

Industrial Symbiosis

The key to our future of
sustainability

Blake Layton, 2024



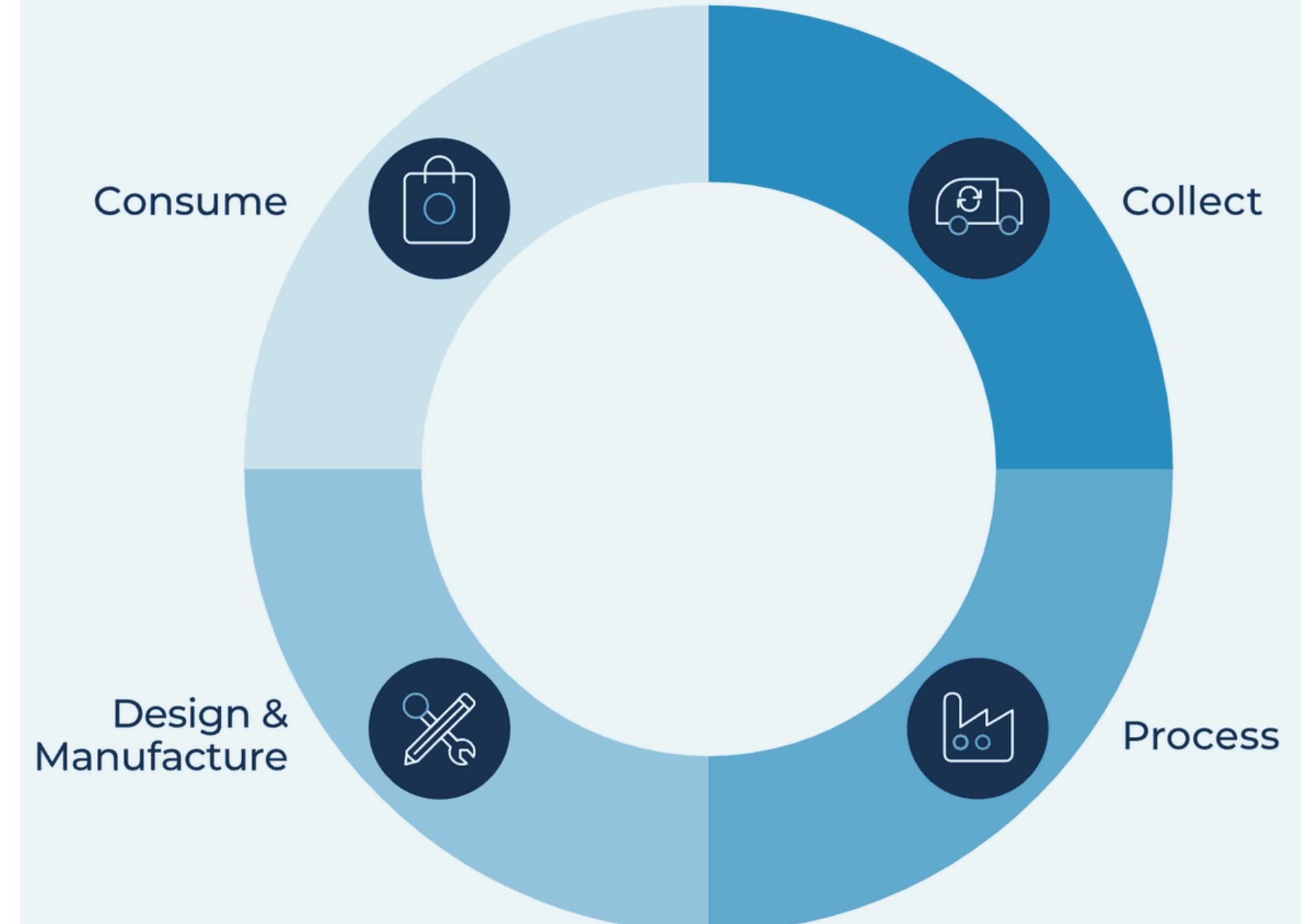
The pressures for sustainability are increasing

Climate and environmental concerns combined with increasing consumer awareness has led to pushing businesses to adopt more sustainable practices.

