# Building the green economy: The time for Big Bets

White Paper

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## INTRODUCTION

The current discussion in Australia is to the most part focused on the potential risks and costs of the environmental challenge we face. And they are daunting – for example, the property market is expected to lose A$571 billion in value by 2030 due to climate change and extreme weather; as temperatures rise, workers in exposed industries may need to reduce their exposure to heat or the physical intensity of their work, which could cost the economy over A$420 billion.

But as American poet and essayist Walt Whitman reminded us, “Keep your face always toward the sunshine, and shadows will fall behind you.” That is not to downplay the seriousness of the carbon and biodiversity challenge the world faces, but rather to reframe it as one that can bring large economic and investment opportunities if we find the right way to engage. The size of the prize is large. Past work led by Dr. Fraser Thompson, co-founder of Cyan Ventures, found opportunities worth A$6.6 trillion in the clean energy and nature transition in the Asia Pacific. Australia is well-positioned to capture a large share of these opportunities domestically and through our export markets, but doing so will require a rethink of our current approach. In short, we need to focus on what we call “Big Bets”- a new technology or market that could meaningfully accelerate the breadth and pace of the transition to a green, low carbon economy. In this white paper, we explain this vast investment and economic opportunity, introduce the concept of big bets, and outline some of the key actions to unlock them.

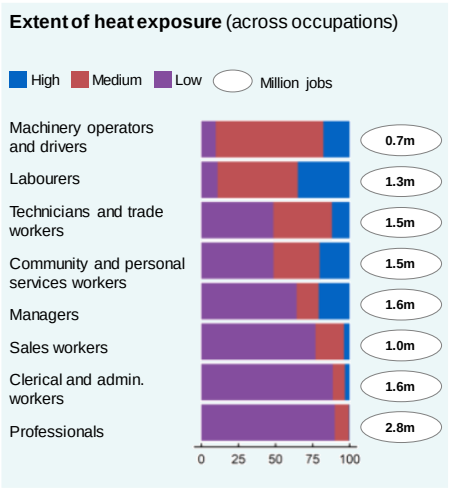
# CLIMATE CHANGE AND BIODIVERSITY LOSS POSE LARGE ECONOMIC RISKS FOR AUSTRALIA

Australia's 2023 intergenerational report identified some of the key risks associated with climate change for the economy and livelihoods. These include:

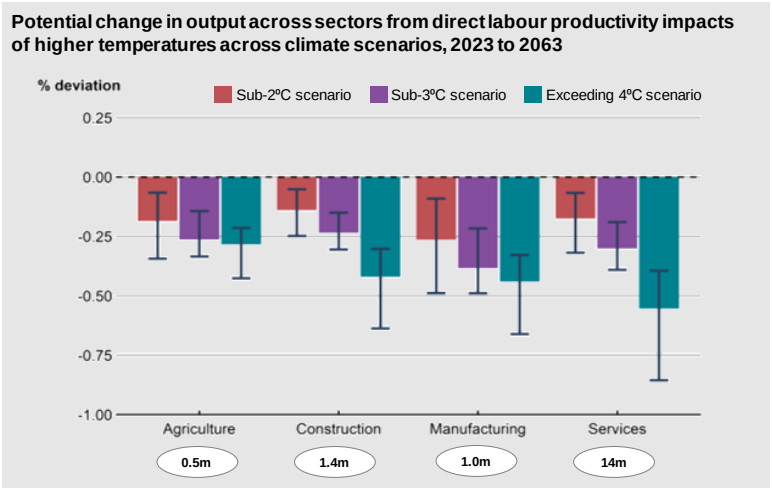
- **Property.** The property market is expected to lose A$571 billion in value by 2030 due to climate change and extreme weather.
- **Agriculture.** Agriculture accounts for almost 14% of Australia's exports and over 2% of jobs. However, extreme events like droughts, heatwaves, cyclones and floods could have a major impact on agriculture and food production. For example, reduced agricultural productivity and labour productivity as a result of climate change is projected to cost over A$19 billion by 2030, A$211 billion by 2050 and A$4trillion by 2100.
- **Worker productivity.** As temperatures rise, workers in exposed industries may need to reduce their exposure to heat or the physical intensity of their work. If global temperatures were to increase by up to 3°C or over 4C, without adaptive changes to current ways of working, Australia's aggregate labour productivity levels could decrease by 0.2 to 0.8 per cent by 2063, with major impacts in some sectors like services (Exhibit 1). This is a significant economic cost, reducing economic output over this period by between A$135 billion and A$423 billion in today's dollars.

