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The Productivity Commission

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Submission - Opportunities in the circular economy: Circular, Regenerative, Resilient Economic (CR^2E) developments in Australia

The Sustainability Research Institute (SRI) is pleased to provide its submission on Opportunities in the circular economy to the Productivity Commission.

SRI Background

SRI was established to conduct scientific research, education, and environment activities to promote sustainability, integrity, equality, diversity, and longevity for the benefit of present and future generations. SRI currently has three focus areas linked to its charitable objects:

- increase security and safety of communities through promoting self-sufficient resilience as a primary means to navigate the extreme events of the coming decades.
- explore new ways of living in the 21st century that create greater connection between human beings, community, and nature
- establishment of Australia's first Organic Regenerative Agriculture Research Institute and promoting the expansion of both organic and regenerative farming and land stewardship to increase food security for Australia.

SRI aims to integrate these focus areas to contribute to creating a new model of urban and regional development, and environment for Australia that will endure through the 21st Century. Underpinning its approach, is the analysis and modelling of complex systems to enhance delivery of beneficial outcomes in the context of an increasing global polycrisis that intersects economic, ecological, scientific, social, and cultural factors.

SRI notes its interest in any further stakeholder engagement, research and education opportunities related to progressing a circular economy agenda in Australia. We thank you for your consideration of SRI's submission. We confirm that SRI's submission can be made public. For any enquiries or further information, please contact Dr James Juniper, Director, Sustainability Research Institute at james.juniper@newcastle.edu.au.

Circular, Regenerative, Resilient Economic (CR^2E) developments in Australia

Executive Summary and Recommendations

Our world today is in every way a complex socio-techno-ecological system with many interactive drivers causing a complex emergent set of many crises together – a polycrisis. The current polycrisis is characterised by interactions between an "array of grave, long-term challenges, including climate change, biodiversity loss, pandemics, widening economic inequalities, financial system instability, ideological extremism, and an escalating danger of nuclear war" (Cascade Institute, 2024).

Circular Economy initiatives assist in the solution set for the polycrisis as it is manifest both internationally and here in Australia. Therefore, we commend the government for promoting an Australian Circular Economy.

In response to the polycrisis and to most effectively grow a circular economy to deliver economic productivity in Australia this submission proposes the opportunity to develop a network of appropriately scaled Circular, Resilient, Regenerative Economy (CR2E) precincts. These precincts would be designed to complement and interact with the regions and existing urban centres and incorporate a range of mutually beneficial industry, regenerative agriculture, housing, social services and circular economy initiatives.

SRI recommendation 1

That the Australian Government include in the Policy a commitment including specific actions that will support the investment made by private capital into research and modelling of complex systems that can inform circular economy responses to the polycrisis for Australia. Followed by support for planning and building the first series of Circular, Resilient, Regenerative Economy (CR^2E) precincts.

SRI recommendation 2

That the Australian Government support and assist the collaboration of interested parties in rapidly establish a polycrisis /complex systems consortium connecting with the one hundred or so existing institutes globally. The aim would be to inform the implementation of Australia's circular economy developments, as an integrated response to the polycrises. Bring together the global research leaders with leading local researchers and organisations, including Circular Australia, in Sustainable Finance, and Nature Positive would enable the rapid formation of diverse expertise to enable effective co-design and multi-disciplinary implementation.

SRI recommendation 3

That the Australian Government continue to promote a range of incentives to re-localise supply chains in domestic industries but also initiates a new range of

incentives: These will support the development of very substantial single large complex systems circular economy projects that can act to stimulate multiple sustainable and circular economy sectors from housing to agriculture to manufacturing and other industries to social services etc. under the umbrella of a coordinated strategic development program.

SRI recommendation 4

That the Australian Government assist in the establishment of an Organic Regenerative Research Institute. This Institute would fund research programmes in the industry but also into how organic and regenerative farming practice is a key pillar of a circular and a resilient food supply chain future for Australia. The Organic Agroecological Industry has been trying for 40 years to establish an Australian Research and Training Institute. Almost every other developed country has established this foundational capability within its economy, but there have been significant barriers in Australia.

