CENTRE OF DECOMMISSIONING AUSTRALIA

Centre of Decommissioning Australia

Opportunities in the circular economy response paper

Introduction

CODA (The Centre of Decommissioning Australia) is delighted to provide our response to the request from the Australian Productivity Commission's inquiry into Australia's opportunities in the circular economy.

For ease of reading, we have structured this submission by responding to the specific questions raised in the call for submissions

Background - Centre of Decommissioning Australia (CODA)

Delivering a transformational approach to late life planning and decommissioning execution, which returns maximum value to the community, environment, industry, economy, and Western Australia's future.

Established in 2020 to work as a not-for-profit independent peak body for the Australian decommissioning industry with a partner network of over 120 organisations, CODA connects operators, supply chain businesses, research organisations, regulators and governments through networking, joint projects, best practice and technology working groups, and knowledge-sharing initiatives. CODA is driving all parties to work together in pursuit of four primary objectives:

Objective 1: Maximise opportunities for the local workforce, service, and technology companies in serving the decommissioning, disposal and recycling needs of the oil and gas industry.

Objective 2: Identify or establish optimal recycling and reuse of offshore infrastructure to enable circular economy opportunities and support emerging low-emissions technologies.

Objective 3: Support the building of a globally competitive domestic decommissioning industry that can service needs locally and throughout the Asia Pacific region.

Objective 4: Improve safety, efficiency and environmental outcomes and support the pursuit of a 35 per cent reduction of decommissioning costs through cross-industry collaboration and planning and implementation of best practice approaches, new and novel technologies.

Through its strong domestic and international partnerships and networks, CODA is helping Australian industry expand its capacity as a regional innovation and technology hub for the emerging decommissioning industry, broadening its economic base and creating opportunities for local businesses.

What is decommissioning?

Decommissioning involves the planned closure of oil and gas production facilities comprising the permanent plugging of production wells and their relinquishment back to government (referred to as Plug and abandonment), the removal of installed equipment and materials associated with the production of oil and gas from title such as well head equipment, pipelines, structures and process equipment to a suitable dismantling facility for cleaning, dismantling, sorting and then either recycling or disposal (globally around 95 to 96 percent of all decommissioned materials are recycled). CODA's 2022 study examining the disposal and

recycling pathways for decommissioning[1] identified that between 1 and 6 million tonnes of materials will be removed from offshore installations in the coming decades through the decommissioning process. These materials predominantly comprise various grades of steel, concrete, non-ferrous metals and plastics

Consequently, the decommissioning industry is a significant contributor of materials to the circular economy.

1: Circular economy success stories and measures of success

Case studies and ongoing activities

As the level of decommissioning activity grows, increasing volumes of removed materials are being collected ready for recycling. Simple and easy to consolidate materials such as grades of steel are being harvested from decommissioning projects and dispatched for recycling. More complex materials to recover, typically from flexible pipelines, and complex bundle cables (known as umbilicals), require specialist equipment to disassemble them into their component materials (steel, copper, fibreoptic cables, various grades of plastics etc.) these machines have been developed and are now beginning to be deployed to process the large volumes of materials that will be recovered.

Impact on business growth and outcomes

The growing volumes of steel are underpinning potential investment in steel recycling facilities such as the Collie Green Steel plant planned for Collie, Western Australia which will be capable of recycling around 50 percent of all of WA's produced steel scrap.

Exotic grades of steel, which attract significant scrap value, will be sorted separately and returned into the economy through specialist recyclers based overseas in countries such as Japan and Korea.

Concrete will be recovered at the port of landing, cleaned, crushed and then reused as aggregate for new construction projects and road base.

Plastics and polymers require careful sorting into different grades before being sold as input material for the manufacture of new products either domestically or on international markets.

Non-recyclable materials remaining after the sorting process will then either be processed to recover any residual value such as through pyrolytic processing, or, where appropriate, send for disposal via specialist waste facilities.