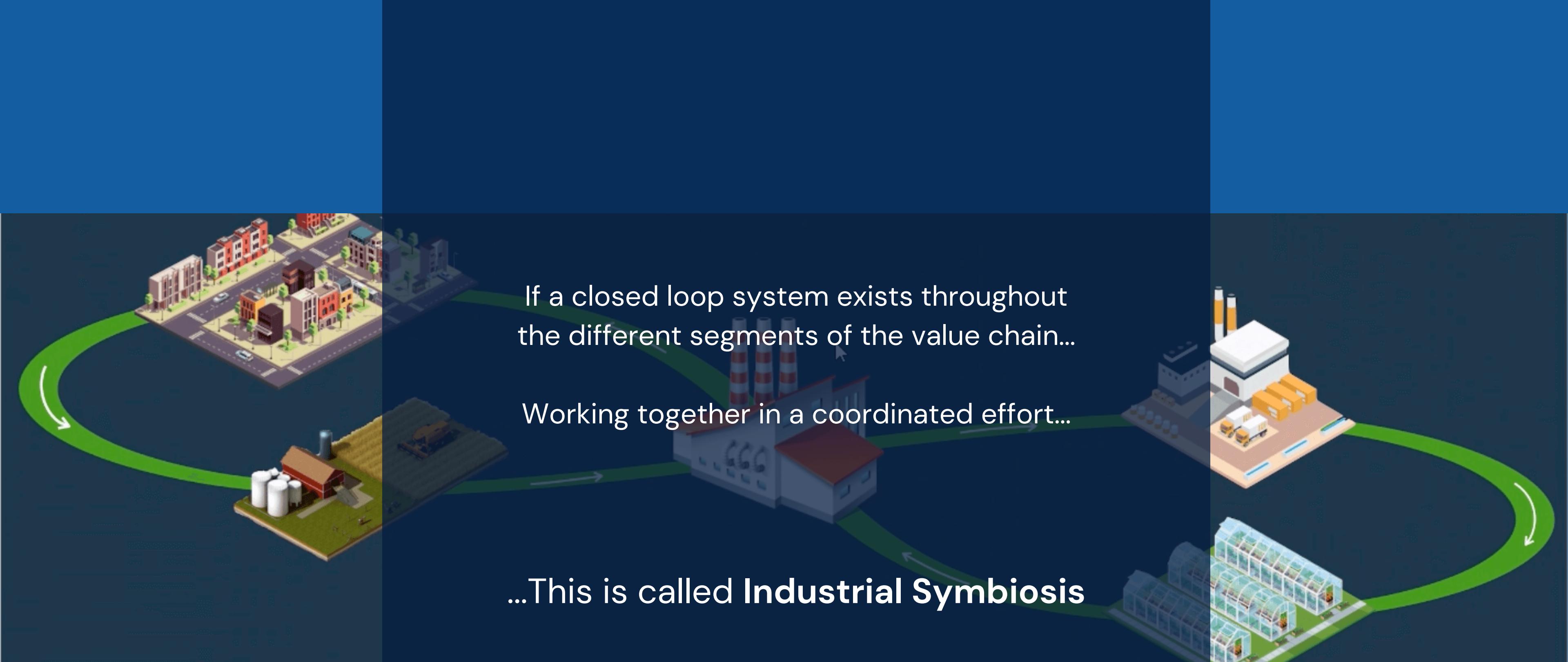


There are many different paths to sustainability

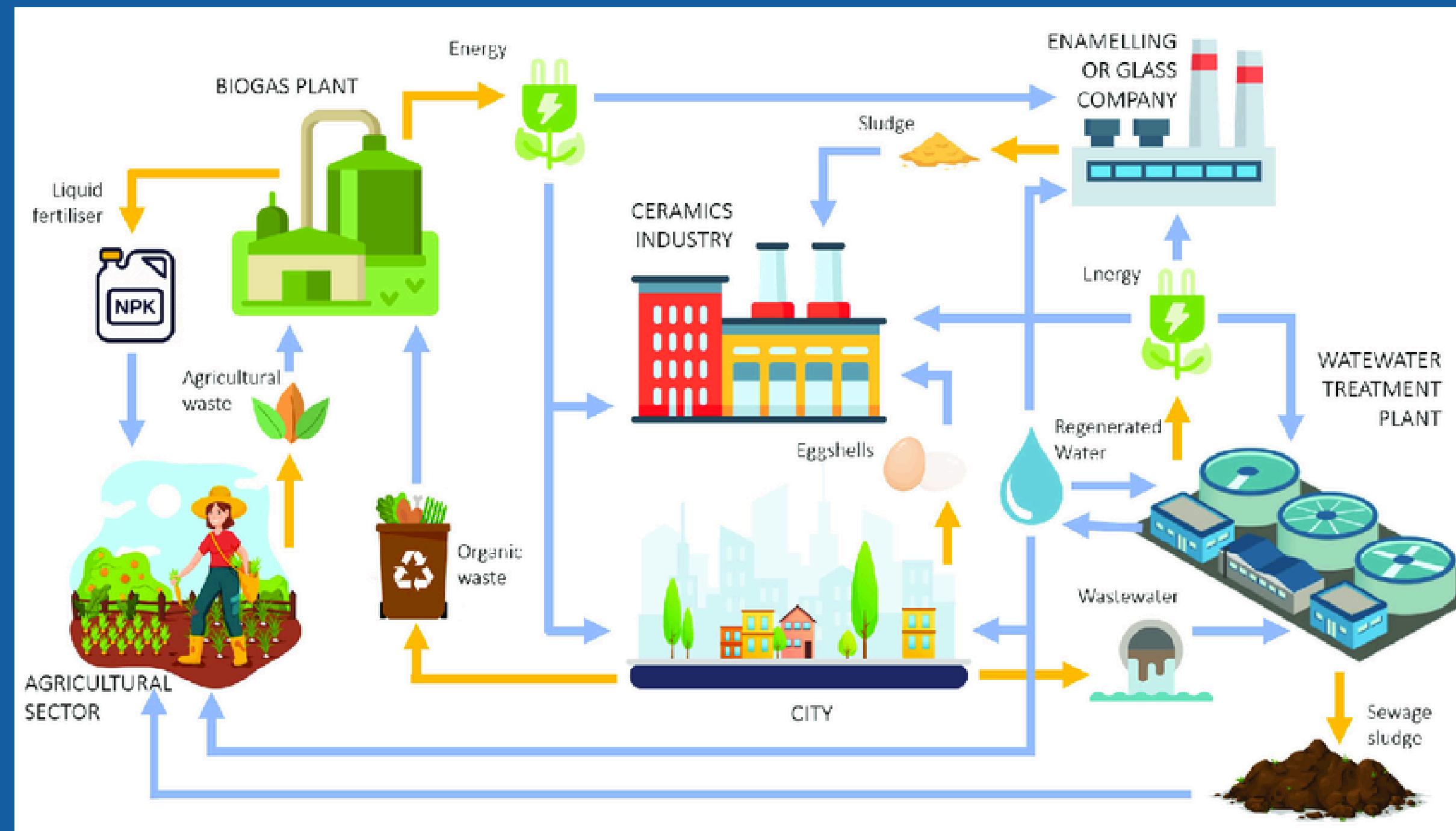
- The utilization of **closed-loop systems** are one way of achieving this goal.
- Closed loop systems drive efficiency, reduce waste, and mitigate environmental impact



[Source](#)



INDUSTRIAL SYMBIOSIS IS THE COOPERATION BETWEEN RESOURCE PRODUCERS, MANUFACTURERS, AND CONSUMERS TO MAXIMIZE INDUSTRIAL EFFICIENCY AT MINIMAL WASTE OR ENVIRONMENTAL TOLL.



Source

Kwinana Industrial Area (Australia)

In Kwinana, various industries collaborate to use each other's by-products and waste materials.

- Waste gases from a fertilizer plant are captured and used by a nearby sodium cyanide production facility.
- Wastewater from one facility is treated and reused by another for cooling processes.



Kalundborg Eco-Industrial Park (Denmark)

