

**CIRCULAR
ECONOMY
INNOVATION
FRAMEWORKS**



ABOUT THESE FRAMEWORKS

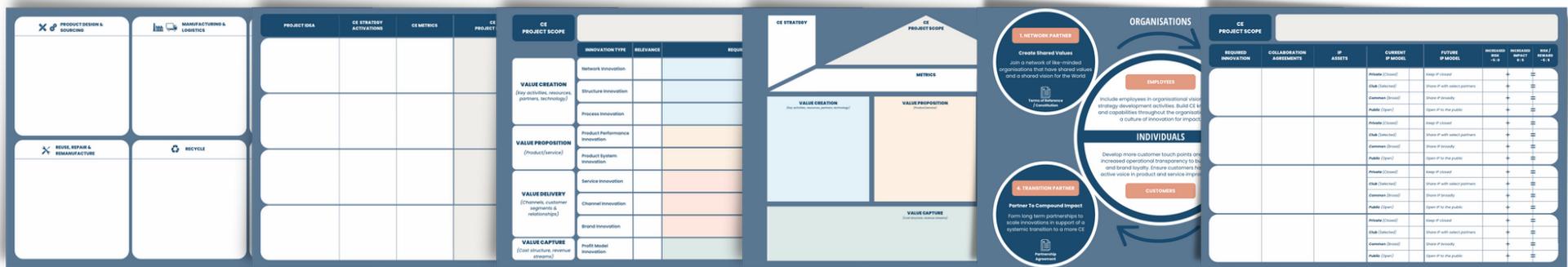
These frameworks were developed as part of the Victorian Circular Activator (VCA), a physical innovation hub based in Melbourne. They were developed to help businesses navigate the emerging circular economy body of knowledge in order to accelerate both disruptive and iterative innovations that help accelerate the transition towards a more circular economy in Victoria.

The hope is that they will create accessible innovation pathways that organisations can use to inform and guide their journey to circularity. This innovation pathway consists of a series of frameworks that support circular economy thinking at different business decision making levels that culminate in an organisation delivering a number of circular economy transition projects throughout their business.

The scope of this work is focused on innovation that is within a businesses control, and does not cover the macro level forces needed to provide the favourable landscape needed for circular economy innovation to thrive. The frameworks are thus limited in their overall impact and should be built on over time. For the purpose of this work we will retain a business centric perspective, focusing on areas that organisations have direct control over.

These frameworks were developed through a theoretical driven literature review process. They consolidate best practice tools and research into an easily digestible set of frameworks. Original sources have been referenced throughout the document, as well as summarised at the end.

Future work of the VCA will help validate and build on this first version of the frameworks through practical application.



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SECTION 1

Understanding the transition
from linear to circular

FROM LINEAR

Our current economy is driven by the throughput of materials. Turning raw materials into products and services to meet human needs. At the perceived end-of-life, most products are disposed of, ending up in landfills or polluting natural ecosystems. This process is commonly referred to Take, Make, Use, and Waste.



This simple process represents a vast and complex global supply chain. To depict the intricacies of this system will be nearly impossible. For the purposes of this work, we break the global supply chain into seven broadly defined stages.

1. **Product design** - All processes and resources involved in designing, prototyping, and testing new products
2. **Sourcing** - All processes and resources involved in sourcing the required material and energy to make the product
3. **Manufacturing** - All processes and resources involved in turning raw materials into finished products
4. **Logistics** - All processes and resources involved in moving materials and products between supply chain stages
5. **Marketing & sales** - All processes and resources involved in selling a product
6. **Product use** - All processes and resources involved in the use of the product
7. **End of life** - All processes and resources involved in disposing of products



FROM LINEAR

Another important element to visualise is the associated social and economic value at each supply chain stage. This can be visualised using the value hill diagram. During each of the myriad of processes and transactions between product design and product use, value is continually being added to the base raw materials. This value is both economic, as well as social.

- **Economic value** - All direct and indirect costs associated with bringing a product to market.
- **Social value** - The social utility of a finished product verse the individual components or materials that it is composed of.

As illustrated in the below image, products are at their highest overall economic and social value during the Sales and Product use stages.



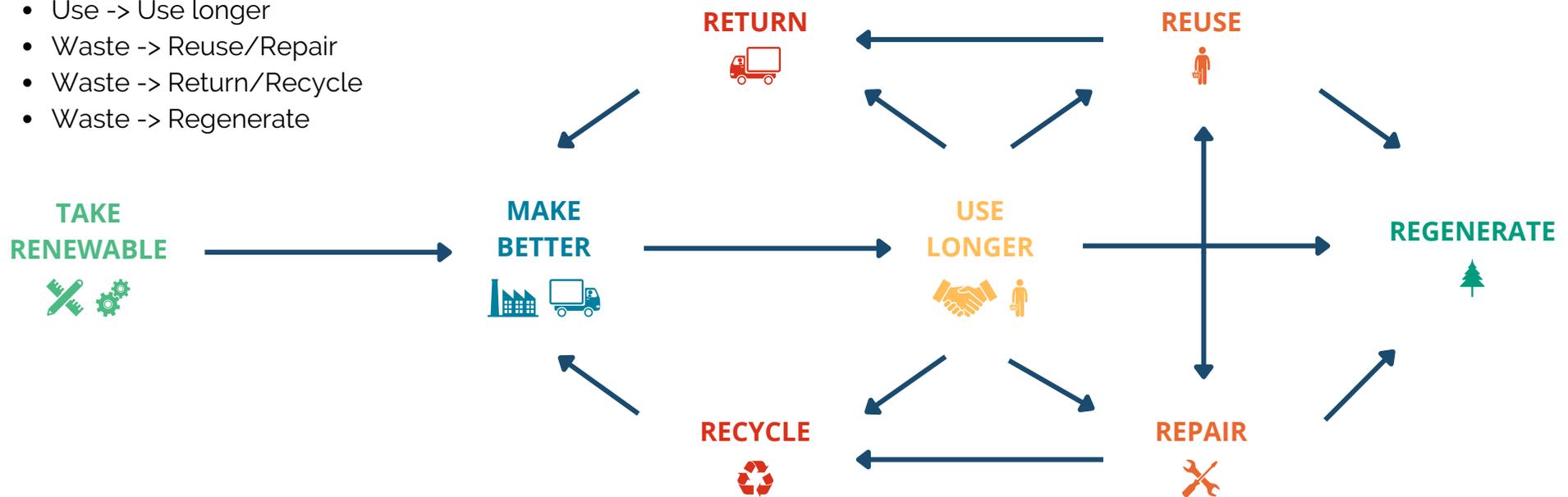
TO CIRCULAR

To achieve a global goal of sustainable development, where we can meet the needs of all people within the means of our Planet, we need to change our linear economy into a circular economy. This economic transition is both broad and complex. For the purposes of this work we use the three Ellen MacArthur Foundation principles to define a circular economy, To transition to a circular economy we need transform our global supply chain so that we can:

1. **Eliminate** waste and pollution
2. **Circulate** products and materials at their highest value and utility for as long as possible
3. **Regenerate** natural systems

This requires us to adjust our current Take, Make, Use, and Waste model.

