Services, Space Plan and Stuff. Design should be for "slippage" so removal of short life-span layers can occur without disturbing longer life-span layers. Consider an end-of-life destination for each layer.

-For ease of separation and deconstruction, fixing components together by reversible means. Consider mechanical fixings; avoid gluing and composite materials. Consider using a type of mortar that allows bricks and blocks to be easily dismantled.

-Designing for replacement ease at the smallest level. For instance, selecting floating carpet tiles that adhere with tabs ensures that damaged tiles can be individually replaced; some carpet manufacturers blend in tiles from another dye lot so attic stock won't be required.

-Design incorporating "material passports" by providing information about building materials that will allow for easier reuse later. The information may be available in a BIM data model and can also be physically attached to the materials.

Recommendation 9: Insert new design criteria for reused material selection. This should include:

-An initial site visit where all materials and structures, if any, should be assessed for their potential for reuse. Then aim to reuse them at their highest capacity.

-Consideration of use of reclaimed components (eg raised floors, kitchens, furniture systems, doors and carpet) and reclaimed materials—such as bricks and lumber—especially if they're local.

-Consideration of re-use of excavation material and balance cut and fill on-site.

-Specifications to be written allowing contractors to substitute approved reclaimed components and materials.

Recommendation 10: Insert new proposed design criteria for recycled materials. This should include:

-Consideration of materials with high recycled content that can themselves be recycled at the end of life, preferably in a continuous circular loop without downcycling.

-Consideration of local sources of recycled materials, such as glass pozzolan, which can replace cement in concrete.

-Consideration of cradle-to-cradle certified products.

8. Food waste

8.1 Context

51. The Issues Paper identified an increasing need for buildings to be designed with better waste stream management. include source separation. It stated:

> "Apartments now account for around 30% of private dwellings in Greater Sydney. Medium and high-density housing (known as multi-unit dwellings, or MUDs) have higher rates of occupancy and density, creating new logistical challenges for effective waste management. For example, waste management has often not been prioritised leading to not enough storage facilities for bins and limited space for source separation. Without improvements, MUDs can contribute to higher rates of contamination in recycling, poor amenity outcomes and traffic hazards."[44]

52. The collection of organic waste can be a significant challenge if it is not incorporated in the design stage because the trash rooms can be either too small or unventilated, or because staff would have to maintain many small containers and return them inside after collection.

8.2 Material flow design

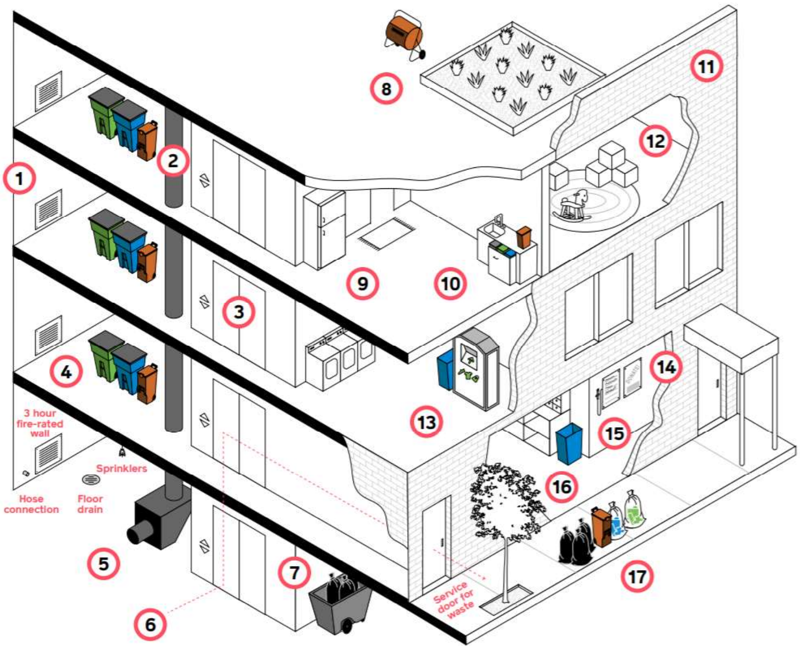
53. In order to transition to a circular economy, material flow must become a critical part of building design. In the design stage, architects must estimate the quantity of recycling, organics, textiles and trash that can be expected in their building—including options for reducing the volume and transporting it— and design for material flows.

