



Circular Economy Principles

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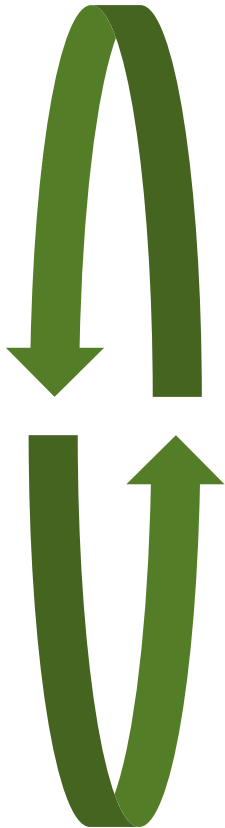


Circular Economy: an Overview



Circular Economy

Transforming our Linear Processes



The circular economy refers to an industrial economy that is restorative, sustainable and collaborative by intention. It relies on renewable and clean resources: energy, water, materials, land. Through careful design, it aims to keep materials and products in circulation for very long cycles and eliminate waste.

Move from Tinkering to Redesigning

Moving from tinkering
the current linear
processes

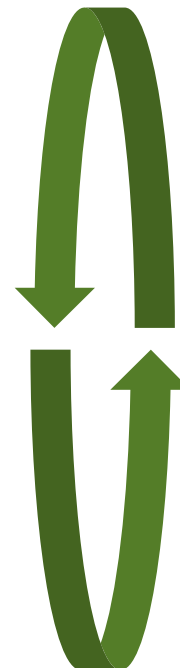
To rebuild and rethink to
design waste out of the
system