[1] https://www.decommissioning.org.au/work/understanding-the-opportunity-for-local-disposal-and-recycling-pathways/

Overall, through the judicious dismantling and sorting of decommissioned materials there is the opportunity for the volumes of materials harvested to underpin several Australian business and value chains in the circular economy. These material streams are relatively predictable due to the regulatory environment around decommissioning and as such, decommissioning can be seen as a significant enabler to the growth of Australia's circular industries.

Uptake levels

Decommissioning is a known commitment by the oil and gas industry to responsibly close their production facilities. CODA has seen a significant growth in companies establishing in Australia to be part of the work, which is leading to greater transparency and an increased appetite for the recovered materials to be reused or recycled.

As the volume of activity increases in coming years, we expect to see many additional opportunities surface, particularly in areas such as reuse and repurposing in place of direct recycling as well as recycling of plastics and polymers as volumes of recovered materials increase.

CODA's disposal and recycling pathways report[2] identifies that there will be significant volumes of materials being retrieved (see Figure 1 below for mid case potential volumes of materials)

[2] https://www.decommissioning.org.au/work/understanding-the-opportunity-for-local-disposal-and-recycling-pathways/

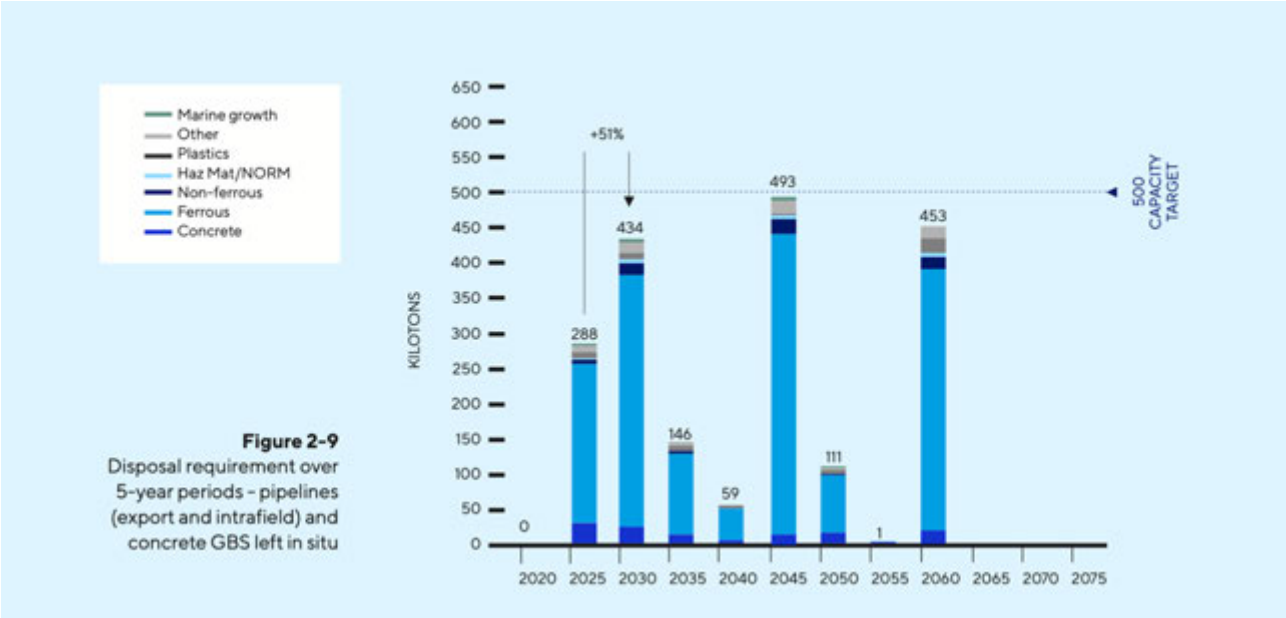

Figure 1: mid case volumes of potential removed material (From CODA report)

Reasons for adoption of circular economy

Within the decommissioning industry, moving to a circular economy would be seen as being commercially and reputationally driven.