- Take -> Take renewable
- Make -> Make better
- Use -> Use longer
- Waste -> Reuse/Repair
- Waste -> Return/Recycle
- Waste -> Regenerate



Board of Innovation: Business Models that work in the circular economy
www.boardofinnovation.com

TO CIRCULAR

To apply this new model to the simplified supply chain processes, six circular economy strategies have been identified from literature to support the transition from linear to circular.

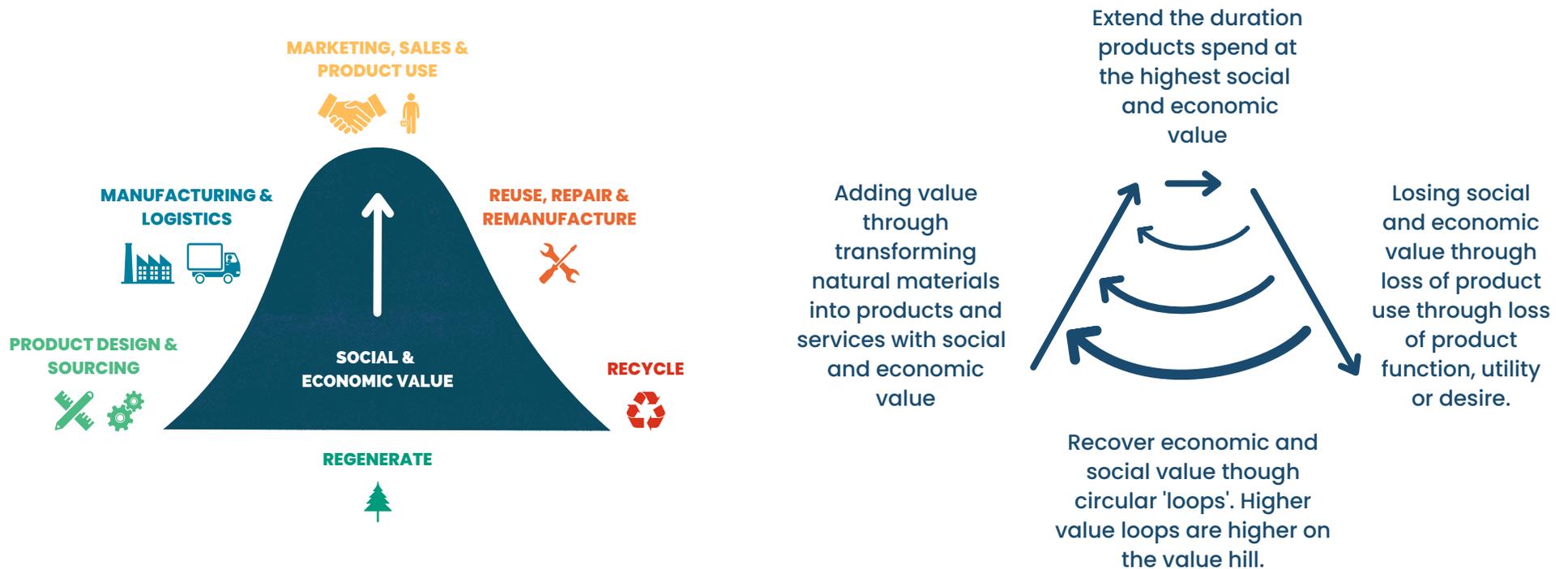
1. **Product design** - Design products with end-of-cycle and eventual end-of-life in mind
2. **Sourcing** - Source recycled or renewable materials
3. **Manufacturing** - Optimise resource use during production processes and use renewable energy
4. **Logistics** - Optimise resource use during logistics processes and use renewable energy
5. **Marketing & sales** - Build strong relationships with customers to support product maintenance, repair and end-of-cycle
6. **Product use** - Support customers to increase the utilisation rate of products
7. **End of life** - Eliminate waste to landfill through reuse, repair, remanufacturing, recycling, and regeneration of natural ecosystems



TO CIRCULAR

Benefits from transition from linear to circular go beyond environmental benefits. The circular economy offers significant social and economic benefits through the retention of value as described by the value hill.

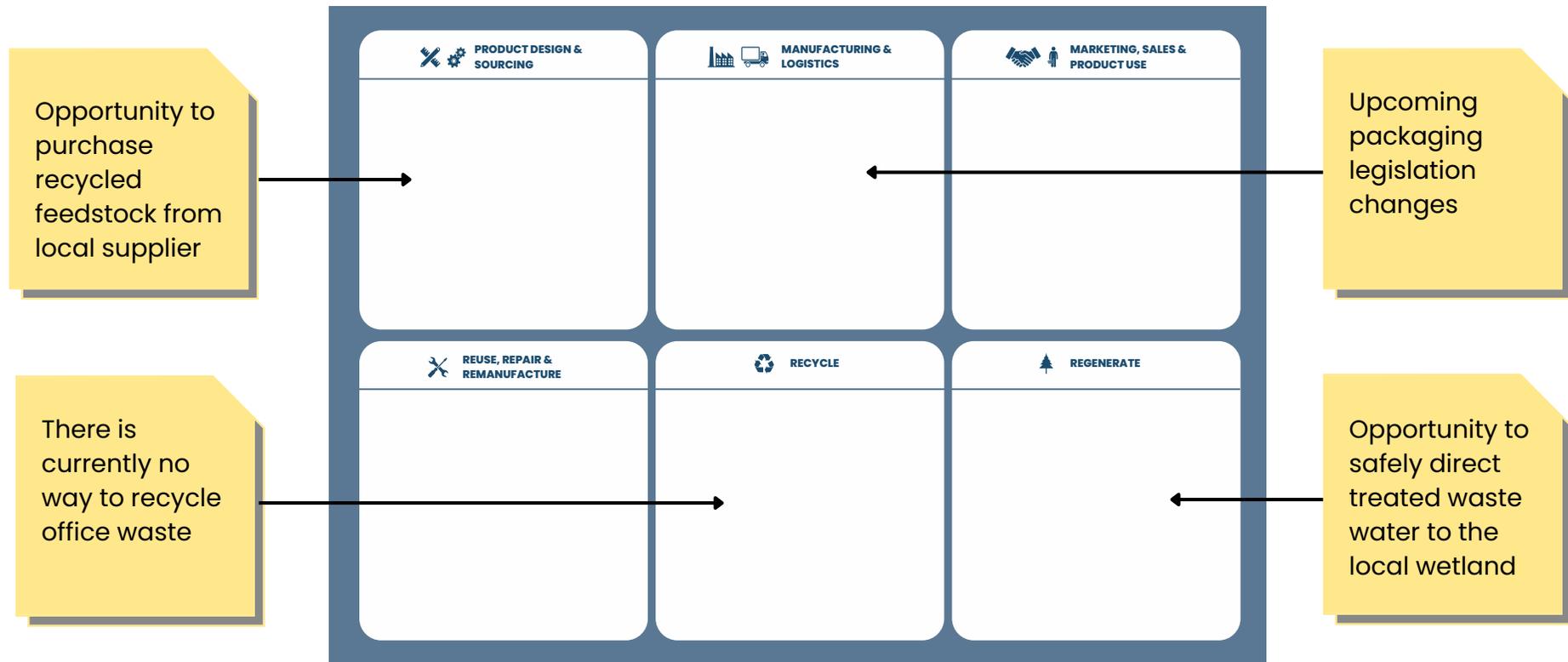
By creating cascades at different points between end of the product use phase and eventual end-of-life, we can retain much of the product, component, and material utility and inherent economic value. The value hill has been adapted below to reflect the addition of circular economy processes.



