A circular economy for Victoria

August 2019

The purpose of this submission from Bioenergy Australia is to highlight the role of the development of a potential bio-economy in achieving a successful circular economy in Victoria.

About Bioenergy Australia

Bioenergy Australia is the National Industry association, committed to accelerating Australia’s bio economy.

Our mission is to foster the bioenergy sector to generate jobs, secure investment, maximise the value of local resources, minimise waste and environmental impact, and develop and promote national bioenergy expertise into international markets.

Bioenergy Australia's objectives are to:

Advocate - With our members, we anticipate and develop leading positions on issues of concern to the advancement and growth of bioenergy in Australia.

Campaign - We raise the profile of the industry within the media and broader community to achieve a greater level of understanding about bioenergy and the vital role it must play to achieve carbon neutrality by 2050.

Inform - We publish reports, webinars and articles to help our members keep ahead of industry trends and opportunities. We also manage the Biomass Producer website, an AgriFutures Australia resource showcasing Australian bioenergy projects, expertise, and identifying opportunities for primary producers.

Connect - We facilitate knowledge exchange and networking for members through task-specific meetings, our Annual Conference, and Webinars. We link investors with emerging businesses; researchers with technology developers; government with innovators. We also administer Australia’s participation in IEA Bioenergy. Our Industry groups bring together specialists in specific fields.
The role of bio-economy in a circular economy

Bioenergy Australia invites the Victorian Government to consider the role of a potential bio-economy in the transition to a circular economy.

The circular economy is complementary to the renewable character of the bio-economy and must facilitate the recycling of carbon after efficient uses.

A bio-economy is circular by nature as it regenerates CO₂ and uses renewable raw materials to make greener everyday products. In fact, bio-based products and materials have the benefit of achieving a more balanced carbon cycle in comparison to fossil alternatives.

The bioeconomy encompasses the conversion of renewable biological resources into high-value products and chemical building blocks, fuels, power and heating via mature or innovative technologies.

Therefore, a bio-economy can significantly contribute to the circular economy by being a supplier of renewable energy (primary sources + side streams), materials that can be well cascaded (wood, fibres) and even feedstock for plastics.

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A circular economy continually seeks to reduce the environmental impacts of production and consumption and gain more productive use from natural resources.

Resource use is minimised, and waste and pollution are avoided with good design and efficient practices. This reduces environmental impacts while maintaining or increasing the value people obtain from goods and services.

Products are designed so that they are durable and can be readily repaired, reused and recycled at the end of their lives.

Business models encourage intense and efficient product use, like sharing products between multiple users, or supplying a product as a service that includes maintenance, repair and disposal.

Innovations to increase resource productivity bring a range of benefits including jobs, growth and social inclusion to local, regional and global economies.

Q1. Is this a useful definition of circular economy? How would you change it?

Bioenergy Australia suggests the following definition for circular economy:

A circular economy is an alternative to a traditional linear economy (make, use, dispose) as it is restorative and regenerative by design. It aims to keep resources in use for as long as possible, extract the maximum value from them while in use, then recover and regenerate products and materials at the end of each service life.

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Q2. Do you think Victoria should pursue a more circular economy? Why or why not?

Bioenergy Australia strongly supports Victoria transitioning to a more circular economy.

As the world population grows and new industrial and developed areas expand, both in absolute and
relative terms, the linear economy will move towards constraint of supply of materials, including food. This may lead to economic hardship, human suffering and conflict. A circular economy is restorative and regenerative by design, and aims to keep products, components, and materials at their highest utility and value, at all times.

Benefits of a more circular economy for Victoria

A more circular economy will reduce waste generation and greenhouse gas emissions and ease pressures on the environment. It can also prompt new kinds of economic activity, generate savings for households and create new business opportunities and jobs for Victoria.

Shifting to a more circular economy will also drive improvements in the quality of recyclable material collected, increase demand for recovered materials and ultimately improve the performance and resilience of the recycling system.

Q3. Are there other benefits of a circular economy that should be considered in developing the policy?

Bioenergy Australia acknowledges that all the benefits identified in the discussion paper are crucial drivers in the development of a circular economy in Victoria.

As highlighted in the discussion paper, a circular economy model has the opportunity to deliver massive environmental benefits and it can certainly play a vital role in achieving the goals of the Paris Climate Agreement.