SRI recommendation 5

That the Australian Government introduce legislative mechanisms to ensure long-term funding for intergenerational infrastructure to enable the sustainable growth of the regions over the next decades, which leverage the financial strength of Australia's sovereign economy and its capacity to deliver infrastructure requirements in a planned and structured way that are legislatively protected from short-term changes in government policy due to political cycles and financial crises.

SRI recommendation 6

That Australian Government support the establishment of innovation zones, which engage all levels of government within certain locations or regions, in providing a special environment for nurturing gains in productivity and the generation of new value through circular economy initiatives. This should include planning and zoning legislation to ensure that appropriate land is available. It should be noted that CR^2E initiatives will include the funding of innovation zones as a component of each development.

That the Australian Government consider increased investment in applied research for innovative models to enable Australia to translate innovative policy, international best practice, and new delivery mechanisms operating in other jurisdictions, and to adapt and demonstrate their application fit for the Australian context.

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Introduction – A Circular Economy

According to a report released by Bocconi University, the Ellen MacArthur Foundation, and Intesa Sanpaolo (The circular economy as a de-risking strategy and driver of superior risk-adjusted returns), a circular economy has three design principles:

- eliminate waste and pollution
- keep products and materials in use
- regenerate natural systems.

The report suggests that a circular economy:

(i) is crucial for achieving global climate targets
(ii) contributes to tackling pollution, rebuilding biodiversity, and achieving other UN Sustainable Development Goals (SDGs)
(iii) reduces our current economic system's exposure to a variety of risks such as epidemics
(iv) decouples economic value creation from resource consumption and environmental degradation
(v) spurs innovation, creates value, and builds, including through product redesign for longevity and repairability, digital-enabled resale and sharing platforms, remanufacturing, material innovation, and regenerative production practices.

This report notes that financial services activity in the circular economy has risen steeply in the last two years, including through issue of corporate and sovereign bonds, and evidence that companies "can reduce their probability of defaulting on debt and drive superior risk-adjusted returns on its stock by adopting circular economy practices".

1. The Challenge - A Complex System Polycrises

Our world today is in every way a complex socio-techno-ecological system with many interactive drivers causing a complex emergent set of many crises together – a polycrises.

Polycrises are characterised by interactions between an “array of grave, long-term challenges, including climate change, biodiversity loss, pandemics, widening economic inequalities, financial system instability, ideological extremism, and an escalating danger of nuclear war” (Cascade Institute, 2024).

A crucial feature of crisis phenomena is extreme tail-risk and the modelling of financial, ‘natural’, and economic fragility. This includes the much-debated application of the precautionary principle to the characterisation of ecological sustainability.

The 2024 Cascade Institute Report, Introduction to Polycrisis Analysis, describes how relationships between stresses trigger events and crises across two or more interacting systems; suggesting that these can combine to create four broad causal pathways that “provide a ‘grammar’ for mapping the distinct system interactions that can form a polycrisis” (Lawrence et al., 2024).

(i) Interacting stresses (stresses in one system amplify stresses in a second system, or the two systems have common stresses)
(ii) Inter-systemic stress-trigger interactions (stresses in one system affect the trigger event of another system)
(iii) Crisis impacts on adjacent systems (a crisis in one system may affect the stresses and/or trigger event of another system)
(iv) Inter-systemic crisis interactions (a crisis in one system may interact with a crisis in another)

Complex systems, as proposed by David Rickles (2008) has a set of inter-related characteristics:

(i) a unit system must contain many subunits
(ii) these subunits must be interdependent at least some of the time
(iii) the interaction between subunits must be non-linear at least some of the time
(iv) properties of the system must be supervenient on those of the subunits and on their interactions. Moreover, these properties may be described as ‘emergent,’ when they amount to a new complex structure transcending those of the smaller subunits. Heterogeneity of subunits can contribute to this emergence. Typically, the subunits would modify their characteristics and behaviour both in response to changes in their environment (i.e., they are self-organizing adaptive) but also to changes in the system as a whole, which they might influence. Within economic and financial systems, other influences and drivers include network effects and the nature of non-linear interactions plus processes of herding and alignment, as well as speculative bubbles that may arise due to self-organising behaviour (Rickles, 2008).

2. Context – Australia and the Polycrisis

Circular Economy initiatives assist in the solution set for polycrises both internationally and here in Australia. Therefore, we commend the government for promoting an Australian Circular Economy and also comment as below.