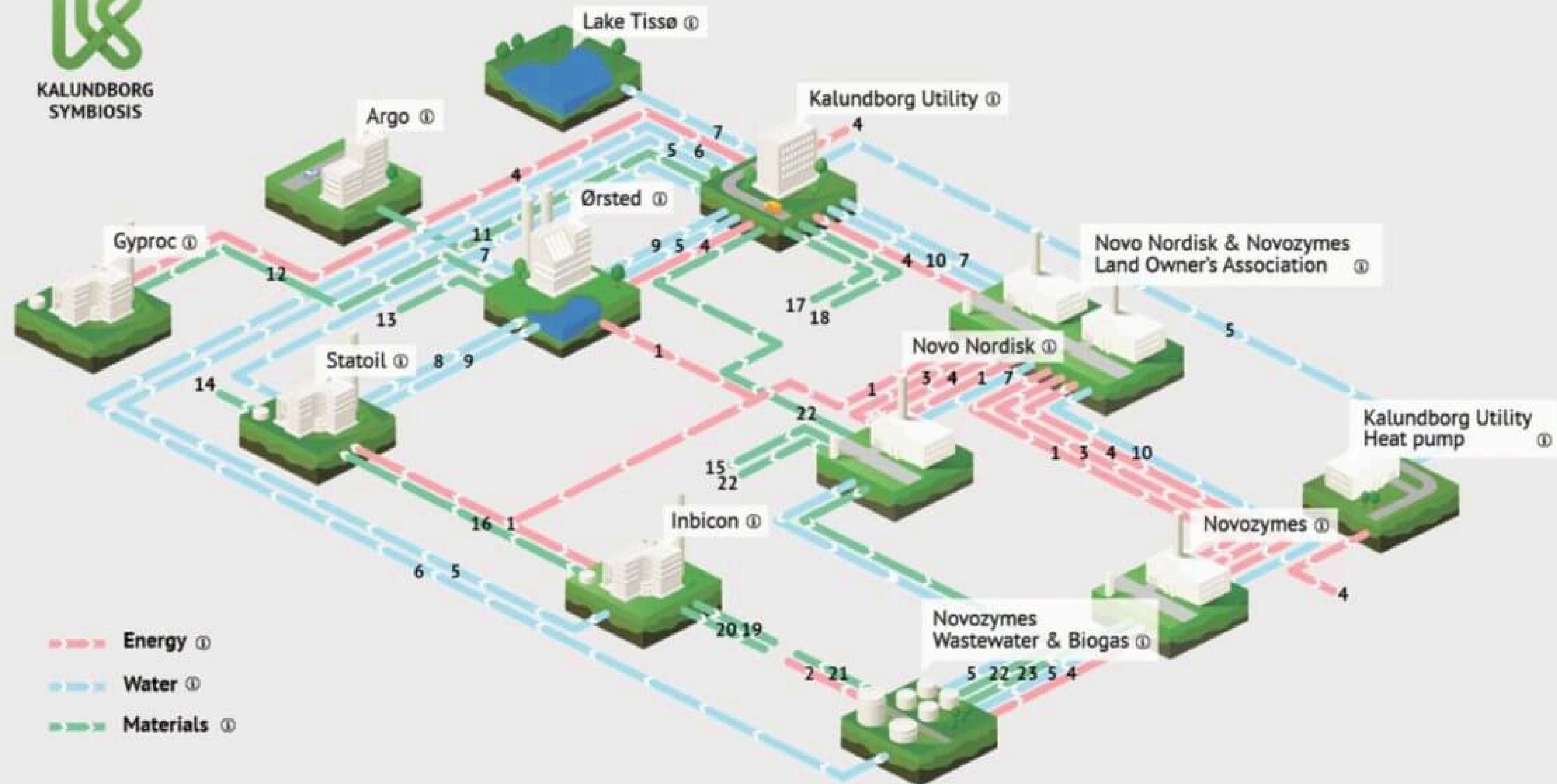
The companies in this industrial park, including a power plant, a refinery, a pharmaceutical plant, and a gypsum board facility, exchange waste materials, energy, and water.

- Excess heat from the power plant is used to heat local homes and a fish farm.
- Fly ash from the power plant is used in cement production.





KALUNDBORG
SYMBIOSIS



Recent pressures for more sustainable practices have generated an expanding need for industrial symbiosis between our economy's diverse network of organizations.

Question: Please select the top most important initiatives for the coming six months based on your understanding of corporate focus (select up to five).

CORP INITIATIVE	Overall	Region >	AP	EMEA	LA	NA
Sustainability Goals	65%		64%	65%	73%	61%
Financial Performance	62%		70%	69%	49%	60%
Digital Transformation	55%		54%	60%	62%	51%
Market Growth	49%		42%	48%	57%	48%
Workforce/Talent Dev	46%		41%	49%	52%	44%
Customer Experience	38%		40%	38%	31%	40%
Business Continuity	32%		37%	32%	25%	33%
Security & Trust	29%		28%	27%	31%	30%

Source

European Progress

- Many European nations have made considerable progress in achieving industrial symbiosis.
- The top 17 nations on the Sustainability Development Report are all European.