FRAMEWORK 1: IDEATE

Start transitioning from linear to circular by brainstorming potential circular transition projects . Projects can be any size, from implementing recycling bins within offices, to adjusting procurement guidelines, to optimising machine downtime, to creating a new product-as-a-service offering, and everything in between.

This framework uses the simplified supply chain stages as a rough guide to support ideation and circular transition project problem/opportunity statements. Write down ideas in the form of a problem or opportunity statement.





**PRODUCT DESIGN &
SOURCING**



**MANUFACTURING &
LOGISTICS**



**MARKETING, SALES &
PRODUCT USE**



**REUSE, REPAIR &
REMANUFACTURE**



RECYCLE



REGENERATE

SECTION 2

Explore the key circular economy
strategies

SIX CIRCULAR ECONOMY STRATEGIES

Section 1 shows that the transition to a circular economy is more than just recycling the office milk bottles. It requires fundamental changes in every organisation throughout the global supply chain.

This section puts forward six circular economy strategies, each consisting of a number of individual circular economy innovations and metrics that support an organisation's transition from linear to circular. The six strategies are not mutually exclusive of each other, but rather support and are connected to each other. It is recommended that organisations start with a manageable scope focused on one of the six strategies and then slowly increase the scope and weave in other strategies over time until every aspect of the organisation has at least one circular innovation and metric embedded with its daily operations.

Below is a brief description of each of the six circular economy strategies, as well as its closest relationship to the simplified supply chain stages from section 1.

PRODUCT DESIGN & SOURCING



Dematerialise strategy

Substitute product utility with services and use renewable materials

REUSE, REPAIR & REMANUFACTURE



Slow strategy

Use products and components for a longer duration

MANUFACTURING & LOGISTICS



Narrow strategy

Use less energy and materials in production & operations

RECYCLE



Cycle strategy

Use products, components & materials again

MARKETING, SALES & PRODUCT USE



Intensify strategy

Increase the utilisation rate of products within the use phase

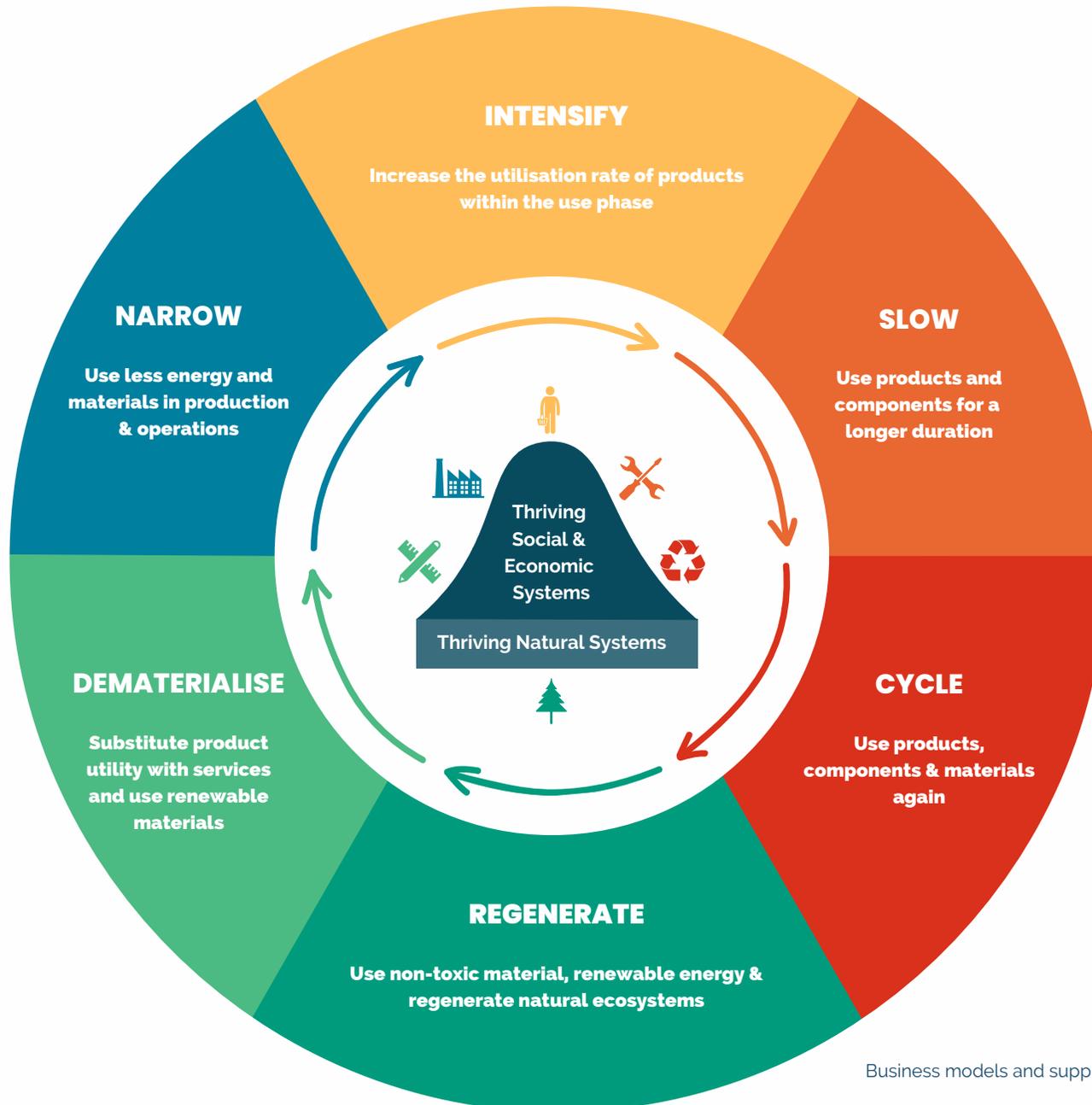
REGENERATE



Regenerate strategy

Use non-toxic material, renewable energy & regenerate natural ecosystems

SIX CIRCULAR ECONOMY STRATEGIES



Business models and supply chains for the circular economy
Geissdoerfer, et al.



DEMATERIALISE

Substitute product utility with services and use renewable materials

DEMATERIALISE strategies focus on reducing the overall quantity of materials within the economy by rethinking how products/services are created to meet human needs.

This can be done by rethinking a products purpose, composition, or ownership model. Below we explore some of the key activations that support organisations to implement this circular economy strategy, as well as the key metrics used to measure progress towards circularity.

Strategy Activations:

- Design for multipurpose
- Design for simplicity (Minimalist)
- Substitute technical nutrients to biological nutrients
- Eliminate toxic chemicals
- Eliminate unnecessary packaging
- Reduce use of hard to recover composite materials
- Increase use of recycled content
- Engage in a product stewardship scheme
- Create a product as a service offering
- Design with low-impact inputs
- Design light-weight products
- Enable and incentivise users to consume less
- Encourage sufficiency



NARROW

Use less energy and materials in production & operations

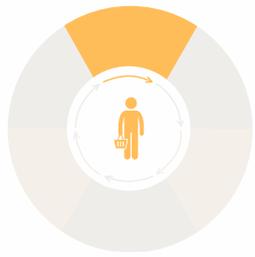
NARROW strategies focus on increasing material and energy efficiency throughout the entire product life cycle.