Commercially, many companies involved are building their businesses based on a model of recovering valuable commodities from the decommissioning process and preparing them for sale for reuse, repurposing or recycling. Demolition contractors for instance are paid a fee to demolish a facility and will then strike a commercial agreement with their client on a level of sharing of the value of the recovered material. Properly structured these agreements will provide sufficient incentive for the demolition contractor to work diligently to secure the best possible price and market for as much of the volume of the demolished plant as possible. Such an achievement will then ensure that the largest volumes of material find a future life rather than being destined for landfill.

Alongside the commercial imperative sits a reputational one, where every company in the value chain is keen to behave in as responsible a manner as possible.

Costs and effectiveness

As volumes of materials increase it is apparent to all parties that the economies of scale are improving to underpin the investments necessary to establish sustainable businesses working in the circularity of these materials. However, the business models themselves may need to evolve to operate in different ways to those presently employed.

In some instances, such as the processing of recovered ferrous and non-ferrous metals, there are established value chains and business models and with increasing scale. In the steel industry companies such as Green Steel WA are looking to build new facilities to recycle

'scrap' steel into new steel products such as rebar and rod, such facilities would supplement Australia's existing small capacity to process scrap steel domestically, which is largely based in SA, NSW and Vic. Similarly with any recovered concrete, this is readily crushed for use as aggregate in the construction industry.

More challenging and largely emerging areas of opportunity are in the vast array of polymers and plastics captured during decommissioning. This ranges from relatively simple and clean HDPE and PET through to complex polymers and glass reinforced plastics.

Potential to move to a more circular economy and measures of success

Circular economy solutions may not exist domestically for all the recovered material streams yet. Many of the complex polymers and composites are just coming into the material flows. But the known volumes from both oil and gas decommissioning and predicted material streams coming from areas like onshore and offshore wind provide a clear indication for future opportunities.

Historically the Australian industry and in particular the resources sector has had a focus on produce for export, leaving the value add through processing then the production and eventual recycling processes to other international markets. However, with both a growing awareness of the need to move to a circular economy and increased cost and complexity of alternates such as either disposal to landfill or export of these materials (which are generally classified as waste) to international markets, now is the time for more structured and systematic investment in capturing the value of these scarce and very valuable materials.

Some of the costs to establish such value chains could potentially be met through the need for industry to find ways to locally reuse or recycle its recovered materials. In most industries the facility owner is required to remove any redundant facilities and for many owners, there are definite financial and societal benefits to finding alternates to direct disposal.

Adopting a more collective, collaborative and end to end approach to the treatment of removed materials could open new industries as well as research pathways where Australia could become a leader in certain areas. For example, Australia is a world leader in the per capita installation of solar panels, in not too many years the early panels will become inefficient and fail, requiring replacement. The resulting volumes of expended panels then presents opportunities for Australian industry to find ways for them to be at least partially recycled, capturing the rare earths and other valuable commodities that went into their original manufacture.

2: Priority opportunities to progress the circular economy

Opportunities to improve environmental and economic outcomes through greater adoption of circular economy activities

Australia has been slow to recognise the opportunities and value societally as well as economically of adopting circular economy principles.

A combination of geography, economy and government posture has made it difficult for companies or groups to establish finically sustainable businesses to enable the kind of circular economy seen in many other parts of the world. In much of Western Europe and many ASEAN countries, circularity has been deeply engrained in the culture for many years and is simply seen as part of a normal life. Australia is not there yet. Many individuals, councils and government agencies are working to build a more circular focussed economy, but the nation has yet to reach its tipping point. For instance, significant volumes of consumer products are imported to Australia, meaning that at the end of the life of the product it is prohibitively expensive to return the product to the manufacturer for recycling. This situation leaves much of Australia with a circular economy where the loop is hard to impossible to close.