54. Unlike conduits and pipes that transport gas, electricity, and potable and waste water in and out of buildings, material flows are not uniform and are largely moved by hand. They involve multiple decisions along the way such as sorting waste, where waste must be disposed of, and can involve multiple locations and people. Figure 17 below is a conceptual diagram of how waste can be incorporated into building design.

55. Further, designing for material flow must integrate with municipal management of waste as it affects the quality of life on a street. In turn, the design of sidewalks and streets affects the ability for waste to be collected in buildings.

[44] State of NSW, above n 41, 20.

1. Waste room: consider area, ventilation, lighting, signage. 2.03, 2.10
2. Chute and disposal of recycling on every floor required by BC 1213.3 ≥ 5 stories and ≥ 9units)
3. Consider how waste travels vertically (by chute, by residents or by building staff in regular/service elevator). 2.02
4. Provide co-location disposal for all waste streams including organics. Consider other waste streams that may block chutes, e.g., cardboard, textiles, hangers. 2.08
5. Trash compactor required by BC 1213.2 for ≥4 stories and ≥12 units
6. Consider path of waste to curb and staff time required. 2.02, 2.05
7. Waste storage room per BC 1213.1 or BC 707.13.4. Use containers unless room is ratproof and fireproof room per HMC 27-2021. Consider area required, ventilation, and washing of containers. 2.01, 2.03
8. Compost can be made and used on-site in gardens. 2.23



9. Shallow refrigerators and shelves to reduce "lost food," or smart refrigerators. 2.17
10. Pull-out cabinet with bins (all waste streams) and counterop organics bin. 2.08
11. Consider impacts of building materials selection and construction process. Optimize material usage, consider end of life. 2.27-2.35
12. Consider amenities that reduce material consumption (e.g., children's play areas with toys, shared goods library, cleaning service with vacuums). 2.15
13. Provide textile recycling and plastics recycling in laundry room. 2.13
14. Consider possibilities for reuse such as online bulletin boards and donation refrigerators. 2.18
15. Provide feedback on waste generation to residents and staff to change behavior. Consider how to incorporate SAYT back to resident. 2.11
16. Provide paper recycling in mail room and cardboard collection in parcel room. 2.13
17. Provide set out area, coordinate with street, trees, furniture, curb cuts and entrance. See NYC Rules for setout. 2.04

Figure 17: Residential building waste design considerations[45]

[45] AIA New York, above [insert] 62.

8.3 EIE Comments

56. Given the importance of design in material flows through a building, it is concerning that the EIE only proposes design guidance for “the separation of waste-sorting spaces for residential and non-residential uses to ensure these are adequately serviced and amenable, aiming to improve recycling activity.” We consider that the Design and Place SEPP must incorporate design principles that consider material flows through a building including the collection of organic waste.

8.3 Recommendations

Recommendation 10: Insert new design principle which is to “Design Places that enable a circular economy”.

Recommendation 11: Insert new design criteria for material flows in buildings. This should include:

-Planning for tenant disposal and separation including waste stream types and quantities, location of waste stations, types of bins and signage.

-Planning for movement of recyclables and waste to central storage including frequency, transport containers and route. This should include safe vertical transfer methods and consideration of chutes and sorters, including organic chutes.

-Planning for waste storage including calculating area required, volume reduction equipment, location, layout, accessibility and time restrictions.

-Planning for collection – such as where bags or containers will be set out on the curb and, if containers are used, areas for washing containers. If compactor containers are used, consider collection vehicle access and ceiling height.

PART 3: Biodiversity

11. Trends

57. Australia's biodiversity is unique and endemic. It is an important part of our identity and essential to our health and well-being.

58. The state of biodiversity in Australia, however, is poor and declining. The 2016 Australian State of the Environment Report concluded:

> "The current overall state and trend of biodiversity has not improved since 2011, and present a very mixed outlook, with many assessments showing poor status and worsening trends. In addition, the impact of many of the pressures on biodiversity is high and increasing. Current management actions and effectiveness appear insufficient to redress the declining status of biodiversity. Although the impact of pressures overall has increased, the resources available for managing biodiversity, research and monitoring have not."[46]

59. The 2018 NSW State of the Environment Report (**NSW SOE**) found that biodiversity in NSW was poor and getting worse. Currently, 77 species are extinct. 1025 species and 112 ecological communities are listed as threatened. In the three years leading up to 2018, 26 more species were listed as threatened under the *Biodiversity Conservation Act 2016* (NSW) and *the Fisheries Management Act* 1994 (NSW).