Resource used within the actual product, as well as resources used within all product associated supply chain processes between extraction and end-of-life should be optimised. This includes all material (solids, liquids, gases), water, and energy flows.

Although very aligned to DEMATERIALISATION, the focus of the NARROW is one design efficiency and process optimisation.

Strategy Activations:

- Switch to renewable energy and minimise power usage
- Minimise water usage and maximise water recycling
- Eliminate production waste
- Minimise inventory holdings
- Reduce batch sizes
- Increase forecasting efficiency
- Localise supply where appropriate
- Optimise logistic routes



INTENSIFY

Increase the utilisation rate of products within the use phase

INTENSIFY strategies focus on increasing the utilisation rate of products by creating products that fulfil more functions and providing greater access to product functions.

This can be done by rethinking the product function, as well as the customer engagement model. Below we explore some of the key activations that support organisations to implement this circular economy strategy, as well as the key metrics used to measure progress towards circularity.

Strategy Activations:

- Design for multipurpose
- Enhanced usage data reporting
- Design for durability
- Support product integration to sharing platforms
- Provide the product as a service
- Maximise capacity use of products
- Design connected products
- Use product-in-use data to design more circular products and services
- Track the resource intensity of the product-in-use
- Track the condition, location and/or availability of the product
- Market circular products, components and materials through online platforms
- Build material database ecosystems



SLOW

Use products and components for a longer duration

SLOW strategies focus on increasing the overall lifetime that the product is usable within the economy.

This can be done by rethinking both the products design, as well as the product system that services a product throughout its life. Below we explore some of the key activations that support organisations to implement this circular economy strategy, as well as the key metrics used to measure progress towards circularity.

Strategy Activations:

- Design for upgradability
- Design for durability
- Design for modularity
- Design for easy dis- and reassembly
- Design with timeless design principles
- Foster strong emotional connection between user and product
- Engage in a product stewardship scheme
- Design for ease of maintenance and repair
- Enable users to maintain and repair their products
- Design for standardisation and compatibility
- Provide an unconditional lifetime warranty
- Remanufacture existing products and components
- Repurpose existing products and components



CYCLE

Use products, components & materials again

CYCLE strategies focus on increasing the total percentage of recovered post use materials that are reentering supply chains. This can also be seen as the strategy aimed to eliminate non-biological waste to landfill. This strategy cover only the recycling of technical nutrients. Biological nutrient recovery and cycling is covered in the REGENERATE strategy.

This is achieved both through the design of products, as well as the reverse supply chains that support material recovery, sorting, and delivery to reprocessing facilities. Below we explore some of the key activations that support organisations to implement this circular economy strategy, as well as the key metrics used to measure progress towards circularity.

Strategy Activations:

- Recycling labels
- Design with recycled inputs
- Design with materials suitable for primary recycling
- Design components, where appropriate, with one material
- Eliminate use of non-recyclable and complex composite materials
- Reuse and sell components and materials from discarded products
- Enable and incentivise product returns
- Recycle products in proper facilities
- Build local waste-to-product loops
- Engage in industrial symbiosis



REGENERATE

Use non-toxic material, renewable energy & regenerate natural ecosystems

REGENERATE strategies focus on increasing the total percentage of recovered post use materials that are regenerating natural systems. This can also be seen as the strategy aimed to eliminate biological waste to landfill. This strategy cover only the recycling of biological nutrients. Technical nutrient recovery and cycling is covered in the CYCLE strategy.

This is achieved both through the design of products, as well as the reverse supply chains that support material recovery, sorting, and delivery to appropriate natural ecosystems. Below we explore some of the key activations that support organisations to implement this circular economy strategy, as well as the key metrics used to measure progress towards circularity.

Strategy Activations:

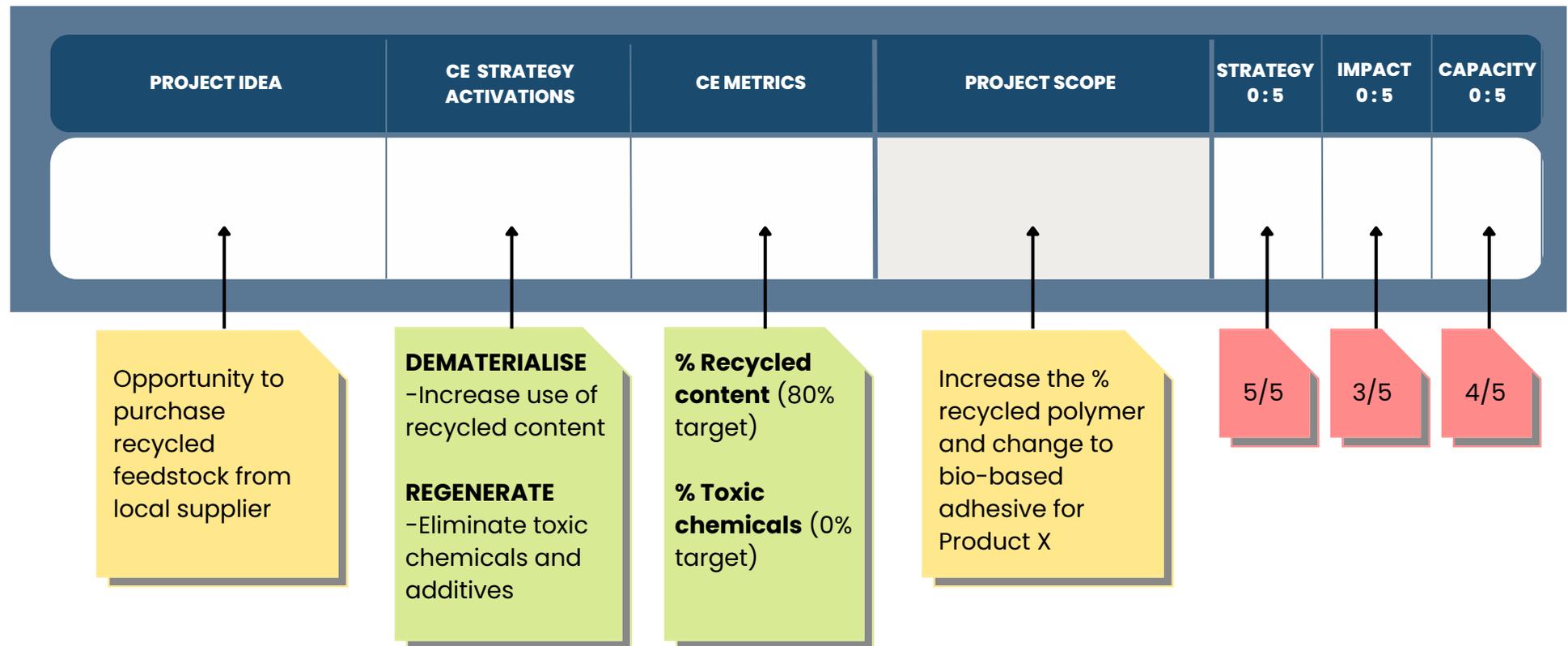
- Eliminate toxic chemicals and additives
- Biodegradable instructions on labels
- Design self-charging products
- Design with renewable materials
- Design with non-toxic materials
- Produce and process with renewable energy
- Power transportation with renewable energy
- Power the use of the product with renewable energy
- Recover nutrients from urban areas
- Regenerate polluted ecosystems
- Manage and sustain critical ecosystem services

FRAMEWORK 2: PRIORITISE

Start transitioning from linear to circular by identify an initial scope. Start small and then build your way up to more complex areas of the organisation. This framework builds on the ideas generated in the previous ideate framework by helping teams to scope circular transition projects by selecting one or more of the circular economy innovations and associated metrics from the six circular economy strategies.