The decommissioning industry, which CODA is supporting, is still in its infancy in Australia but the broad industry is keen to pursue the levels of circularity achieved in Europe's best practice centres of recycling or reusing more than 95 percent of all material by weight. To achieve these goals industry is looking firstly for domestic recycling pathways for materials and where those are not available, to international markets. Some examples are as follows:

- Standard grades of steel could be recycled domestically but the system is capacity constrained with more scrap steel produced across the economy (scrapping of vehicles, domestic white goods, construction waste, etc.) than there is ability to process it. This results in the export of large volumes of scrap steel.
- High grades of steel are generally exported as a matter of course due to the specialist nature of their production; this is unlikely to change in the short to mid-term.
- Nonferrous metals can in some instances be recycled domestically and where domestic capacity does not exist, will be exported to specialist facilities.
- Concrete is readily recycled local to its port of landing, requiring only a suitable crushing facility once the material has been cleaned.
- Polymers and plastics, as mentioned above, comprise challenging materials in a circular economy. To be reused materials need to be carefully screened and categorised to avoid contamination, alternatively technologies such as pyrolysis can be considered to reduce the polymers back to useable raw materials.

Opportunities to affect business, social, environmental and economic outcomes

The Australian economy has many good opportunities to build a future focussed circular economy. Societally there is an increasing awareness and advocacy for the earth's scarce

natural resources to be carefully stewarded and not consumed in a linear was as has long been the case. However, such a transformation will be neither straight forward nor without cost.

In the industrial context of decommissioning, demonstrating conscientious stewardship of resources is already embedded internationally, a culture that has transferred to the Australian decommissioning industry as it has established. With many facets of decommissioned facilities essentially representing a pool of future material resources, the industry is actively pursuing opportunities to reuse or recycle materials. Examples of this internationally are around the following:

- Several Norwegian operators and supply chain companies exploring and testing opportunities to directly reuse recovered material such as sections of hull from FPSO's for structural and civil engineering purposes.
- Companies working in the decommissioning industry have developed equipment that can remove coatings from redundant or removed large bore pipe sections. These sections are then available to be used for structural engineering purposes such as piling in civil projects.
- Recycling of materials such as glass reinforced plastic will be a requirement in some oil and gas decommissioning projects. Establishing a GRP recycling ecosystem will be of use to the oil and gas decommissioning industry but will become invaluable in future industries, most particularly Australia's onshore wind and eventually offshore wind industries. As wind assets begin to reach the later stages of their lives, blades will need to be replaced or removed, these blades, which are manufactured using significant quantities of GRP will need to be recycled and will likely use the same solutions as established to support the oil and gas industry's needs.

Feasible levels of future uptake or adoption in Australia

Australia could establish an industrial circular economy ecosystem that can reprocess the increasingly large volumes of material resulting from industrial demolition, oil and gas and mining decommissioning. Many of the facility owners in these industries are keen to see as much of their old infrastructure recycled as possible but have struggled to find economic ways to achieve these goals. Recycling is a critical part of a full decommissioning cycle and as decommissioning volumes grow there will be increasing levels of critical mass of materials to underpin the establishment of these industries.

However, the massive geographic spread of Australia's industrial footprint makes some recycling and circularity aspirations challenging. Economies of scale as well as development economics will mean that some potential materials may be more economical to export or as a worst case send to landfill if the environmental and economic costs may outweigh the value of saving the materials.

Provision of some strategic enabling investment from government would be beneficial in assisting companies with the development of technological solutions and establishment of their businesses in practical locations. Additionally, clarity around the generation and ownership of carbon credits resulting from a growing circular economy will help many businesses with their planning and investment.

Prioritisation and measuring of effects

Prioritisation of opportunities in the circular economy should be managed by assessing the demand in terms of volume of input material, availability of solutions, proximity to treatment facilities and net cost of execution.