## EXHIBIT 1

**A large share of Australia's workforce is exposed to heat**




**…leading to labour productivity decreases of up to 0.9% in some sectors by 2063**

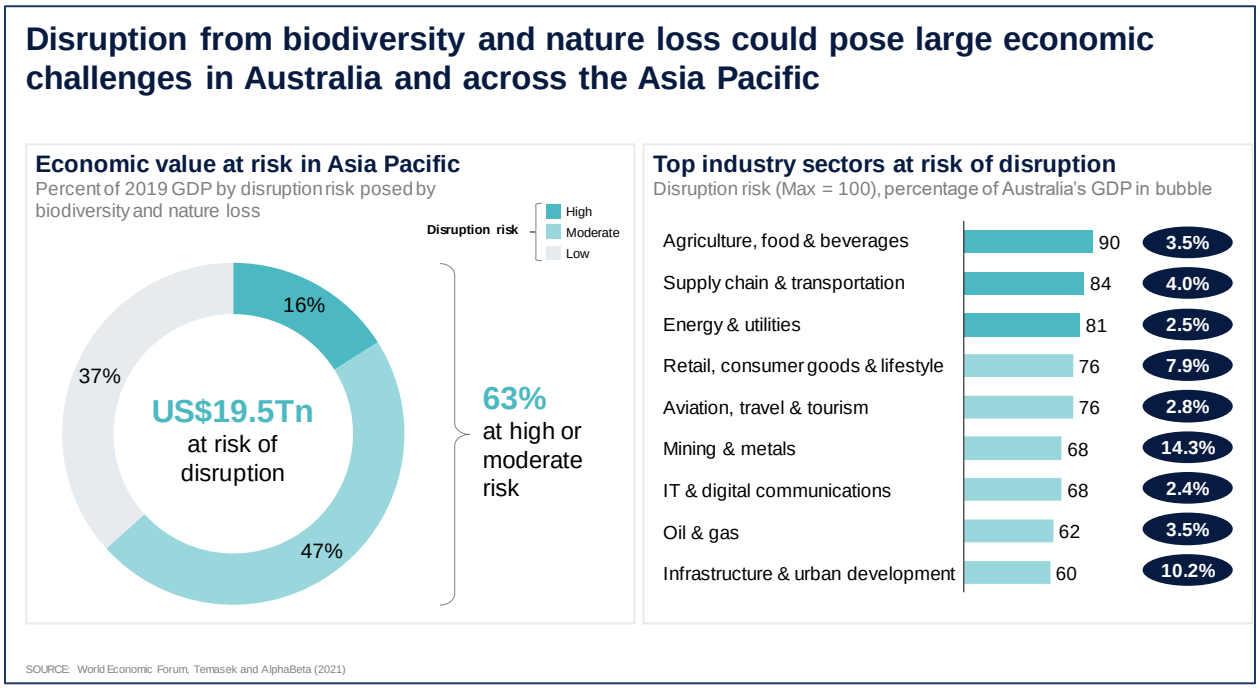



SOURCE: 2023 Intergenerational Report, Australian Bureau of Statistics, Jobs in Australia 2020-21 financial year

- **Tourism.** Tourism was worth A$26.1 billion in 2022-23 (or 2.5% of Australia's GDP) and employs over 626,000 people. However, biodiversity loss and climate change could pose large risks to the tourism market for Australia. For example, in the immediate aftermath of the 2019–20 bushfires, an estimated 80,000 tourists cancelled or postponed activities.