The framework then helps teams prioritise potential circular transition projects by rating scopes against three key priority areas:

- **Strategy** - How aligned is the potential project to the organisation's strategic goals?
- **Impact** - How much potential positive impact can be gained from a circular transition project?
- **Capacity** - How likely is the project to succeed?



PROJECT IDEA	CE STRATEGY ACTIVATIONS	CE METRICS	CE PROJECT SCOPE	STRATEGY 0:5	IMPACT 0:5	CAPACITY 0:5

SECTION 3

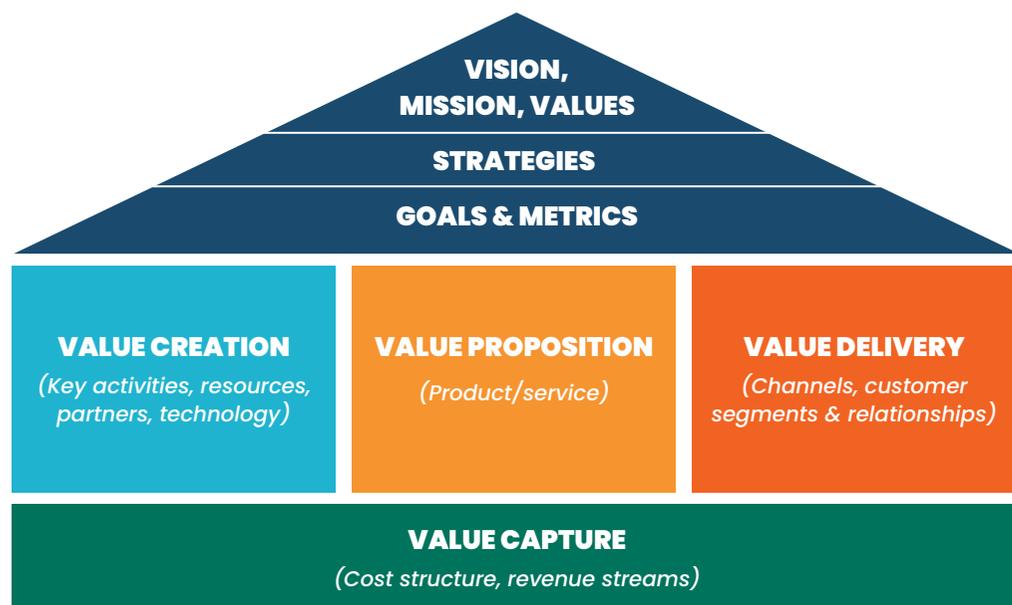
Embed circular economy
strategies into the business
model

CIRCULAR ECONOMY INNOVATION HOUSE (CEIH)

Section 2 provides a structured process to sort brainstormed circular economy opportunities into a priorities list of scoped circular transition projects. This section provides a framework to understand what type of innovations or changes are required to successfully deliver the scoped circular transition project, as well as how these innovations effect the core elements of the organisations business model. The framework puts a circular lens to a combination of Doblin's Ten Types of Innovation framework, as well as an adjusted version of Osterwalder's Business Model Canvas.

This framework is presented in the form of a house, with the 'roof' representing the vision, mission, values, strategies, goals and success metrics of the organisation. This 'roof' is supported by three 'pillars' that represent the way organisations create value, how they package their value into a value proposition, and deliver the value to customers. These 'pillars' are then supported by a 'base' that represents how an organisation captures this value.

Each component of the 'house' has a number of innovation types that can help embed circularity into the organisation's business model. These ten innovation types are explored further in the following page.



STRATEGIC 'ROOF'

- Is the organisation's vision is driving sustainable development?
- Is there strategic support for sustainable development initiatives?
- Are there measurable success goals/targets/metrics?

STRUCTURAL 'PILLARS'

- How does the organisation create value?
- How does the organisation offer its value to the market?
- How does the organisation deliver its value to its customers?

FOUNDATIONAL 'BASE'

- How does the organisation capture its value?

TEN TYPES OF INNOVATION (Doblin)

The adjusted Doblin Ten Types of Innovation are shown below. They are categorised into four core elements of the adjusted Osterwalder Business Model Canvas elements, that form the foundational 'base' and structural 'pillars' of the Circular Economy Innovation House. The strategic 'roof' of the house is not explored in any further depth within this framework.

VALUE CREATION <i>(Key activities, resources, partners, technology)</i>	Network Innovation - Innovation on how the organisation manages its relationships with stakeholders and key partners
	Structure Innovation - Innovation to the organisational structure, as well as the strategy that leads it
	Process Innovation - Innovation to the internal systems and processes of the organisation
VALUE PROPOSITION <i>(Product/service)</i>	Product Performance Innovation - Innovation to the overall performance of a product from the market's perspective
	Product System Innovation - Innovation to the overall value of a product offer from the organisation's perspective
VALUE DELIVERY <i>(Channels, customer segments & relationships)</i>	Service Innovation - Innovation that improves the relationship between the organisation and customers
	Channel Innovation - Innovation to the ways that customers find out about the organisation
	Brand Innovation - Innovation that strengthens the perception of your company from the markets perspective
VALUE CAPTURE <i>(Cost structure, revenue streams)</i>	Profit Model Innovation - Innovating how the organisation makes and spends money

FRAMEWORK 3 - SCOPE

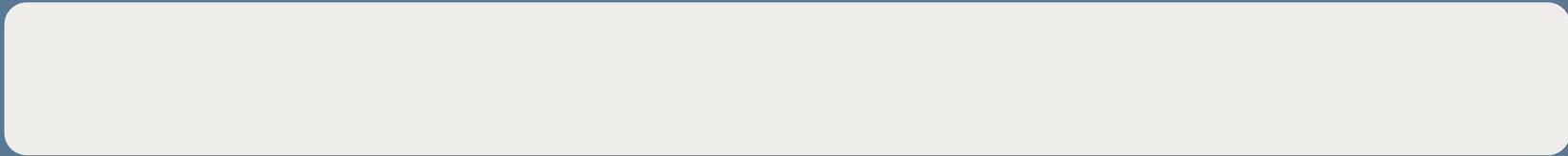
Now that you have identified a circular transition project scope, it is important to understand what aspects of the business model require innovation in order to successfully deliver the project. Start with the minimum number of innovations needed to succeed and then build on that to fully embed the innovation into the organisation's business model over time.

Increase the % recycled polymer and change to bio-based adhesive for Product X.