For example, materials such as conventional scrap carbon steel is a well-known commodity that is easy to consolidate, treatment pathways are well understood (reprocessing and occasional direct reuse of materials). Barriers to local processing remain financial and regulatory in that it is expensive to establish a new steel processing facility and requires a lengthy regulatory approvals cycle. But once in place, strategically positioned steel reprocessing facilities could both process Australian scrap steel on shore as well as serve as an entry point to a more vertical steel production facility, incorporating iron smelting in the future. Similarly, non-ferrous metals such as copper, are easily reprocessed back into copper ingots for remanufacture.

However, some exotic ferrous metals are costly to reproves and are likely best handles through careful sorting into different grades then re exporting to the place of original manufacture for reprocessing into new product.

Plastics is a particularly complex area for circular economy activities. Relatively simple plastics such as PET and HDPE have a healthy reprocessing market, however, many plastics encountered in everyday products as well as industrial applications are either of very complex and often unique polymers or comprise multiple different polymers combined into a single product. Processing these into a reuseable form is both very challenging and expensive.

Outcomes could be relatively easily measured through metrics such as the economic viability of processing facilities and their outputs, measuring net import/export volumes of some materials (such as scrap steel exports, import of construction steel etc) and community sentiment.

Potential benefits and costs of implementing opportunities at the sector, product or supply chain segment level

Growing a new supply chain is not without its costs and risks however, both societally and economically now is the right time to work to grow Australia's circular economy ecosystem. The benefits of growing this ecosystem will be a significant reduction in landfill and single use materials, reduction in requirements for landfill, increased access to numerous scarce natural

resources through recovery from recycling and a significant reduction in the need to extract natural resources.

Identifying a sensible pathway to grow such an ecosystem will require time and careful planning, with initial effort best focussed on commodities that are more readily available and in greater volumes such as steel and plastics before moving into more complex areas such as the recycling of old solar panels.

There is a significant role for government in terms of setting the regulatory and financial signals and environment for such an endeavour, as well as in providing some investment capital to companies to establish themselves in the industry. Additionally, finding markets or uses for the recovered materials will need work but could well lead to the establishment of new manufacturing and processing industries in Australia.

As discussed elsewhere in this paper, the decommissioning industry is anticipated to generate tens of thousands of tonnes of materials per year for the next decades, much of which can help to underpin some of these investments, particularly in terms of predictable volumes of known quality materials.

Long, medium, and short term distribution of benefits and costs

In the medium and long term, growing Australia's circular economy capability will prove to be a significant investment in sovereign capability as well as meeting society's growing expectations around use of raw materials and resources. However, to get to this point will require some bold regional, state and national commitments. Culturally Australia has for decades focussed its resources industry and much of the national economy and psyche on the extraction and export of raw materials (iron ore, LNG, wool etc.). While this approach has served the nation well in generating revenue it has been at the expense of nurturing growing local manufacturing and associated capabilities.

With global bans on the export of material classified as waste, as nation, Australia now must find ways to reprocess much of its own waste products. To achieve this will require investment of finance, research and corporate and political capital to establish a future focussed industrial and cultural ecosystem that enables the growth of a truly circular economy.

Opportunities and risks for Australia from international developments

Many circular economy practices are seen internationally as non competitive. This is in contrast to the more traditional race to be world leaders in the production and export of raw materials and manufactured products.

Australia has a definite part to play in a global circular economy and could readily join with other OECD and developing nations in finding ways to be part of developments.

Conversely, if Australia chooses to either go alone or compete with the rest of the world there is a significant risk of spending precious time and resources in the wrong areas and missing out on global opportunities.

Innovative processes that could be adopted in Australia

Australia has a strong and proud tradition of fundamental research but an equally poor track record of converting the outputs of this research into products and new industries. Focussed investment in research toward the recycling and reuse of material streams which Australia knows it will have in large volumes (solar panels, wind turbine blades etc) that will absolutely be available for recycling that is tied directly into establishing real world industrial solutions to address these needs. Such direct, tangible connections should help to ensure a more realistic and reliable future industry.

Alongside these R&D target areas that would transform research into operation, additional areas that should be addressed are around areas where Australia has a known surplus of recovered materials such as scrap steel as well as domestic material streams such as soft plastics. These areas offer a clear here and now opportunity for the Australian economy to expand its circularity reach.