Rank	Country	Score
1	 Finland	86.35
2	 Sweden	85.70
3	 Denmark	85.00
4	 Germany	83.45
5	 France	82.76

[Source](#)

Geographic Limitations

Europe's higher population density and smaller geographic area have led to the formation of large industrial clusters.

Because of proximity, waste becomes a more immediate consequence for businesses.

Government Regulation

The EU has seen a large influx in policies enforcing sustainable practices on businesses.

For example, the Corporate Sustainability Reporting Directive (CSRD) applies to nearly all EU companies and enforces emissions transparency.

Previous framework

NFRD



Scope

11,600 companies

Listed firms, banks, insurance companies of 500+ employees



Content

Basic disclosure

Regular environmental, social and governance information



Format

Non interoperable

Non standardized data format



Audit

Non mandatory

No external audit required in most EU countries

New framework

CSRD

49,000 companies

Including some non-European companies and listed SMEs

Extended disclosure

Additional information (forward-looking, double materiality, EU taxonomy alignment...)

Interoperable

Standardized data format

Mandatory

Audit by accredited independent certifier

Evolution of the EU corporate sustainability reporting framework:
NFRD (since 2014) vs. CSRD (2024 onwards)



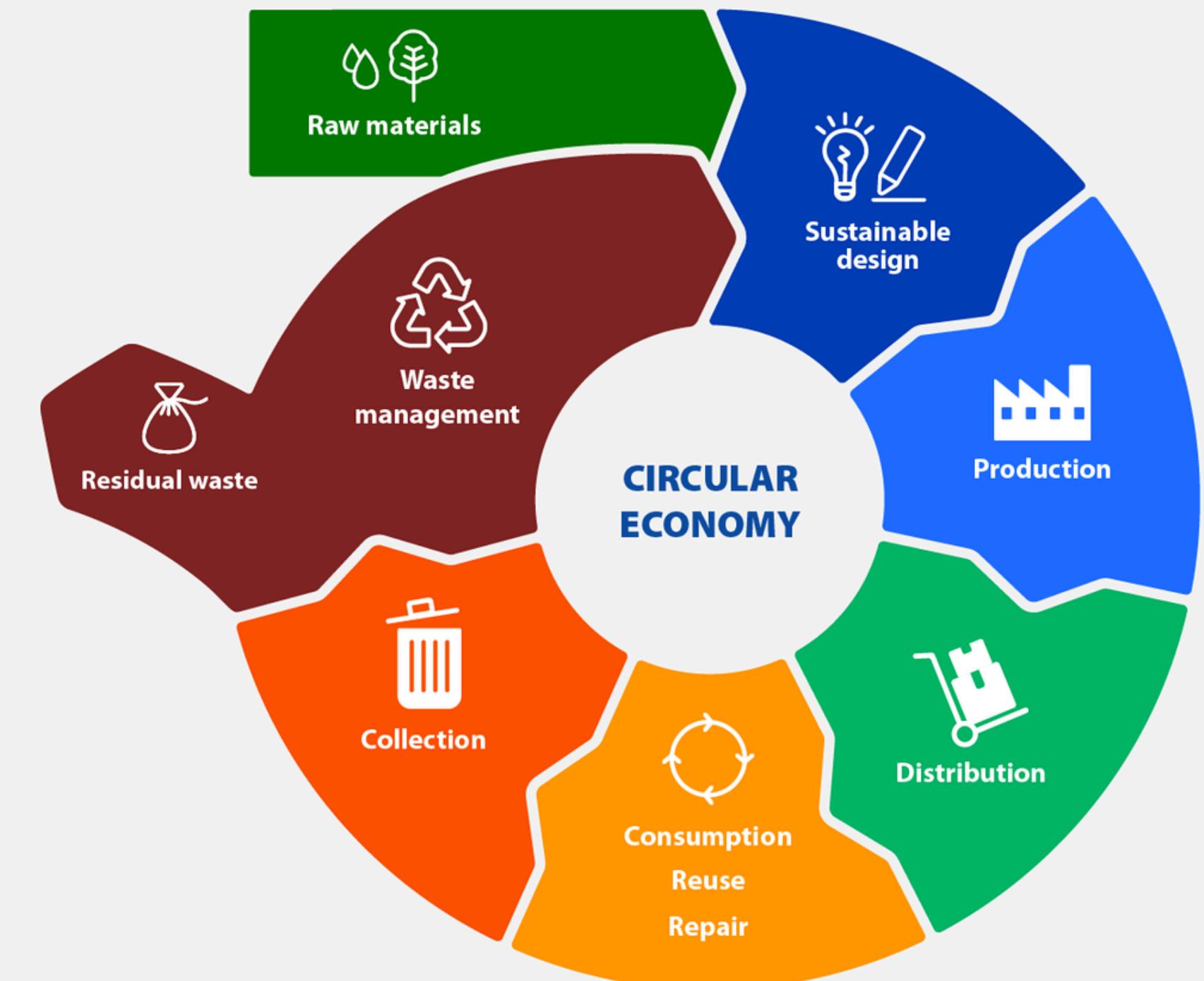
Circular Economies

The entire life cycle of resources and their products are accounted for.

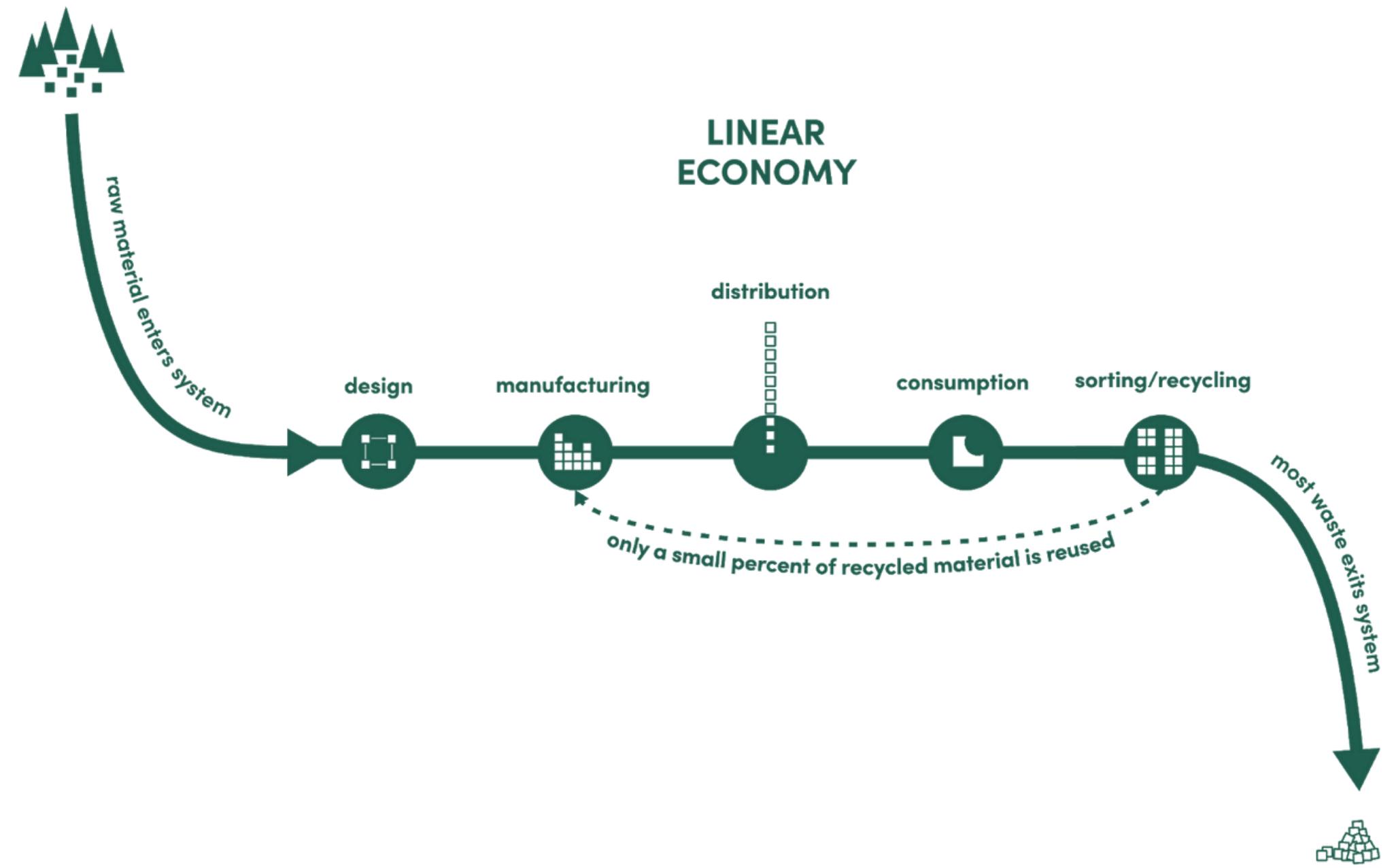
- Resources are kept in use for as long as possible through repairing, refurbishing, remanufacturing, and recycling.