CE PROJECT SCOPE			
	INNOVATION TYPE	RELEVAN CE	REQUIRED INNOVATION
VALUE CREATION <i>(Key activities, resources, partners, technology)</i>	Network Innovation	✓	Partner with Supplier A to test a variety of recycled polymers and bio-based adhesives. Build a more transparent relationship with a shared goal. Explore shared IP options.
	Structure Innovation	✗	
	Process Innovation	✓	
VALUE PROPOSITION <i>(Product/service)</i>	Product Performance Innovation	✗	Optimise production runs based on new properties of recycled polymer and bio-based adhesive. Train staff on new process innovation.
	Product System Innovation	✗	
VALUE DELIVERY <i>(Channels, customer segments & relationships)</i>	Service Innovation	✗	
	Channel Innovation	✗	
	Brand Innovation	✗	
VALUE CAPTURE <i>(Cost structure, revenue streams)</i>	Profit Model Innovation	✓	Sell the product at a premium for its sustainable credentials, and offer a return credit at end-of-use cycle.

Decide what innovation types are relevant to your CE Project Scope. Start with the bare minimum and then iteratively increase the scope over time.

**CE
PROJECT SCOPE**



INNOVATION TYPE

RELEVANCE

REQUIRED INNOVATION

Network Innovation

Structure Innovation

Process Innovation

Product Performance
Innovation

Product System
Innovation

Service Innovation

Channel Innovation

Brand Innovation

Profit Model
Innovation

VALUE CREATION

*(Key activities, resources,
partners, technology)*

VALUE PROPOSITION

(Product/service)

VALUE DELIVERY

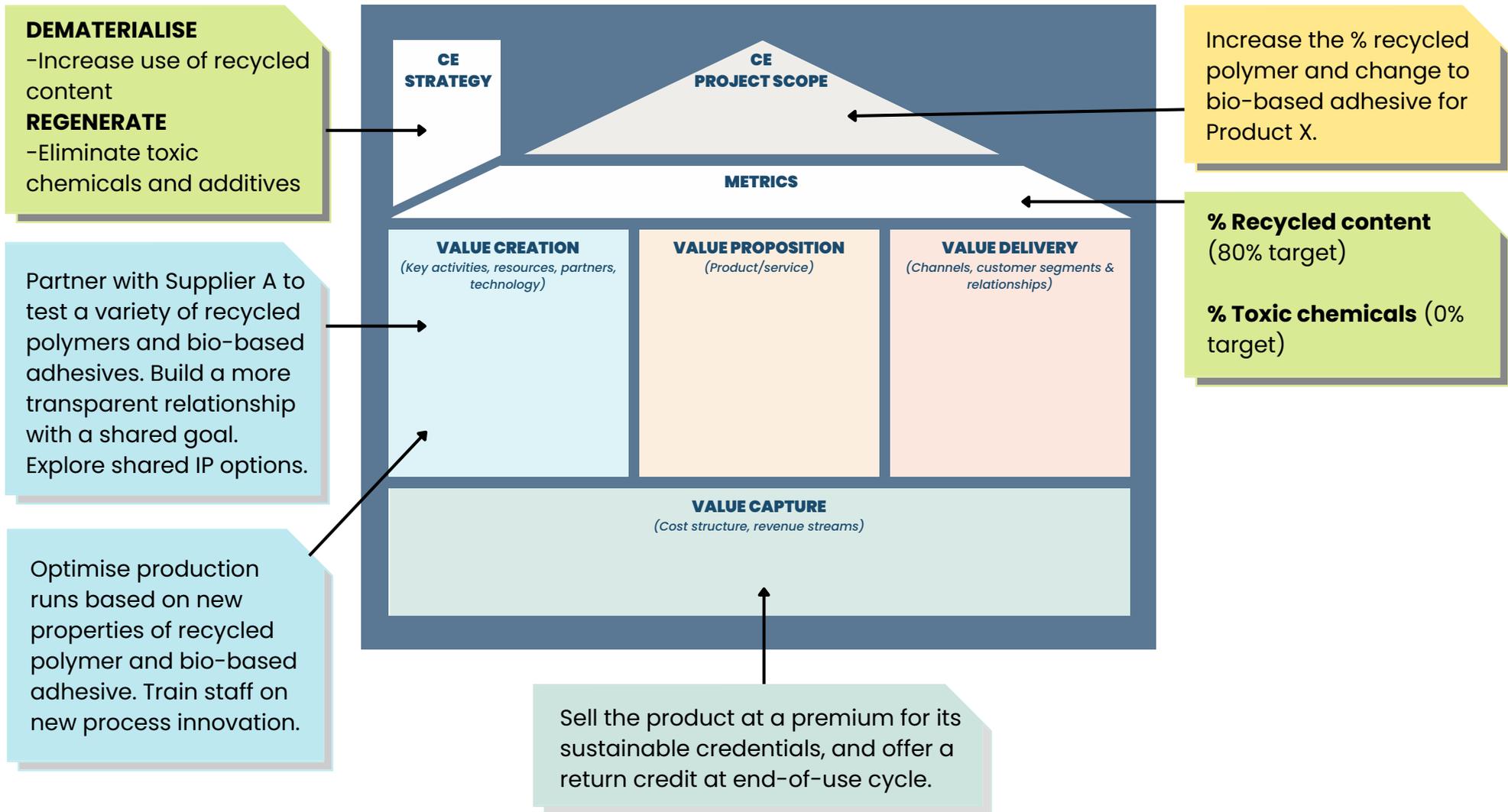
*(Channels, customer
segments &
relationships)*

VALUE CAPTURE

*(Cost structure, revenue
streams)*

FRAMEWORK 4 – EMBED

After ideation, prioritisation, and scoping, the circular economy transition project is ready to be delivered as part of a broader business model transition. This embedding process is critically important to prevent sustainability initiatives remaining at the periphery of organisations. Below is the example case study used in the above frameworks being embedded in the CEIH.



CE STRATEGY

**CE
PROJECT SCOPE**

METRICS

VALUE CREATION

(Key activities, resources, partners, technology)

VALUE PROPOSITION

(Product/service)

VALUE DELIVERY

(Channels, customer segments & relationships)

VALUE CAPTURE

(Cost structure, revenue streams)