The 2024 Interim Report by the Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Circular Economy Ministerial Advisory Group is to be commended for recognising the need for an overarching circular economy policy, strategy, or framework, noting that 75% of the G20 have such a policy framework whereas Australia does not.

The Interim Report also notes that Australia has the highest material footprint of the G20 and third highest of the OECD (behind Iceland and Ireland). Based on 2019 data, the Report notes that Australia's material footprint was 46.82 tonnes per capita compared to the OECD average of 21.5 tonnes per capita and that we the fourth lowest rate of material productivity in the OECD, generating US$1.20 of economic output for every kg of materials consumed, which is well under half of the OECD benchmark of US$2.50.29. Moreover, on a per capita basis, Australia generates 2.94 tonnes of waste, of which only 60% is recycled so that more waste is landfilled in this country than in any other developed economy.

The Circular Economy Ministerial Advisory Group is also to be congratulated for setting out a series of recommendations on policy and governance mechanisms that are designed to promote circular design, production and consumption in the Australian economy. This includes the development of National targets and indicators, commissioning a Productivity Commission study on resource efficiency impact on economic growth, determining the key circular economy measures in the Australian economy that will support net zero and quantify emissions benefits where possible, and developing an Australian Circular Economy Systems Map. Nevertheless, section 2.3.1 of the Interim Report concedes that:

> There is some limited modelling of the economic opportunities represented by a circular economy for Australia, which suggest actions could support a significant increase to GDP. However, these analyses are not whole-of-economy or comprehensive. A better understanding of how the circular economy supports economic growth in Australia will help inform decisions on how to target economic interventions.

In this regard, the Interim Report only cites two consultancy reports offering economic evidence to justify the adoption of a circular economy framework: one a 2021 report released by Price Waterhouse Coopers and the other a 2020 Report by KPMG Economics, which summarises the outcome of simulations conducted using the KPMG CGE Model.

The political and economic context for our submission has been informed by the notion that "cracks" are finally occurring to the edifice erected after half a Century of

Neoliberal policy. In a nutshell, politicians of all persuasions in the US, Europe and Australia are waking up to the fact that too much productive capacity has been "offshored", especially within the manufacturing sector. This loss of capacity has undermined the ability of nations to innovate, including within the advanced manufacturing and defence equipment sectors. Moreover, AI is touted as a solution, but this will barely help to overcome the substantial shortfall of capacity.

This problem is generally discussed in the context of "strategic supply chain management," but is something that can readily be investigated through comparative studies of R&D and other innovative activity across nations. Policy responses have included Biden's omnibus "Anti-Inflation Bill", Trump's MAGA threat to impose punitive tariffs on China, and the more cautious "Future Made in Australia" proposals of the Albanese Government. For its part, China has attempted to transcend the dichotomy between "market versus plan" (Boer, 2024) and has embraced a technology-based industry policy under the influence of Germany's "Industrie-4.0" agenda (Naughten, 2021)

The first section of our submission, focusing on the polycrisis, could be summarised by the maxim "complex problems require complex *integrated* solutions". In the Australian context, one of the major stressors, relates to the under-provisioning of social housing and the crisis of housing affordability in urban regions. Coupled with this are the costs associated with congestion and accessibility to employment opportunities and social infrastructure within large scale residential developments. And the current period of inflation has further impacted on the costs of energy generation, storage and transmission, and on construction costs in the housing sector.

Another major problem is the lack of private investment flowing into all sectors of the Australian economy to create renewal, growth, and new production capital. This is especially obvious, for example, in the lack of funding for Nature, for our fragile biodiversity ecosystem (second most fragile in the developed world) in the regenerative agriculture sector in Australia, the small, diversified family farms including organic, and new circular industries and urban developments.

Regenerative, organic, and small farms must compete with unsustainable forms of agriculture, and also contend with the market distorting power of a supermarket duo/triopoly intent on profiting more effectively from cost-reduction techniques and economies of scale across the farmer to shelf chain.

A recent NCAG report by Natural Capital Advisory Group (comprising Macdoch Foundation's Farming for the Future and ASFI), representing Australian financial institutions that have indicated that they are committed to providing financial support to sustainable agriculture, has clearly identified the multiple internal and external barriers to long-term investment in the sector. The problems range in magnitude from prohibitive (e.g., volatility and liquidity), to minor but pervasive (e.g., attitude and ignorance about the potential for investment in the regenerative agricultural industry).