Technologies developed in Australia for recycling some hard to address products such as solar panels and large GRP structures including turbine blades then present an export opportunity for the developers.

3: Hurdles and barriers to a circular economy

Reasons businesses and consumers have not adopted circular economy practices

In the decommissioning industry circular economy practices have been embedded in the work in Northern Europe for a number of years. In Australia the industry is very much in its early stages and is adopting all the ethos of the European industry. Operators and the service sector are actively seeking channels to ensure that the absolute maximum volumes of removed materials are reused or recycled with only intractable waste materials such as asbestos, mercury and NORM's being destined for appropriate waste facilities as a matter of course.

The volumes and locations of most of this material (northwestern WA, Bass Strait Victoria and Darwin in the Northern Territory) each have different characteristics as to their ability to receive and fully process the material streams but the broader industry is rapidly coming together to address these opportunities and challenges.

The volumes and types of materials derived from decommissioning are each helping to move toward a tipping point that will assist in making broader circularity exercises more economically sustainable and will hopefully make it easier for other industries to join the journey.

Costs

Establishing a new industry is not a cheap exercise, making the investment decisions to build a material receiving, sorting or processing facility required confidence in the material streams as well as potential offtake agreements, power, land approvals etc. As such, cost will continue to be a barrier to entry for companies interested in being part of the circular economy associated with the decommissioning industry.

However, as discussed elsewhere in this paper, the industry will produce a relatively predictable profile of known materials which will hopefully assist companies in making their investment decisions.

Attitudes

Within most of the global decommissioning industry the principles of circular economy are well accepted. Many international facilities are justifiably proud of their ability to ensure the maximum volumes of materials are reused or recycled in the most efficient manner possible.

These attitudes are very much present in the Australian industry with the industry aspiring to match or better their international counterparts and partners.

Regulatory constraints

Regulations continue to be a barrier to achieving the optimum circular economy benefits for both Australia and the international community. Legacy classifications as waste of much of the material now considered as recovered resources makes it very challenging and at times almost impossible to move these materials across international borders.

Lack of information or resources

With the circular economy and in particular recycling of materials, whether domestic of industrial, taking a very low profile in public and industrial discourse there is consequently a significant shortage of information on every aspect of the circular economy ecosystem. There is little information on the volumes or types of materials, the feasibility of their recycling or repurposing, locations capable of undertaking the work or end users for the recovered materials. Without this information it is extremely difficult for businesses to form an opinion on their ability to offer a service.

In the decommissioning industry CODA has been working to address this shortage of information. This began with the publication of our disposal and recycling pathways report[3] which began to shine a light on the volumes of materials. This has recently been expanded

[3] https://www.decommissioning.org.au/work/understanding-the-opportunity-for-local-disposal-and-recycling-pathways/

with the release of our decommissioning outlook dashboard[4] which for the first time in Australia provides a single, consolidated outlook of all offshore oil and gas facilities, their component infrastructure and the anticipated timeline for their decommissioning. This granular and searchable information is the next step in providing the industry with a timeframe for availability of decommissioned material so they can plan how to ensure the maximum volumes of material are recovered.

We have ongoing work in mapping waste facilities across Australia as well as developing an increased degree of granularity on the material types than can be anticipated, with each additional piece of information adding clarity and surety to company's business planning options.

Lack of coordination

Coordination is critical to growing any new industrial sector. As can be seen from the above CODA has been working hard to build this coordination in the decommissioning ecosystem, bringing detailed information and connections to facilitate the growth of the industry and increase its ability to be a significant part of the circular economy. However, at the more macro, state and national level this coordination is still lacking.

It would be good to see national coordination across the entire circular economy that would support but not hinder or overregulate its expansion. Greater clarity on policy, markets, materials and where appropriate financial support channels will be essential in the future.

4: Governments' role in the circular economy

How policy or regulatory changes could enable the pursuit of circular economy activities.