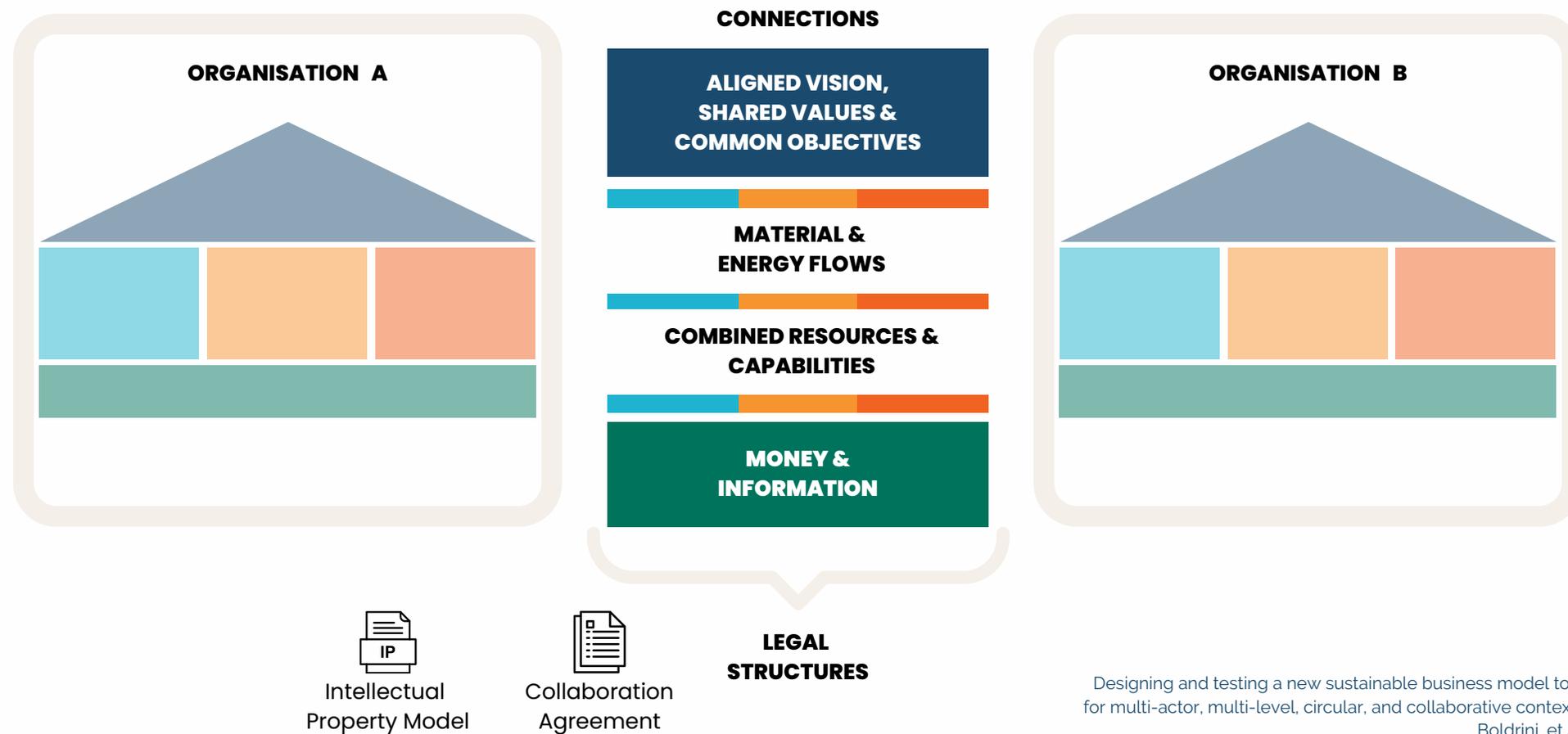
SECTION 4

Partner to compound impact

CIRCULAR ECONOMY ECOSYSTEMS

The transition towards a more circular economy goes beyond individual business models. It requires entire supply chains to become more effective at meeting human needs within the means of the planet. These systemic changes within our economies and societies require businesses to consider themselves as part of complex networks of individuals and other organisations. For the purposed of this work we will refer to these complex production and consumption systems as circular economy ecosystems.

In order to integrate businesses into circular economy ecosystems, organisations need to understand and define the connections between their organisation and other entities. The below image provides a simplified illustration of some of the key connections that occur during business-to-business collaborations, as well as two key legal structures needed to support them.



Designing and testing a new sustainable business model tool for multi-actor, multi-level, circular, and collaborative contexts
 Boldrini, et al.

FRAMEWORK 4 – COLLABORATE

This framework presents four business-to-business collaboration types and examples of the associated agreements needed to support circular economy ecosystem development. The collaboration types build on each other as trust builds and circular economy ambitions increase.

The idea is that by following this model, organisations are able to slowly build their circular economy networks over time.

1. **Network Partner** - Join a network of like-minded organisations that have shared values and a shared vision for the World.
2. **Strategic Partner** - Explore shared value opportunities with organisations with aligned goals and complimentary capabilities.
3. **Innovation Partner** - Team up to test new ideas that explore holistic value creation in support of shared CE goals.
4. **Transition Partner** - Form long term partnerships to scale innovations in support of a systemic transition to a more CE.

The framework also encourages continued relationship building with two groups of individuals that are fundamental to the success of circular economy transitions within businesses: **Employees**, and **Customers**.

It is important to note that this framework is not comprehensive and needs to be developed further to illustrate how businesses engage with other socio-cultural, technological, economic, environmental/ecological, and political elements present within circular economy ecosystems.

Further work of the VCA will explore this, as well as continue to refine the collaboration types presented in the framework. Future iterations of this framework aim to explain the legalities involved in each respective collaboration type in more depth to support an increase in circular economy ecosystem development within Victoria.

ORGANISATIONS

1. NETWORK PARTNER

Create Shared Values

Join a network of like-minded organisations that have shared values and a shared vision for the World



Terms of Reference
/ Constitution

2. STRATEGIC PARTNER

Build Trust & Explore Ideas

Explore shared value opportunities with organisations with aligned goals and complimentary capabilities



Memorandum of
Understanding

EMPLOYEES

Include employees in organisational visioning and strategy development activities. Build CE knowledge and capabilities throughout the organisation. Foster a culture of innovation for impact.

INDIVIDUALS

Develop more customer touch points and foster increased operational transparency to build trust and brand loyalty. Ensure customers have an active voice in product and service improvement.

CUSTOMERS

4. TRANSITION PARTNER

Partner To Compound Impact

Form long term partnerships to scale innovations in support of a systemic transition to a more CE



Partnership
Agreement

3. INNOVATION PARTNER

Team Up For Innovation

Team up to test new ideas that explore holistic value creation in support of shared CE goals



Services
Agreement

INTELLECTUAL PROPERTY MODELS

Intellectual property (IP) models are important legal structures that play a vital role within the transition towards a more circular economy. They provide the protection and commercial incentives needed to drive innovation by allowing organisations to create assets for competitive advantage. These assets can then be shared openly over time to provide the foundation for future innovation. This process of eventual open innovation is fundamental to long term socio- technical transitions