And unfortunately, it is not just climate change that poses an environmental risk to the economy. Loss of biodiversity and nature creates an additive risk. Biodiversity and nature loss disrupts the key contributions of nature to people, in turn placing critical economic activities at risk of disruption. For instance, pollinator populations have declined globally, putting at risk the production of crops. In Australia, pollination services have been estimated to contribute between A$620 and A$1,730 million to the value of Australian agricultural production.[1] It's not just agriculture at risk from biodiversity loss, almost every sector in the Australian economy has some significant exposure either directly or indirectly to loss of biodiversity (Exhibit 2).

**EXHIBIT 2**



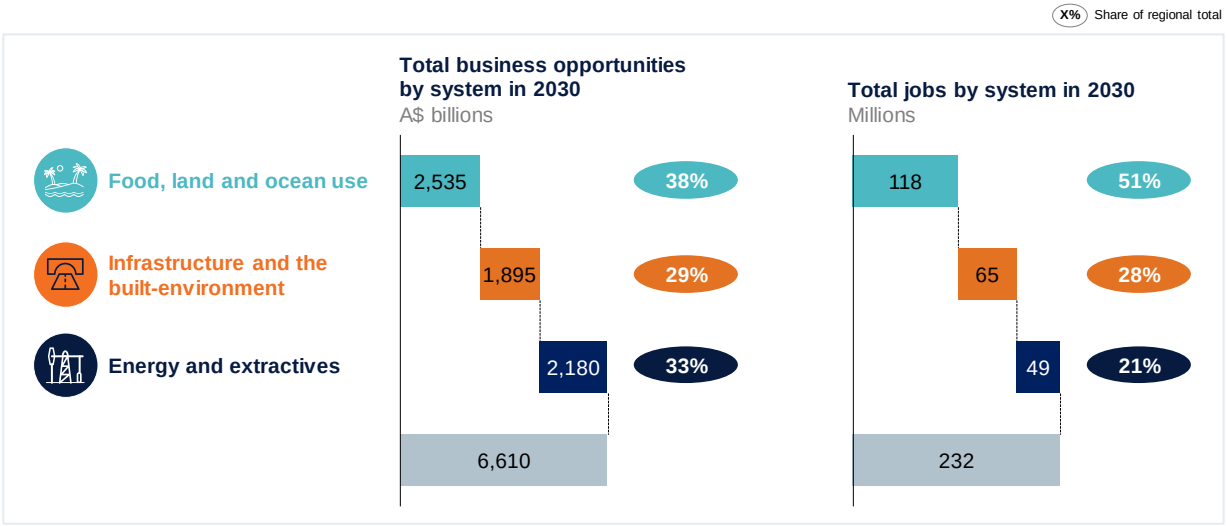

[1] Further information available from Australia's Department of Agriculture, Fisheries and Forestry. Link: https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/bees

## A $6.6 TRILLION OPPORTUNITY, BUT TWO-THIRDS HAS LIMITED FOCUS

Now for the good news. There is a viable pathway to address these climate change and biodiversity risks, which could also drive significant economic and investment value. Research led by Dr. Fraser Thompson, Managing Partner of Cyan Ventures, on behalf of AlphaBeta, and in collaboration with the World Economic Forum and Temasek, identified US$4.3 trillion (A$6.6 trillion) of business opportunities by 2030 in the Asia Pacific related to the clean energy and nature transition (Exhibit 3).[2]

**EXHIBIT 3**

**There is A$6.6 trillion (US$4.3 trillion) of business opportunities associated with the energy and nature transition in the Asia Pacific by 2030**