Financial incentives

Financial incentives would be a great help to growing the broader circular economy. These could take the form of tax incentives for businesses establishing new premisses, grants or supported loans toward the development or acquisition of equipment of simple financial incentives toward encouraging the broader community to be more conscious of their recycling habits.

In the decommissioning industry, the commitment from the oil and gas producers will support the operation of facilities that specialise in the management of their materials recovered from their decommissioning activity. However, many of the technology companies involved across the ecosystem would benefit greatly from easier access to capital.

[4] https://www.decommissioning.org.au/work/forward-outlook/

One incentive that we have discussed many times with industry that they are asking for would be for the government to enable easier access to more cost-effective capital in the form of underwritten loans. These loans would be put toward the R&D and purchase of equipment as well as premise establishment. Many small technology companies in Australia have pointed to the challenges accessing investment capital as one of the biggest challenges preventing the scale up of their business, with some opting to accept foreign investment in their business, leading to the technology going overseas, while others have their growth trajectory constrained by their cashflow.

Loans such as those described above could operate similar to those available in the agriculture industry to support farmers in the purchase of their machinery and are often preferable to grants since grant processes tend to be long, protracted and complex processes with uncertain outcomes.

Regulatory changes

State, national and international regulations covering the classification and movement of recovered materials could definitely benefit from a review in light of the movement toward a more circular economy. Barriers to movement of materials that were put in place a decade ago are now preventing much of the global movement of materials simply because these materials continue to be classified as waste rather than as a refined natural resource.

As an example, scrap steel can be shipped internationally and readily accepted for processing at steelworks where it is returned into new steel products. However, if there is small volumes of plastics and polymers in the shipment, such as where pipelines may be plastic coated, there is uncertainty as to whether these cargoes will be accepted, since the plastic is classed as waste, even though the plastic will burn off in the furnace during processing. Where these uncertainties occur, companies may opt to send the same material to landfill to avoid the regulatory challenges. These regulatory barriers, while well intended when put in place, are often now acting as an inhibitor.

Education and training

Education to boost a circular economy can take many different forms, community information campaigns can help to educate the population on how they can contribute and the benefits of a more robust circular economy; training of personnel directly involved in the circular economy could help raise the collective ability of the sector to ensure the maximum value is extracted from all the earth's natural resources, and; training at the regulatory level would assist those regulating the industry to deliver the best possible outcomes for society.

Focussed research tied to real commercial opportunities that look at opportunities to recover valuable raw materials from discarded or redundant equipment and products would also be of great benefit. Areas such as complex polymers and plastics, electronics, glass reinforced plastics and solar panels are ripe for research and the development of technologies that will enable their recycling into new, valuable commodities.

Facilitating collaboration

CODA has established as a collaboration hub for the decommissioning industry, we work with over 120 partner organisations domestically and internationally to establish and grow the decommissioning industry. A significant part of many of our discussions is now in areas of the circular economy – reuse of materials, recycling and repurposing of facilities. We operate as an independent not for profit and are both dependent on and limited by our ability to access monies in terms of our impact.

As part of our operating model, we partner with likeminded organisations across Australia and internationally. Many of these are having similar conversations in their own locations, some are more progressed, others are just commencing, but the trends are similar.

It is however our belief that the most effective way to facilitate collaboration is through independent organisations like CODA who operate outside of the constraints of government. Through our independence we can work faster and more efficiently than for profit businesses, government agencies or even independent organisations solely and directly funded by government. Support to organisations like CODA from government would, however, be greatly appreciated as greater funding surety allows organisations like us to have a greater impact.

Planning

Planning in the circular economy should be comprehensive but flexible and adaptive. CODA has demonstrated through its work these past four years with the oil and gas decommissioning industry that with a comprehensive work program to show the size of the opportunity, the timing of the upcoming work and the potential value to the community, a new industry can be established.