They emphasise their belief that the major barriers will be insurmountable without significant changes being made in the future.

Australia is dealing with a multiplicity of “wicked problems" that have become unsolvable when they are intertwined in so many ways that they become entrenched. We have cited two examples above, affordable housing and unwillingness of Australian financial institutions (including superannuation funds) to participate in Australian regenerative agriculture etc. Global capital, with more flexible and diverse investment requirements is far more willing to invest in the long term.

3. CR^2E a Proposed Solution

The Sustainability Research Institute has identified that an integrated solution to the multiple interwoven features of the Australian polycrisis, as described above, can be achieved through the adoption of a complex systems approach. To translate this into practice and grow productivity in the economy a network of Circular, Resilient, Regenerative Economy (CR^2E) precincts developments is proposed as a primary vehicle to realise the opportunities of a circular economy. These precincts would be designed to complement and interact with the regions and existing urban centres and incorporate a range of mutually beneficial industry, regenerative agriculture, housing, social services and circular economy initiatives.

These place-based circular economy precincts will operate like regional hubs servicing the region but will also be interconnected with each other across regions forming a Circular Resilient Regenerative economy network.

They will each have a unique configuration of industries reflecting local traditions, regional capabilities and home-grown technological advances drawn from both the individual precinct and from across the entire network of precincts. Not only would this include representatives from the regenerative agriculture, forestry and fisheries, but also those from construction, architecture, and the built-environment, energy, transport, water and waste management and the creative industries, along with consulting, education and training activities.

There will be the provision of both affordable housing and conventional housing so that the needs of the population for housing will be met. Regarding the current insurmountable obstacles to building affordable housing, we can incorporate innovative ways to crack the impasse on costs, labour, supplies etc into our design and planning. On the bottom line of the CR^2E development financials, it shows that we can employ innovative solutions because we have a bundled revenue financial structure and risk to investors is spread across multiple income streams.

The revenue streams derived from a wide variety of circular and regenerative economic activities will be bundled together to form a composite investment vehicle. What needs to be emphasized is that scalable and networked developments of this kind could contribute greatly to insulating financial institutions (especially

superannuation funds) from upheavals in financial markets. The adoption of sustainable circular-economy initiatives across the network of precincts, including the business and service entities operating within them, would generate a stable internal market for a wide variety of goods and services, along with equally stable employment opportunities. It is important to realize that flows of real resources, that move in one direction within a circular economy, must necessarily be matched by a monetary flow of income and expenditure in the oppositive direction. By the same token, circular flows of investment would be matched by flows of savings in the opposite direction that assume a form, which Keynes first described, in his famous 1937 paper on the *General Theory*, as a circular flow of funds. This internal market would boost average returns and lower overall levels of risk for investors, while removing incentives for the exploitation of income- and asset-based Ponzi schemes.

The CR^2E investment structure will need to be designed by leading financiers in Australia utilising the expertise of those collaborating on the project. The structured financial arrangements will vary to conform to the individual preferences of investors. There are expected to be multiple iterations and a notable variation in each project and in its investment structure, which will alter in response to each configuration of investors and what they require (e.g., by way of an exit strategy).

Anticipated Potential Benefits of CR^2E Developments to Government

Both the CR^2E Developments and, by association, the Australian corporations that contribute to their design, planning and construction, could assist the Australian Government in meeting its Circular Economy objectives in two inter-related ways:

1. By attracting private capital into CR^2E Developments on an on-going basis; recognising that there is an excess of patient, long-term capital available for projects of this kind, provided that their economic and financial viability can be clearly demonstrated. At the same time, this would also serve as a “proof of concept” for the complex systems perspective that we have drawn upon.
2. By providing a showcase for the capabilities of Australian companies: not only for those involved in regenerative agriculture and circular economy initiatives, but also those specifically involved in the modular design of low-cost accommodation, management of wastewater, and renewable energy production and storage.

4. Research and Modelling to Inform Solutions

In summary, what has been highlighted above is the need to develop solutions to complex economic and socio-ecological problems. This will require foundational research to develop a model that can succeed in obtaining substantial capital to implement.