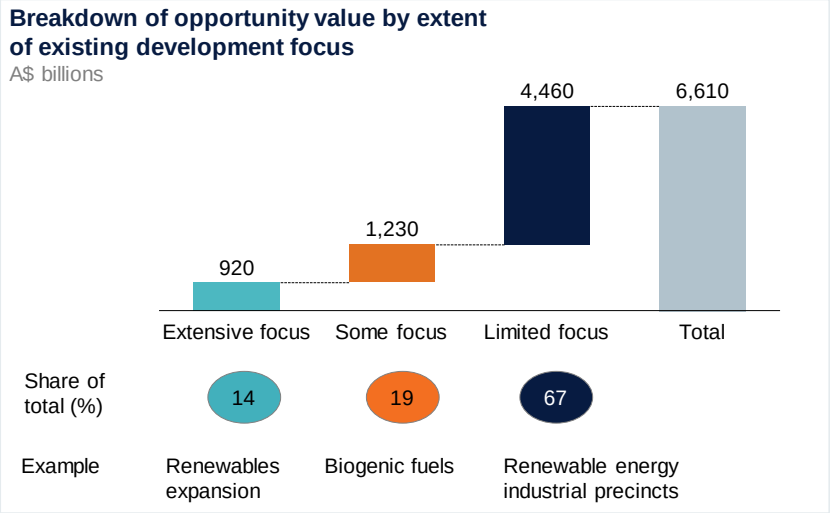

Note: Converted from USD to AUD based on exchange rates in March 2024.
SOURCE: World Economic Forum, Temasek and AlphaBeta (2021)

These opportunities range from creating a circular economy to reduce waste through to zero carbon long range transport. Unfortunately, only one-third of these opportunities are receiving significant business and investor focus today. The remaining US$2.9trillion (A$4.5 trillion) of the opportunity space receives only marginal attention from investors, even though they are feasible, could have a large impact, and have investors ready to deploy capital (Exhibit 4).

[2] For further information on this research, see AlphaBeta, Temasek and World Economic Forum (2021), *New Nature Economy: Asia's Next Wave*. Available at: https://www.ecosperity.sg/en/ideas/new-nature-economy-asias-next-wave.html

EXHIBIT 4

## Unfortunately, over two-thirds of these opportunities are receiving limited focus today




What explains this limited focus on the potential business opportunities? There are three main reasons:

- **Lack of understanding of the full set of business opportunities.** Existing research entities (e.g., investment banks) lack the incentives to properly understand these areas as they are still emerging and lack an existing large corporate base. As a result, there tends to be a focus on just a small subset of opportunities (e.g., wind / solar development).
- **Multiple market failures which cannot be tackled by traditional team structures.** For most sustainability business opportunities, there tend to be not just one market failure to deal with, but several, including lack of regulatory frameworks, pricing signals, and information failures with investors. This makes it difficult to effect change without having a broader set of capabilities than the traditional engineering focus. Engineering teams work well for more mature opportunities (e.g., wind and solar) which have a more defined pathway through to financial close.
- **Challenges with mobilising a coalition of actors.** Most opportunities are multi-sectoral and require collaboration with a range of stakeholders, which can make progress difficult.

## A NEED FOR BIG BETS

We define a Big Bet as "a new technology or market that could meaningfully accelerate the breadth and pace of the transition to a green, low carbon economy". Big bets have four characteristics:

1. **Significant.** The opportunity is sufficiently large (in terms of environmental and business opportunity) that it could create a meaningful difference in the shift to a green, low carbon economy.
2. **Additive.** The opportunity is not adequately covered by existing efforts, particularly by project developers. There is considerable "white space" in investment related to the clean energy and nature transition.
3. **Feasible.** While it is ambitious, with concerted action there is a realistic probability of success. In particular, the economics of the opportunity with realistic technology improvements must be sound.
4. **Investor ready.** There is a competitive set of partners who would be willing to provide capital once the investment concept is clearly defined.