In addition, socio-economic advantages of the circular economy model are widely demonstrated by the results achieved in the international scenario. In January 2018 the European Union (EU) adopted a new set of measures to ensure its Circular Economy Action Plan is implemented across Europe as efficiently as possible. An analysis by the global firm McKinsey estimates that shifting towards the circular economy could add US$ 500 million to the global economy by 2025 and create 100,000 new jobs within five years.

Finally, a key benefit that seems to be missing in the issues paper is the regenerative aspect of a circular economy, which is about maintaining and enhancing land resources and land productivity from capturing and returning nutrients to land. This aspect of the circular economy concept is particularly critical for resilience of agricultural systems, for food security, and for maintaining capacity to produce biomass for bioenergy and biomaterials, and for reducing GHG emissions from fertiliser manufacture.

Opportunities for a more circular economy in Victoria

There are large opportunities for improvements in specific business sectors or with particular materials:
- Manufacturing
- Public infrastructure projects
- Food waste reduction and recovery
- Technology innovation

Q4. Which parts of the economy, which materials, or which activities should be a priority focus for
Victoria’s circular economy policy? Why?

Considering that recent estimates suggest that ca. 1.3 billion tons of food are lost every year across the globe, food waste reduction and recovery certainly represents a key opportunity in the transition to a circular economy.

The method of choice to treat and recover food waste in a circular economy is anaerobic digestion (AD) which is now undertaken commercially at a large scale internationally and can play a significant role in reducing the 4 million tonnes of food that reach Australian landfills each year.

By using waste locally produced as inputs and generating biogas and digestate as outputs, the overall biogas value chain is representative of the circular economy concept. Food waste digestion can therefore play a central role in the circular economy, with particular importance due to its potential to capture nutrients and return these to the agricultural production system.

The anaerobic digestion of post-harvest food waste arising from processing and consumption of food is energetically favourable and, because of the high moisture content of food waste, is a more effective approach for energy recovery than thermal processing. Stable food waste digestion has now been shown to be possible at commercial scale, despite the high ammonia concentration, through selective trace element addition to promote a more resilient microbial community. The elucidation and verification of this has been a useful example of research delivering a solution to allow anaerobic digestion to be applied to what were previously thought to be very difficult substrates. There are still further measures that could be undertaken to recover nutrients from food waste as a contribution to the circular economy; but perhaps one of the largest contributions of food waste digestion was unforeseen when work to promote it began in the UK 15 years ago. The very act of collecting source separated food waste has raised our awareness of this material, and seeing it in our homes, canteens and restaurants has led to the development of the food waste hierarchy and to reductions in the overall amount of food waste generated.

In order to maximise the utilisation of food waste as resource, Bioenergy Australia strongly supports zero food and garden waste to landfill and we encourage the separation of organics because, unlike the garden waste, food residues can be used as feedstock for anaerobic digestion.

More information about the role of food waste digestion in a circular economy can be found in the IEA report “Anaerobic Digestion of Food Waste for a Circular Economy”.

If food waste is successfully separated and converted to biogas, it is important to consider the opportunity of injecting biomethane (the upgraded form of biogas) into the gas grid or feeding electricity generated by biogas into the electrical grid. This would take waste to energy much further and on a larger scale. State governments could play a key role in this space by modifying their gas supply, reconsidering their energy mix and providing ‘green credits’ or monetary incentives. In European countries where the biogas sector is more mature such as France and Germany, the virtuous contribution of biogas to waste treatment is rewarded in the feed-in tariff’s feedstock premium, which is based on the nature of the waste used for production.

The recently launched report “Biogas opportunities for Australia”, prepared by ENEA consulting for Bioenergy Australia, examined the potential for the use of biogas energy in Australia and found that biogas represented a multi-billion dollar investment opportunity for Australia, with the potential to offset natural gas use in transport and could be used for heat and/or electricity generation and injection into the existing gas network.

According to the Deloitte report “Decarbonising Australia’s gas distribution networks”, biogas is
currently the cheapest option for decarbonisation of energy provided by gas networks. Enough biogas potential exists to meet all residential and commercial gas demand on the East Coast. The cheapest form of biogas feedstock (urban waste, livestock residue and food waste), is currently sufficient to meet around 14% of energy used from gas.

In a study conducted by ENEA Consulting and Quantis in 2015, the replacement of natural gas by biomethane in France resulted in the reduction of GHG emissions by 54 gCO2e for each MJ that was produced, injected into the gas grid and consumed. This amount translates to more than 85 per cent emissions reduction from the consumption of natural gas, which has the emission factor of approximately 63.1 gCO2e per MJ (LHV) in France.