Figure 18: A koala in an urban environment (Source: Australia Koala Foundation)

[46] Cresswell ID & Murphy HT (2017). *Australia state of the environment 2016: biodiversity*, independent report to the Australian Government Minister for the Environment and Energy, Australian Government Department of the Environment and Energy, Canberra.

12 Urban biodiversity

60. Urban areas encapsulate diverse and valuable habitats which provide ecosystem services, social and health benefits (see Figure 18 below).

	Cities	Buildings	People
Climate change and environment	• cooler cities[2] • carbon sequestration • provision of habitat for plant and animals[3] • filtration of airshed and reduction in pollution[4]	• anthropogenic noise bugging and natural sounds • air purification	• pro-nature attitude
Health and wellbeing	• reduced obesity and health costs	• reduction in stress of workers • improvement in attention and attendance; fewer sick days • improved social connection	• better health outcomes, mental and physical • increased life expectancy • positive effect on anxiety and mood disorders
Value and economic impact	• reduced energy use • passive stormwater management[6] • resilience to major storms and climate events • Attraction of investment	• energy savings • management of on-site stormwater run-off • cooler and quieter buildings • increased property value	• safer neighbourhoods • improved social cohesion, liveability and local commerce

Figure 18: The value of ecology and biodiversity to the built environment and its occupants[47]

61. The protection of urban biodiversity is important because human populations inevitably occupy the places where certain aspects of biodiversity are richest. Fastest growing cities tend to be in areas where numbers of species are also naturally the highest.[48]

62. Streamlining the planning process through the Design and Place SEPP is an excellent opportunity to embed the protection of urban biodiversity into the urban landscape to deliver resilient communities with thriving habitats which provide essential ecosystem services to the community.

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[47] Green Building Council of Australia, *Building with nature: Prioritising ecology and biodiversity for better buildings and cities* (May 2018) 25.

[48] Steve Morton, Andy Sheppard, Mark Lonsdale (eds.), *Biodiversity* (CSIRO Publishing, 2014).

13 Principles

13.1 EIE proposal

63. The EIE proposes five guiding principles for the Design and Place SEPP as follows:

Figure 19: Guiding principles of the proposed Design and Place SEPP[49]

64. We consider that the conservation and enhancement of biodiversity need to be clearly articulated in the guiding principles.

13.2 Recommendation

Recommendation 12: Amend Design Principle 5 to "Design resilient and diverse places enduring communities and habitats".

Recommendation 13: Insert new design principle as follows: "Principle 6. Design places that conserve and enhance biodiversity with no net loss to biodiversity and, where feasible, a net biodiversity gain.

14. Design Qualifications

14.1 EIE proposal

65. The EIE proposes that the Design and Place will require "developments that are three or more storeys, open space over 1000 m2, and precincts and significant development, to be designed by suitably qualified design professionals, particularly where design has a high impact on the environment or community due to its scale or future population."[50]

[49] State of New South Wales, *Explanation of Intended Effect of a Design and Place SEPP* (2021) 14.
[50] Ibid 25.

66. These new requirement for qualified designers will align the requirement for designers under the *NSW Design and Building Practitioners Act 2020* with current regulatory requirements under the *Environmental Planning and Assessment Regulation 2000* (NSW) (**EP&A Regulation**) and SEPP (Educational Establishments and Child Care Facilities) 2017 (**Education SEPP**).

67. In particular, the EIE proposes to require qualified designers at three levels of development as follows:

> "-a registered architect (qualified designer, same definition as presently used) will be required for all buildings with three or more storeys, and in the case of multi-residential buildings, four dwellings;
>
> -a registered landscape architect (qualified designer, new definition) will be required for all open space greater than 1000 m^2;
>
> -a qualified designer, i.e. urban designer, architect with master planning skills or landscape architect, will be required for master planning of all precincts and significant development (qualified designer, new definition)."