What could these Big Bets look like for Australia? Here are a few examples:

**Big Bet Example 1: Positioning Australia as a world leader in sustainable aviation fuel**

Aviation is one of the fastest growing sectors, but also one in which carbon emissions reduction can be the most challenging. Fortunately, there is a long-term solution in the form of sustainable aviation fuel, which has reduced carbon emissions versus conventional jet fuel. One particularly promising type of sustainable aviation fuel is Power-to-Liquid (PtL), where electricity is used to make green hydrogen that is in turn used in concert with carbon dioxide to produce SAF. Australia has all the prerequisites to be a global leader:

- *Lowest cost renewable energy resources:* Renewable energy is around 56% of the total cost of power-to-liquid production, and Australia has some of the most cost competitive solar (and wind) production globally.
- *Land availability:* Only 2% of Australian land is enough to supply the world's total aviation fuel needs.

- *Significant domestic market to help early scale:* Australia's demand for aviation fuel is growing rapidly. Assuming 10% of SAF blend by 2030, this could lead to up to 1340 million litres of demand.

Longer term, the economic opportunity is immense. The International Air Transport Association (IATA) forecasts that global SAF production needs to be 449 billion litres to meet 2050 Net Zero targets. Assuming 50% of global demand can be supplied from PtL and that Australia can supply 20% of this volume (a not unreasonable target), this would equate to over A$60 billion of export revenue annually. This could be the second largest export sector for Australia in the future (behind only iron ore). However, making this happen will require rethinking our current approaches, particularly in terms of policy mechanisms. This includes:

- **First, build a cohesive plan.** Australia needs a clear roadmap for what it would take to be a global leader in power-to-liquid production, including understanding specific policies, consortiums and research required to support this. The CSIRO roadmap on sustainable aviation fuel released in 2023 had limited focus on power-to-liquid and a more comprehensive analysis of opportunities and actions specific to this technology is needed.
- **Second, create some lighthouse projects.** Australia needs some initial projects to demonstrate the potential and understand the practical challenges to scale power-to-liquid technologies. Building this in partnership with key airlines and the Department of Defence is critical and the government could agree to a contract-for-difference to minimise merchant risk.
- **Third, accelerate targeted R&D funding.** One of the key technology requirements is around Direct Air Capture, and there is the opportunity for Australia to fund "DAC innovation parks" where different technologies can be trialled, and those proving more efficient, scaled.
- **Fourth, send the demand signal.** Encourage the signalling of local demand for SAF across government, commercial and defence users, giving investors certainty to establish new plants. This could include commercial airlines having a domestic SAF mandate and providing opportunities for consumers to voluntarily purchase SAF certificates on flights (beyond carbon offsets).

**Big Bet Example 2: Closing the loop to eliminate waste and capture value**

A circular economy is a way of achieving sustainable consumption and production, as well as nature positive outcomes. In a circular economy, products are either recycled, remanufactured or re-used after they have served their initial purpose. This minimises pressure on the environment, and helps tackle global challenges like climate change, biodiversity loss, waste, and pollution. The potential economic value to Australia is significant. A 2021 report estimates that a circular economy model for Australia could generate A$1,860 billion in direct economic benefits over 20 years and save 165 million tonnes of CO2 per year by 2040.[3] However, making this happen will require investments in new infrastructure, changing consumer and business behaviour, and putting in place supportive regulatory frameworks that create the right economic signals to support change. Our view is that we need to do four things to make this happen:

- **First, ban key products from landfills.** Organic waste, timber, e-waste should never be put into landfills and should be the subject of landfill bans.
- **Second, make recycling pay by increasing state landfill levies.** The most straightforward way for this to happen is to increase state-based landfill levies so that it makes economic sense to recycle and reprocess. These state-based landfill levies should also be harmonised to prevent gaming waste systems across state borders.
- **Third, use the money from the levies to fund recycling and reprocessing infrastructure.** To achieve the national waste targets by 2030, implies an increase of resource recovery of about 2MT per year nationally. This will require a host of sorting, recycling and re-processing infrastructure; catalytic seed funding could support more advanced technologies and new reprocessing industries.
- **Lastly, create end markets for recycled products.** There is no point in recycling and reprocessing products if they have no new use. Hypothecated funds from state land fill levies should be directed to helping develop new end markets for products.