Incidentally, on 4 July 2024, SRI made a submission to the National Urban Planning Review and on 15 July 2024 SRI's submission to Nature Positive. In our NUP submission SRI proposed a new consideration in planning and zoning to support a

much-needed alternative to the century-old model of city and suburban expansion that will be relevant to population growth and well-being throughout the 21st Century.

SRI's lead team will draw on talent from leading complex systems and polycrisis researchers and institutes around the world to develop the place-based circular, regenerative and resilient economic development as a new model to address current crises and demonstrate their economic and financial attraction to both institutional and private investment.

Our modelling is focused on calculating net benefits derived from CR^2E developments, which will take three forms:

(i) economic modelling as described in section 3 of this submission

(ii) social modelling from a planner's perspective, with low or zero discount rates applied to projected streams of monetised net benefits that include the shadow pricing of environmental goods and services in accordance with the United Nations System of Environmental-Economic Accounting

(iii) modelling from a financial perspective, proving up the commercial feasibility of such developments so that the goal of achieving the optimum philanthropic/private/public partnership in a bankable deal will be reached.

This approach is aligned to US climate envoy John Kerry's framework for how to achieve the substantial finance needed for major change at a global scale for both climate and biodiversity. Public capital is not needed and unless it wants to participate, we see the major assistance from government in the areas of legislation, bringing together collaborative teams, providing incentives etc. to facilitate economic growth, competition and innovation.

The following aspects indicate some of the complex systems modelling being taken into consideration in our work.

In a 2005 paper, Michael Weber, T. Volker Barth, Klaus Hasselmann introduce the Multi-Actor Dynamic Integrated Assessment Model (MADIAM) developed for applications to climate change. The third author shared the 2021 Nobel Prize in Physics "for the physical modelling of Earth's climate, quantifying variability and reliably predicting global warming". The MADIAM model couples a nonlinear impulse response model of the climate sub-system (NICCS) to a multi-actor dynamic economic model (MADEM). The authors acknowledge that "[n]o single model will ever succeed in capturing all the intricacies of the innumerable interactions characterizing the dynamics of the complete system." Moreover they warn that "current impulse-response models do not yet include changes in the statistics of extreme events or the possible occurrence of instabilities of the climate system," such as "a shut-down of the oceanic thermohaline circulation", a "break-off of the West-Antarctic ice sheet," or "a release through global warming of large quantities of methane stored in permafrost regions or in methane clathrates in the deep ocean ."

Their chosen “Classically motivated” approach contrasts with those of “later neoclassical growth models,” have been revived again in various forms in recent models of “endogenous technological change,” which represents the principal driving factor of economic growth. In defense of their modelling choice, they cite a 2003 text by economist Neri Salvadori, in arguing that a Classical political economy approach is implicit in the New Growth Theory, which specifically accounts for the multi-sectoral production of capital goods using other produced goods. This cannot be said of the CGE models routinely employed by consultants such as KPMG

Just as nonlinearities and tipping points can lead to erroneous predictions at the macroeconomic level, they can also play havoc with Integrated Assessment Models (IAMs) constructed and calibrated at the microeconomic level. By way of an example, many agencies calculate Energy Returns on Investment (EROIs) for different techniques of power generation. These can vary dramatically over time (e.g. typically because the best sites for generating renewable energy are acquired first, so that less attractive sites must be considered as the demand for renewable energy increases). This problem is discussed at length in Delannoy et al, 2024. For this reason, the biophysical modelling of potential sites for the generation of solar and wind power may be necessary to support the application of IAM over the medium to long run.

Most industrial ecologists model the circular economy by extracting information from input-output tables and other process-based sources (see Chapter 2 of Shmelev, 2012). For example, mining engineer, Simon Michaux (GTK Reports | Simon Michaux), has identified chokepoints and bottlenecks in the global economy, using mining- and production-based process analysis under the assumption that firms are drawing on the best-available technologies, known reserves, and extant discovery rates for different minerals and metals that will be required on a global scale. These bottlenecks can then be interpreted as stimulants for urgent research into alternatives to current technologies (e.g. Chinese control of known reserves of rare earths has promoted research into alternative battery technologies using more plentiful mineral deposits, and the Hazer Group has pioneered the production of hydrogen and graphite from methane in a Commercial Development Plant to lower the cost of hydrogen production as a clean fuel).

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