The work of CODA and indeed our operational approach could be taken as a model and applied across many other industrial areas in support of growing discreet areas of the circular economy which collectively would facilitate greater critical mass of work and capacity. Some of this is quite organic but much of it is the result of a thorough strategic planning process where each piece of work builds on the story and moves the industry forward in an ever-increasing velocity.

Rigid planning for such a large and complex undertaking as a national circular economy should be avoided however as it often fails simply because these rigid plans are unable to adapt to evolving circumstances.

How current policies hinder circularity

Current government policies are unwieldy and rooted in historical views that redate concepts such as the circular economy. Legislation that sits across multiple levels of government and numerous government departments and ministers are complex to the point where for many

businesses it is simply easier to follow historical practice and send material to landfill where otherwise it could have been recovered.

A whole of government and whole of country review of the entire regulatory ecosystem is needed. While this would be an enormous undertaking, it may be necessary to remove a lot of confusion. Such a regulatory review could however focus on simplifying regulations and guidance that both maintains the integrity of the safety network in place while facilitating a more flexible, easier to navigate, future focussed circular economy.

Benefits and risks of policy changes

As has been seen numerous times in policy reform there is always a risk of future unintended consequences. For example, banning the export of plastic "waste" was intended to prevent dumping of Australian rubbish on the shores of our regional neighbours but at the same time it led to shortages of input plastic in some factories in Asia. Similarly, the soft plastics policies introduced several years ago have led to warehouses full of old plastic bags that have been returned to supermarkets that can neither be exported nor processed domestically since we do not have the technologies available in Australia to process them.

The risk of policies like these is that it convinces the broader population that these materials are being recycled and that the circular economy is thriving while in reality there are many barriers yet to be resolved. This false sense of accomplishment then prevents genuine progress in many adjacent areas.

In the decommissioning industry there are future challenges associated with transborder shipment of materials that are yet to be addressed, these include issues such as the plastic coated steel example mentioned above as well as many other challenges associated with recovered plastics that have a high residual value but may not yet have a ready market in Australia.

Policies government could adopt

We would advocate for Australia to adopt a more visible circular economy policy framework that encourages every part of the economy to look for opportunities at the end of life for every product and commodity to reuse, repurpose or recycle in preference to sending to landfill. This could additionally be incentivised through provision of carbon credits to those who achieve higher level of circularity in their work.

These policies should be forward looking and flexible to allow for adaptation as things evolve.

Financially we would advocate for government to look for ways to provide financial support to companies moving into the circular economy. Financial mechanisms however which suit the needs of the companies as distinct to traditional mechanisms such as constrained grants which require competitive tendering processes.

Summary

Much of the world is now looking to circular economy principles ass a way to reduce its reliance on newly extracted primary resources. Finding safe, economic and practical ways to capture the absolute maximum commercial and societal value from every molecule of material is a significant way to transform local, national and international economies from ones where products are seen as simply consumables to long term resources.

We see this as both a challenge and opportunity in the decommissioning industry, where 96 to 97 percent of all removed equipment and material is recycled or repurposed. However, here in Australia achieving these volumes is still a complex and challenging endeavour due to scarcity of remanufacturing capacity such as electric arc steel processing facilities, plastics processing and manufacturing facilities and availability of technologies to process materials such as GRP.

Working in oil and gas decommissioning comes with additional challenges, often raised by well-intentioned NGO's who question both the intent and methods of the industry. In some instances, the best solution may be to leave some material in situ once a facility has been decommissioned. An example here would be, through receival of all required approvals, leaving some material on the seabed where, by being in place for the past decades, it has become part of the marine ecosystem, supporting thriving marine life. This is however the exception rather than the norm and the vast majority of decommissioned material, whether from offshore or onshore facilities, will be removed, brought to Australian cleaning and dismantling locations, dismantled and sorted into its component materials then transported for reprocessing into new products, ensuring a long and future life for the valuable materials in whatever future form they may take.

Australia's growing decommissioning industry is therefore providing significant and predictable volumes of materials back into the circular economy. These volumes are already helping to underpin the establishment and growth of the material processing businesses.

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