The conversion of waste into sustainable fuels, such as bioethanol, biojet, biodiesel and renewable diesel, should also be a priority focus in the development of Victoria’s circular economy. As an example, Australia’s newest biodiesel facility in Barnawartha in Northern Victoria, has demonstrated that there is a significant opportunity to turn Victoria’s used cooking oil (UCO) and tallow into a renewable and sustainable fuel. Much of Victoria’s UCO and tallow is being exported to Singapore and/or Europe to be turned into biofuel, while a local biofuel production should be encouraged. Similarly, much of Victoria’s grease trap waste could be diverted from composting and soil injection and converted into biofuel. Victoria is also a major producer, processor and exporter of canola seed and canola oil, all of which could form part of the feedstock mix for biodiesel production.

Managing the shift to a more circular economy

There are economic, social and environmental benefits to be gained in moving Victoria to a more circular economy. But any major economic transformation requires considered management. The Victorian Government will explore ways to maximise potential benefits, understand transitional effects and ensure any adverse impacts are minimised.

Q5. What issues will the government need to consider or manage in the shift to a circular economy?

Many industries have the capacity to contribute to the development of a circular economy, through their carbon storing, recycling, bioenergy and waste to energy projects being undertaken across Australia. However, most of these strategies need adequate funding in order to be given operational capacity and unlock the true benefit for the industries involved. Accordingly, the government should consider potential financial barriers and incentivise recycling and circular economy initiatives in order to facilitate the shift to a circular economy.

Q6. Would the shift to a circular economy adversely affect your industry? How could government mitigate these effects?

The shift to a circular economy would not adversely affect the bioenergy sector. On the contrary, it would be strongly beneficial for the industry.

Victoria will measure progress against circular economy targets

There will be many factors that will need to be measured and tracked, such as:

• materials used for each unit of economic output
• waste generation per person
• recovery rate—the proportion of waste materials collected for recycling, reuse or energy recovery
• recycled material as a share of total material used in the Victorian economy
• energy generated from waste
• reduction in stockpiles of recyclable material
• new jobs created in circular businesses
• reduction in greenhouse gas emissions
• alignment with the United Nations Sustainable Development Goals—in particular, Goal 12: sustainable production and consumption.

Q7. How do you think the Victorian Government should measure and report on progress toward a more circular economy?

Bioenergy Australia invites the Victorian Government to refer to the recently published paper “Measuring Progress towards a Circular Economy” to gain more information regarding potential monitoring frameworks.

In coming months, we will release a draft policy that proposes specific actions on four focus areas—waste and resource recovery; business and government; places; and communities and charities.

Waste and resource recovery

Actions the government is likely to explore to achieve these outcomes include:
• considering new rules to prevent ‘mixed’ or ‘unsorted’ waste being disposed to landfill or waste to energy facilities
• a package of measures to very substantially increase recovery of organic materials (including food, garden and timber waste): – food and garden organic collections for most Victorian households – rules to prevent disposal of organic material to landfill – more market development support for use of compost in agriculture
• improving the value of our recovered materials by finding better ways to separate materials at kerbside collections
• working with the Australian Packaging Covenant Organisation on the national packaging target that all packaging will be recyclable, compostable or reusable by 2025, and improve recycling labels
• encouraging more private investment in the infrastructure Victoria needs to recover, recycle and reuse materials, or to generate energy from waste unsuitable for recycling
• reviewing the governance arrangements for Victoria’s waste and resource recovery agencies to ensure they can deliver real benefits for Victorians from these reforms.

Waste to energy: the circular economy policy and action plan will consider the appropriate role for waste to energy technologies in a Victorian circular economy.

Q8. What are the most effective actions the government can take to shift Victoria to a circular economy?

Bioenergy Australia invites the Victorian Government to consider waste-to-energy technologies as key players in the circular economy policy and supports the development of a waste-to-energy strategy, which clearly identifies the waste hierarchy and the technologies currently available. Waste-to-energy technologies are particularly an attractive option to solve not only the pressing waste disposal problems but several other challenges simultaneously: shortages in baseline and on-demand peak
power generation, limited space for landfills, and greenhouse gas emissions from inappropriate waste disposal.