68. In order to deliver environmental benefits that enhance biodiversity and habitats which provide sustainable ecosystem services, there must be a formal inclusion of a registered ecologist on the design skills requirement.

69. Landscape architects or designers do not have the skill set to assess the feasibility of ecosystem enhancements and secure ongoing management of these spaces so they achieve the desired outcome. Ecologists must be involved in the design process from project inception. Early ecologist involvement is crucial to ensure the environment is considered early in the project process thus ensuring mitigation and environmental enhancement measures are duly considered in the design process.

14.2 Recommendation

Recommendation 14: A qualified ecologist to be required for all open space greater than 1000 m^2 and for master planning of all precincts and significant developments.

14. Considerations

14.1 EIE proposal

70. The proposed Design and Place SEPP will require applicants to demonstrate through application requirements that the SEPP principles and considerations have been met. These requirements will streamline existing provisions in the planning system and will comprise of:

    a. a site analysis;
    b. a precinct structure plan;
    c. a design statement; and
    d. precinct planning support documents.

14.2 Biodiversity retention

71. While some green developers make allowances for remnant vegetation, and build it into the design, but most of the developers draw up their plans with no attention to what is on site, and then push hard to get it all cleared. Developers often advocate complete clearing to make things easy and cheaper for themselves. This “clear then build” approach is, for the most part, supported by local councils.

72. In terms of biodiversity, the proposed design and place considerations on pages 23-32 of the EIE are disappointing. They do not adequately translate the 5 Principles allowing for biodiversity and habitats to thrive in an urban environment whilst providing crucial ecosystem services that provide resilient and diverse places.

73. In our view, consideration 7, which states that “the precinct retains, where possible, and provides additional green infrastructure”, does not adequately protect biodiversity values. Green Infrastructure should be a mandatory requirement for all development. The wording ‘where possible’ should be removed.

74. The inclusion of ‘tree canopy’[51]as a core consideration is simply not enough and a weak attempt at addressing the complex nature of biodiversity and habitat diversity in urban areas. Tree planting is often proposed as part of project designs to demonstrate that the project improves environmental values, but this is often at the expense of other habitats. Not all tree planting is positive and not all trees are equal. This should be reworded to “net biodiversity gain’ to allow for diversity and innovation.

14.3 Biodiversity enhancement

75. While consideration 7 refers to “green infrastructure”, this focuses on connecting spaces and retaining/enhancing tree canopy and lacks inclusion of biodiversity enhancement requirements. The other considerations appear to be solely based on hard infrastructure. However, there is scope in all development to include biodiversity enhancement. For example, all apartment design should include living roofs.

[51] Ibid 32.

Figure 20: Namba Parks, a retail and office complex in Osaka, Japan, has an eight-level rooftop garden. Photograph: Yuji Kotani/Getty Images

Figure 21: The terraced ‘Step Garden’ of the Acros Fukuoka Prefectural Hall in Japan was designed to be used by the public as park space, as well as helping to lower temperatures in the surrounding area.

76. We refer to the London Plan, which expands the concept of “green infrastructure” to include urban greening as a fundamental element of site and building design, and incorporating measures such as green roofs and green walls. The rationale for this is that any additional development places greater demands on existing green infrastructure and, as such, a higher standard is justified.[52]

Figure 22: An example of a green wall[53]

77. The London Plan uses an Urban Greening Factor for a proposed development. It is calculated in the following way: (Factor A x Area) + (Factor B x Area) + (Factor C x Area) etc. divided by Total Site Area. So, for example, an office development with a 600 sq.m. footprint on a site of 1,000 sq.m. including a green roof, 250 sq.m. car parking, 100 sq.m. open water and 50 sq.m. of amenity grassland would score the following:

(0.7 x 600) + (0.0 x 250) + (1 x 100) + (0.4 x 50) / 1000 = 0.54.

78. So, in this example, the proposed office development exceeds the interim target score of 0.3 for a predominately commercial development under the current policy. Currently, the urban greening targets under the London Plan are set out in Table 3 below.