If Australia did these things, it could be a global leader in recycling and reprocessing and develop a new billion-dollar circular economy export industry.

[3] For further information, see https://www.pwc.com.au/media/2021/circular-economy-to-grow-australian-GDP.html

**Big Bet Example 3: Becoming a clean export superpower**

Each year 58 million petajoules of solar energy falls on Australia, but in 2021 Australia converted just 100 petajoules of solar to electricity. Australia could become a clean export superpower with the right policy settings. Australia has a natural clean energy advantage: an abundance of solar and wind energy and the metals and minerals required for the energy transition. It has the highest average solar radiation per square metre of any continent in the world and is already the world's largest miner of lithium, a key input into batteries. Australia is also the largest producer of some of the most important materials for industrial development and decarbonisation (including iron ore, copper and bauxite) which we are well placed to process with renewable energy. Our combination of high-quality renewable energy resources and abundant metals and minerals means that Australia could be positioned to prosper in the global energy transition. Some of the best opportunities that can be realised by 2040 include:

- >A$100b critical minerals revenue, from retaining world leading positions in mining and increasing value-adding onshore.
- ~A$100b of green iron & steel revenue, from becoming a leading producer of green iron in a global market that rapidly decarbonises.
- A host of sizeable opportunities around exporting electrons via HVDC, green ammonia or hydrogen, developing our battery industry and developing our renewable energy supply chain

The question is how does Australia become a clean export superpower? We believe three approaches could result in a vibrant clean energy export industry:

- **First, a new approvals process that would be more timely, robust and prioritise onshore value-add.** The approvals process is currently too slow and does not prioritise the most important opportunities for Australian industry. Australia could provide priority environmental assessments and approvals for projects deemed material for realising Australia's exporting superpower vision.
- **Significant production incentives for producing new clean energy exports.** To compete with other countries, the Australian government would need to support key clean exports with production tax credits or contracts for difference that would provide short term support for new entrepreneurs.

- **Support new industries with programmes** that allow for critical skills development, which would support commercialisation of new R&D and that would incentivise corporates to work together in industrial precincts.

By making these policy commitments, Australia could realise >A$300B in additional export revenue by 2040 p.a. and be a global leader in clean energy exports.

## HOW DO WE MAKE THESE BIG BETS HAPPEN?

As shown above, there are a number of specific interventions required to accelerate these Big Bets, ranging from shifting reporting standards through to introducing new financial products and mechanisms. However, there are three "non-negotiables" for creating success in this area:

1. **Understanding where to focus.** Further research and attention by policymakers and business leaders is needed to shift the focus from risk mitigation to opportunity creation. The starting point should be understanding which "Big Bets" are relevant in different sectors.
2. **Building the coalition.** Most of these opportunities involve many different sectors. Scaling circular models for materials, for instance, requires nine sectors to be highly involved. Some sectors have enabling roles across a significant number of opportunities, such as finance and advanced manufacturing. Business collaboration, particularly cross-sectoral collaboration, can be challenging, but there are groups like the Climate Leaders Coalition (CLC) that are active in this area. Such collaboration mechanisms need to be scaled up and lessons shared on how to shift from talk to action.
3. **Shifting mindsets from regulating risk to enabling opportunity.** In almost every one of these opportunity areas, there is a crucial role for government policy, whether it be around pricing of externalities or addressing information failures. At present, the focus of government departments is skewed towards only a few limited areas. Policymaking needs to shift from thinking about regulating against risks to thinking about how policy can enable businesses and investors to go after these opportunities.

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Environmental challenges could be a large headwind for future prosperity in Australia, or an enormous tailwind driving investment, jobs and economic growth. Enabling these Big Bets gives us the best chance to ensure we capture the economic opportunities and mitigate against future environmental risks.