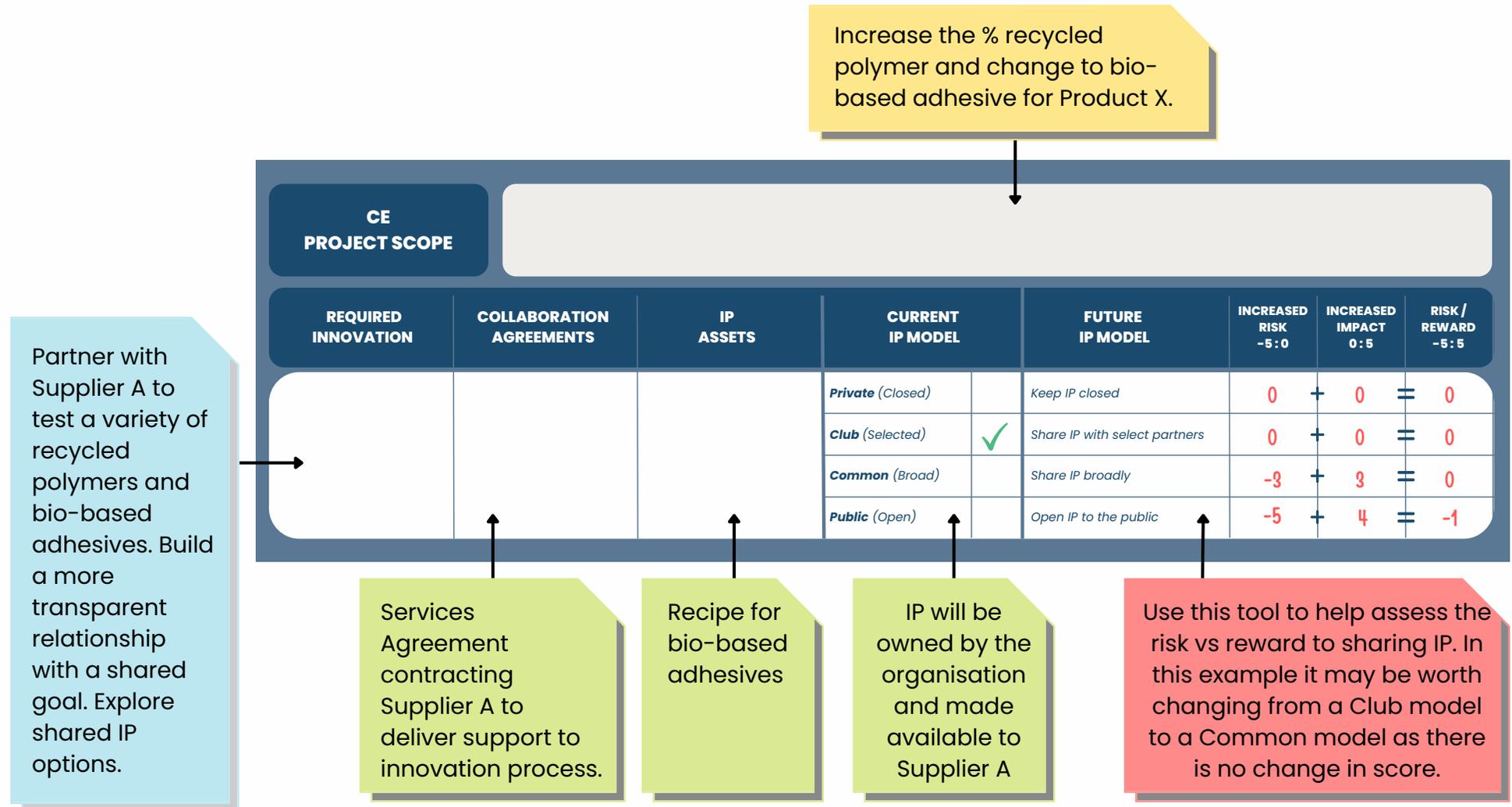
It is vital for organisations to take a balanced approach to IP development. Businesses need to remain competitive in the market, while simultaneously scaling their sustainable development oriented impact by increasing the degree of openness of their innovations over time. The below table and accompanying framework provide organisations with a simplified way to think about IP, and track the degree of openness of each innovation. Note that this work is not comprehensive and needs to be refined over time.

	PRIVATE IP MODEL <i>(Closed use)</i>	CLUB IP MODEL <i>(Selected sharing)</i>	COMMON IP MODEL <i>(Broad sharing)</i>	PUBLIC IP MODEL <i>(Open sharing)</i>
Ownership of IP	Ownership is highly concentrated	Ownership is concentrated or distributed among several owners		No one owns the IP (Public domain)
Access to IP	Owners prevent others from accessing their IP	Only members of the club can access IP (Entry barriers high for outsiders)	Almost anyone can access the IP (Entry barriers are low for outsiders.)	IP is accessible to anyone
Commercial usage of IP	Owners restrict commercial usage by others entirely	Only members of the club are entitled to commercial usage	Owners allow almost anyone to use the IP with restrictions	Owners cannot/do not restrict commercial usage by anyone

Closed - **Degree of openness** Open +

FRAMEWORK 5 – SHARE

After understanding how the circular transition project can be embedded within the organisation's business model, it is important to understand the IP that will be produced, and assess how that IP can be increasingly shared over time to compound broad circular economy impact. The below framework offers a simple way to track and assess IP related to circular transition projects.



**CE
PROJECT SCOPE**



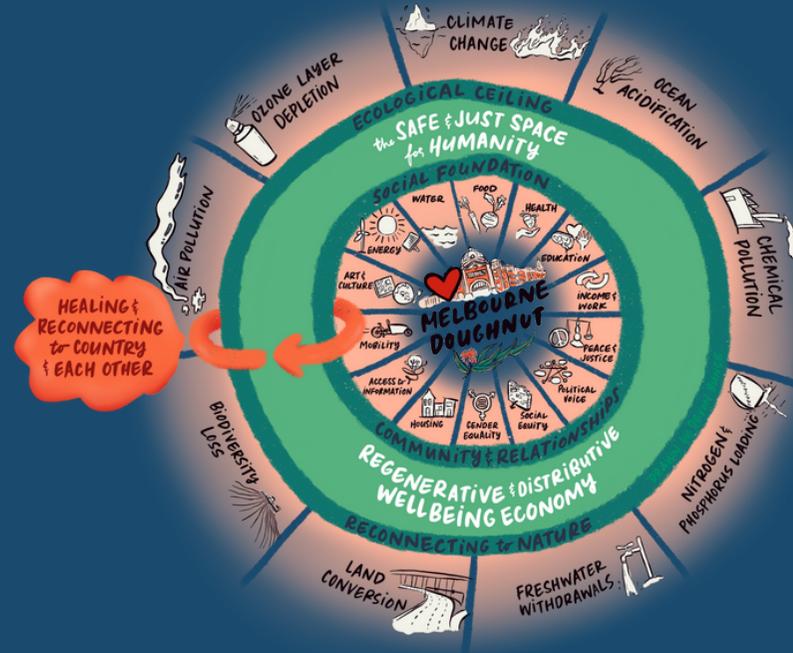
REQUIRED INNOVATION	COLLABORATION AGREEMENTS	IP ASSETS	CURRENT IP MODEL		FUTURE IP MODEL	INCREASED RISK -5:0	INCREASED IMPACT 0:5	RISK / REWARD -5:5
			<i>Private</i> (Closed)		Keep IP closed		+	=
			<i>Club</i> (Selected)		Share IP with select partners		+	=
			<i>Common</i> (Broad)		Share IP broadly		+	=
			<i>Public</i> (Open)		Open IP to the public		+	=
			<i>Private</i> (Closed)		Keep IP closed		+	=
			<i>Club</i> (Selected)		Share IP with select partners		+	=
			<i>Common</i> (Broad)		Share IP broadly		+	=
			<i>Public</i> (Open)		Open IP to the public		+	=
			<i>Private</i> (Closed)		Keep IP closed		+	=
			<i>Club</i> (Selected)		Share IP with select partners		+	=
			<i>Common</i> (Broad)		Share IP broadly		+	=
			<i>Public</i> (Open)		Open IP to the public		+	=
			<i>Private</i> (Closed)		Keep IP closed		+	=
			<i>Club</i> (Selected)		Share IP with select partners		+	=
			<i>Common</i> (Broad)		Share IP broadly		+	=
			<i>Public</i> (Open)		Open IP to the public		+	=

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The Victorian Circular Activator (VCA) embraces a regenerative vision for Victoria where all Victorians can thrive in balance with the life giving systems of our Planet. This vision has been articulated by Regen Melbourne, of which the VCA is proud to be a founding member.



The VCA acknowledges the living connections of the Bunurong Boon Wurrung and Wurundjeri Woi Wurrung peoples to the lands and waters of the Eastern Kulin Nation. We pay our respect to their Elders past, present and emerging.