[52] Greater London Authority, *The London Plan: Spatial Development Strategy for Greater London* (2021) 322.
[53] <https://www.landscapearchitecture.nz/landscape-architecture-aotearoa/2018/2/16/green-walls-good-or-bad-for-the-environment>

Table 3: Urban greening factors under the London Plan[54]

Surface Cover Type	Factor
Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site.	1
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm – see livingroofs.org for descriptions.[A]	0.8
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree – see Trees in Hard Landscapes for overview.[B]	0.8
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) – meets the requirements of GRO Code 2014.[C]	0.7
Flower-rich perennial planting – see RHS perennial plants for guidance.[D]	0.7
Rain gardens and other vegetated sustainable drainage elements – See CIRIA for case-studies.[E]	0.7
Hedges (line of mature shrubs one or two shrubs wide) – see RHS for guidance.[F]	0.6
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6
Green wall –modular system or climbers rooted in soil – see NBS Guide to Façade Greening for overview.[G]	0.6
Groundcover planting – see RHS Groundcover Plants for overview.[H]	0.5
Amenity grassland (species-poor, regularly mown lawn).	0.4
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014.[I]	0.3
Water features (chlorinated) or unplanted detention basins.	0.2
Permeable paving – see CIRIA for overview.[J]	0.1
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0

79. The above urban greening factors are useful because they incorporate biodiversity features and establish relative values. For example, species-poor grassland is given a lower value than intensive vegetation.

80. We note that establishing wetlands or open water in sites as part of developments would be of particular value in NSW as they could serve as refuges in hot climate or extreme weather conditions such as bushfires.

14.4 Street density

81. The EIE emphasizes the need for "finer grained streets' and proposes requirements for street density. It states;

[54] Greater London Authority, above n 52, 324.

"A key design element of public space is the street, making up some 80 per cent of the public space of our cities. Streets are the key social spaces in a community and provide the address for all residents and visitors, as well as facilitating movement and place activities. Finer grained street networks enable greater walkability and introduce a diversity of street types. New street grids in current precinct planning practice can often be too coarse to facilitate walkability, and the streets themselves, designed for cars, can lack sufficient provision for walking, cycling, and trees within a compact footprint, or lack differentiation of function.

Methods for calculating performance-based metrics of street intersection density and block sizes will be set out in the guide. Additional guidance on the design and connectivity of pedestrian and cycle networks, and the delivery of council and State government active transport routes will be provided, together with desired dimensions for streets based on their role and function."[55]

82. We are concerned with the criteria for fine-grained streets without consideration of the impacts on biodiversity and fragmentation of habitat. Streets are the greatest cause of loss of vegetation especially with the increasing use of roundabouts in design.

14.3 Recommendation

Recommendation 15: Amend consideration 7, which states that "the precinct retains, where possible, and provides additional green infrastructure" by removing the phrase 'where possible'.

Recommendation 16: Amend consideration 7, which requires "replacing any removed moderate or significant trees with at least two trees or precinct DCP/council replacement rate, whichever is higher" with "projects must provide a net biodiversity gain". This should also apply to the (1) site analysis and (3) design statement.

Recommendation 17: In situ retention of all remnant vegetation.

Recommendation 18: An urban greening factor to be applied to development proposals.

Recommendation 19: Methods for calculating performance-based metrics of street intersection density and block sizes will be set out in the guide to be applied only where streets do <u>not</u> impact patch sizes of habitat for threatened species and result in further fragmentation of habitat.

Recommendation 20: Street density planning guidelines must incorporate principles from the Koala Planning Guidelines by the Australian Koala Foundation to mitigate impacts on koalas.

[55] State of New South Wales, above n49, B10.

Recommendation 21: Amend the benefits of proposed design consideration 7 to acknowledge the use of trees for shade to reduce energy consumption and improve the livability of urban areas.

14. Guidelines

83. The proposed urban design guide does not make sufficient reference to generating a net biodiversity gain, securing ongoing management of these areas to ensure positive conservation management and that the desired outcome is achieved.

84. It should be a requirement in terms of UN Sustainable Development Goals to ensure intergenerational equity by ensuring access not only to open space but our natural habitats and the species that inhabit them.

85. It is noted that there is scope to address biodiversity requirements further in the proposed guidance tools and within local precinct or master planning controls.

    Recommendation 22: The proposed urban design guide to require net biodiversity gains and to secure ongoing management of these areas to ensure positive conservation management and that the desired outcome is achieved.