3 Traditional R's



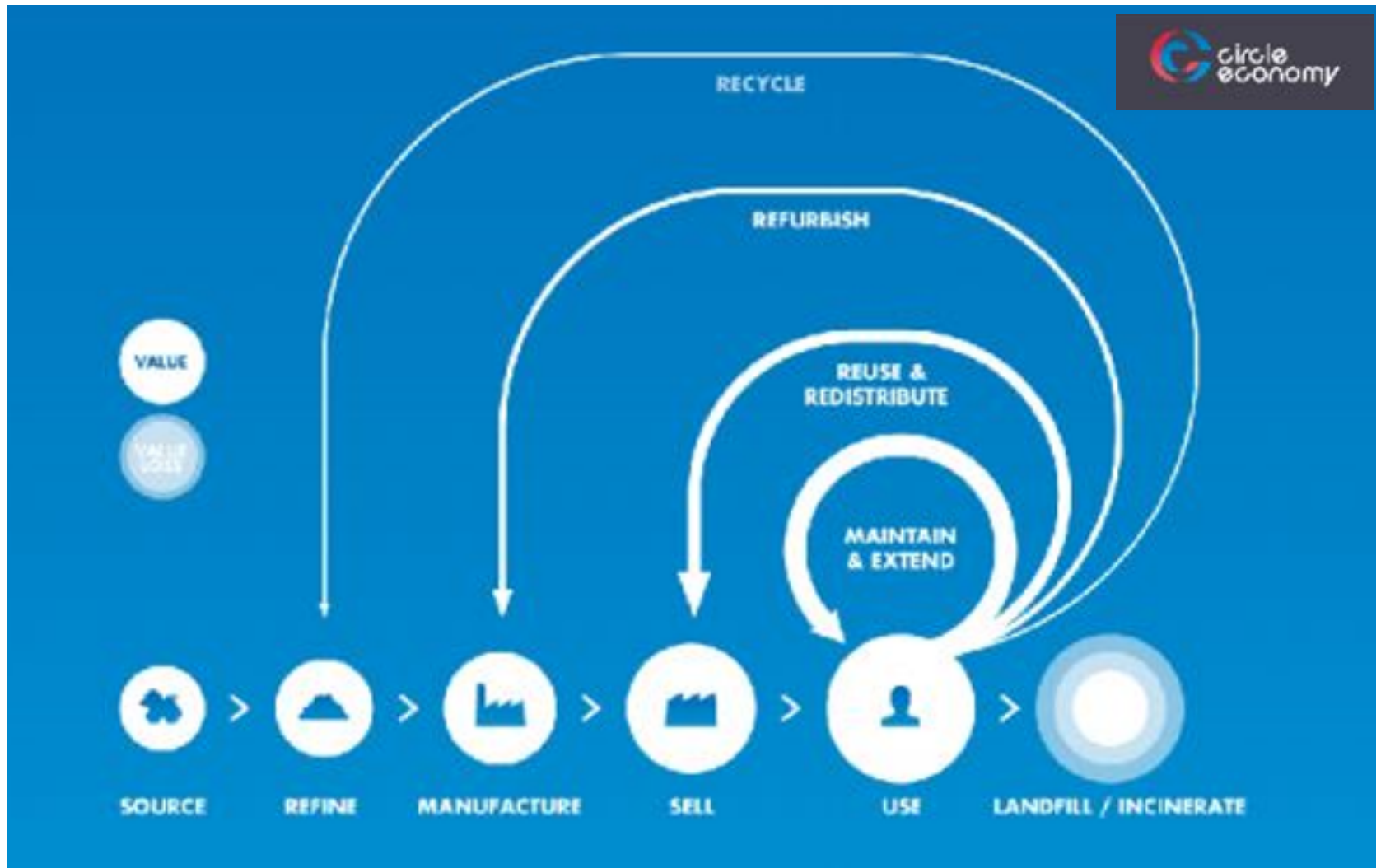
Reduce
Reuse
Recycle

16 Regenerative R's



| | |
|---------------------|----------------------|
| Rethink | Restore |
| Redesign | Repurpose |
| Reduce | Remanufacture |
| Redistribute | Rent |
| Refuse | Renovate |
| Reuse | Recover |
| Repair | Rot |
| Return | Recycle |