- Products are designed for durability, reuse, and recyclability, aiming to eliminate waste and pollution from the start.

The circular economy model:
less raw material, less waste, fewer emissions



Linear Economy



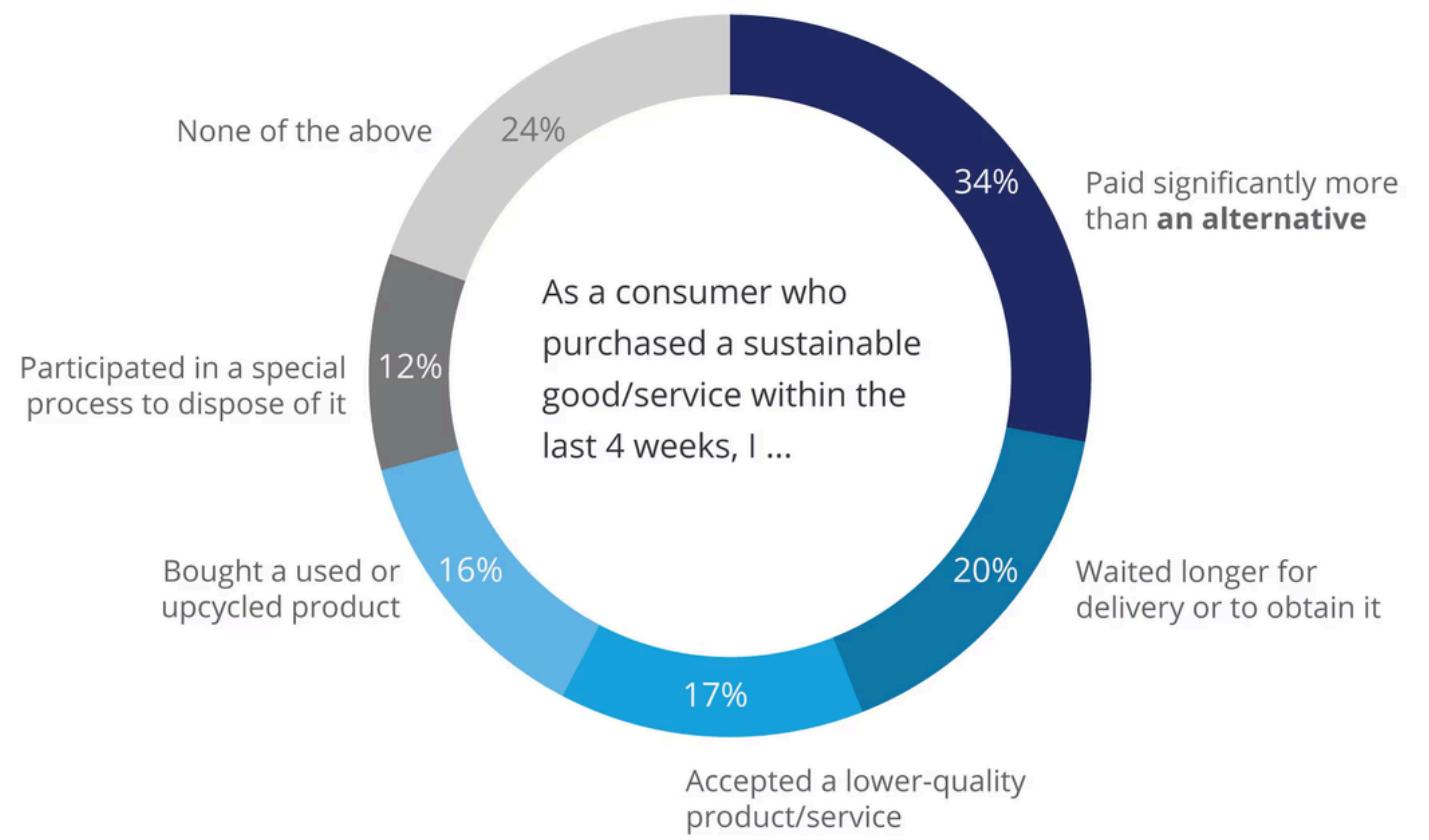
Traditional consumption leads to significant waste and environmental degradation.