There are a number of suggestions that Bioenergy Australia has in the development of a waste-to-energy strategy to support the transition towards a circular economy:

- Defining waste and waste to energy

It is important that the Victorian Government is clear about what is defined as waste to energy and what feedstocks are considered to be ‘waste’ or ‘residues’. This consistency is required for not only local purposes but also international consistency. For instance, the Government needs to consider whether in changing the definition of something as a ‘waste’ there might be other flow on effects to legislative mechanisms (for example, to the Queensland Government mandate in relation to biofuels and what is considered to be sustainable) or international mechanisms (such as feedstocks for use in sustainable aviation biofuels). As an example, classifying plastic as a ‘waste’ poses a challenge for the approval of new facilities based on emerging technology such as Hydrothermal liquefaction (HTL), which can chemically recycle End-of-Life Plastic with an 85% recovery rate to oil (and the balance as gas recycled back through the process). Policy which allows the fast-track approval of emerging technologies to deal with ‘waste’, such as End-of-Life Plastic, is essential to dealing with non-recyclable plastic in the most environmentally efficient way possible. In keeping with the waste hierarchy, chemical recycling of waste plastic is preferable to incineration, but policy must support the approval of these new technologies as well as consider if ‘wastes’ such as plastic would be better classified as ‘resources’, in keeping with the ethos of the Circular Economy.

There is already significant confusion within the public arena regarding waste to energy and the Government should be on the front foot regarding the definition in terms of technology and feedstock that will apply locally. The scope of the term waste to energy (or energy from waste) is broad, encompassing a range of thermal and biological processes. These include mature technologies, including combustion for heat and power, anaerobic digestion to generate biogas, and emerging technologies, such as those based on conversion of mixed sugars derived from waste into biofuels, fast pyrolysis, hydrothermal liquefaction (HTL) and gasification. The latter (emerging technologies) allow waste to be converted to other energy products, such as gas or liquid fuels, waxes and residual products such as bitumen.

The most effective action the Victorian government could take to support the conversion of waste into sustainable transport fuels would be to introduce and enforce a biofuel mandate in line with the mandates already operating in NSW and QLD.

- Feasibility of waste to energy technologies

In order to assess the feasibility of each waste to energy technology from a technical, economic and social standpoint, it is important to understand and integrate three key elements:

1) a comprehensive understanding of and low value side waste streams—the feedstock (relates to the need to separate recyclables from non-recyclables; organics from inorganics);

2) the use of appropriate conversion technology—matching feedstock with technology; and

3) understanding the end utilisation of recovered materials that makes the most economic sense.
• Waste hierarchy

A circular economy solution is consistent with the waste management hierarchy, which shows the interrelationship between recycling and recovery of energy, and the preference of recovering products, materials or energy from waste instead of disposal of waste into landfill (see diagram below).

![Waste management hierarchy diagram](image)

**Figure 1. Waste management hierarchy.**

It is important to recognise that, in accordance with the waste hierarchy, wastes should be recovered for its highest order use wherever it is economically feasible to do so. The utilisation of residual wastes for bioenergy production is a preferable alternative to landfilling of these wastes. Bioenergy Australia strongly encourages the Government to look at strategies to support the development of projects to recover energy from organic residues supporting the intent of the waste hierarchy and circular economy principles. It is only by respecting the waste hierarchy that waste-to-energy can maximise the circular economy's contribution to decarbonisation.

Similarly with regards to plastics, we believe it is important to focus on recovery prior to incineration. We encourage the Victorian Government to invest and support physical recycling facilities that enable recovery of PET and HDPE, as well as investment and legislation that embraces emerging chemical recycling technologies such as hydrothermal liquefaction (HTL). Chemical recycling drives forward the circular economy by transforming End-of-Life Plastics into a circular resource that can be used over and over again.

Investment in better waste sorting technologies that remove contamination and increase the value of the various waste streams as well as emerging would provide a more economically secure and environmentally friendly path forward when dealing with waste, plus technologies such as chemical recycling create new products for market. Better recycling and sorting would lead to significantly less mixed waste feedstock.

• Public communication and consultation

Waste and waste to energy topics are highly emotional and there is a significant amount of misinformation in the public domain. It will be essential for any project to be successful that a significant public education and knowledge campaign takes place to ensure the public are aware of the facts and the technologies that are available today and the real data regarding emissions. The Government should be proactive in this space to increase the consumer awareness about the opportunities around the circular products in order to guarantee a sufficient demand. Bioenergy Australia encourages politicians, authorities, regulators and stakeholders to reference operating plants in the context of plant type and feedstock use across Europe, US and Japan to ensure that an informed rather than biased view is provided.
Thank you for the opportunity to provide this submission.

Yours sincerely

[Signature]

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