Maximize value by staying as close to the inner circle for as long as possible

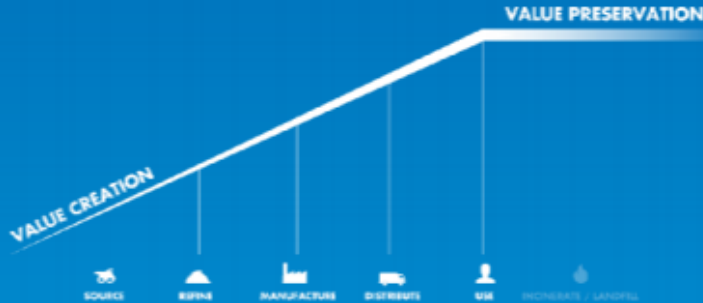


The circular economy maintains and utilizes resource value for much longer

VALUE IN A LINEAR ECONOMY

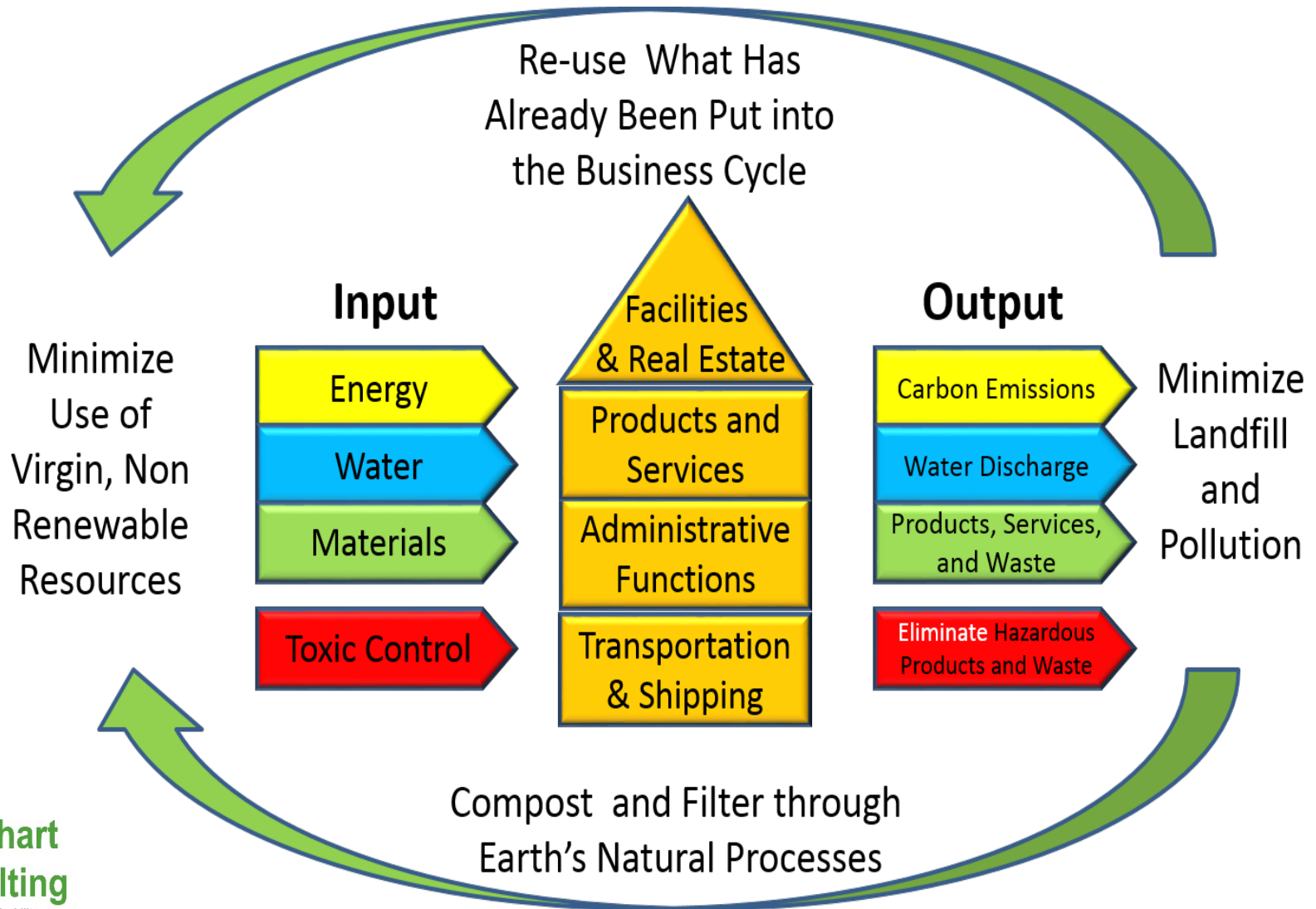


PRESERVE VALUE AT THE HIGHEST LEVEL



Circular Economy

Transforming our Linear Processes



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Probing Questions to Consider

| | |
|---|--|
| <p>DESIGN FOR FULL LIFECYCLE</p> | <ul style="list-style-type: none"> • Can you design waste out of this product or service? <ul style="list-style-type: none"> ○ Could you reduce resources used in this product or service? ○ Are there opportunities for efficiencies? ○ Is disassembly possible? ○ Is this product even necessary? • Could quality be improved to extend the useful life? <ul style="list-style-type: none"> ○ What would be the impact to the lifecycle cost? |
| <p>INPUT IMPACTS OUTPUT</p> | <ul style="list-style-type: none"> • Are your procurement policies considering circular economy concepts? • How could you increase the use of clean and renewable resources in the product or process? <ul style="list-style-type: none"> ○ Are there any toxic materials in the product? ○ Are there scarce or slow growing resources in the product? Fossil fuels? • Where was this product manufactured? Where did the input for the product come from? <ul style="list-style-type: none"> ○ Can you get it locally? Would that be possible? |
| <p>KEEP MATERIALS IN THE BUSINESS CYCLE LOOP</p> | <ul style="list-style-type: none"> • Where does this product fit in the “Value Circle”? <ul style="list-style-type: none"> ○ Can the product be re-used, refurbished, recycled? ○ Are there opportunities to divert waste from landfill? ○ Are there opportunities to compost? ○ Is disassembly possible? ○ Could the product be repaired? ○ Could the materials be reused, remanufactured or recycled? • Are there options for reverse logistics to return the product when you are done with it? <ul style="list-style-type: none"> ○ Is there a process? Infrastructure? Alternatives? |
| <p>THINK SUSTAINABLY</p> | <ul style="list-style-type: none"> • Are there any innovative technologies or platforms to enhance the product business model or delivery? <ul style="list-style-type: none"> ○ Sharing platforms ○ Product as a service ○ Warranties are offered on the remanufacture of refurbished products ○ Ownership of assets retained by the owner |

Probing Questions to Consider

- Can you design waste out of this product or service?
 - Could you reduce resources used in this product or service?
 - Are there opportunities for efficiencies?
 - Is this product even necessary?
- How could you increase the use of clean and renewable resources in the product or process?
 - Are there any toxic material in the product?
 - Are there scarce or slow growing resources in the product? Fossil fuels?
- Where does this product fit in the “Value Circle”?
 - Can the product be re-used, refurbished, recycled?
 - Are there opportunities to divert waste from landfill?
 - Are there opportunities to compost?
 - Is disassembly possible?
 - Could the product be repaired?
 - Could the materials be reused, remanufactured or recycled?
- Could quality be improved to extend the useful life?
 - What would be the impact to the lifecycle cost?
- Are there any new technologies or platforms to enhance the product business model, or delivery?
 - Sharing platforms
 - Rental models
- Where was this product manufactured?
 - Can you get it locally? Would that be possible?
- Are there options for reverse logistics to return the product when you are done with it?
 - Is there a process? Infrastructure? Alternatives?
- Are there municipal programs to assist?
 - Health and safety? Disposal? Regulatory requirements?

Numerous Benefits of a Circular Economy



- Benefits include economic value creation), job growth, material savings, reduce dependency on virgin resources and resource price volatility, supply chain lock-in risk (stranded assets) and CO₂ reductions.
- 2014 McKinsey study, "Toward a Circular Economy," found the economic gain from material savings **alone** is estimated at **over \$1 trillion per year by 2025** if companies reorient toward circular supply chains that increase recycling, reuse, and remanufacture.

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