- “Take, make, dispose.”

- While far less sustainable, it is a far more simple and cheap model for businesses to follow.

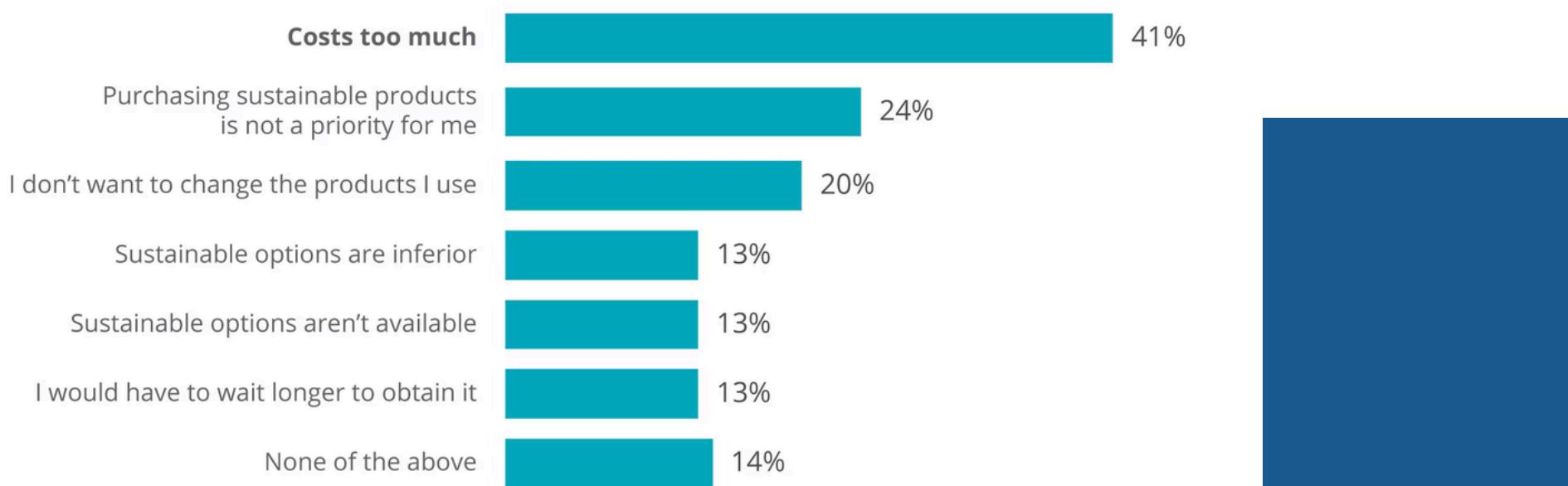


The United States largely uses a linear economic model.



With fewer immediate incentives, businesses and organizations have less motivation to make the large initial investments that sustainability requires.

Reasons why consumers did not purchase a sustainable good/service within the last 4 weeks



[Source](#)

HOWEVER, COMPANIES IN THE US ARE STILL MAKING MAJOR COMMITMENTS TOWARDS SUSTAINABILITY

Producers



BRIGHTMARK

Brightmark converts plastic waste and organic waste into new raw materials and renewable energy, reducing landfill use and promoting sustainability.

Manufacturers



Patagonia promotes a circular economy by encouraging the repair, reuse, and recycling of its products through initiatives like the Worn Wear program.

Consumers



Loop offers consumer products in reusable packaging, which customers return for cleaning and refilling, reducing single-use waste and supporting a circular consumption model.

LOGISTICS AND EXPERTISE IS STILL A BARRIER FOR MOST

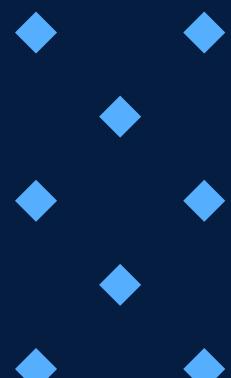
58%

of companies identified insufficient technical expertise as a major barrier to adopting energy-efficient practices
-International Energy Agency

45%

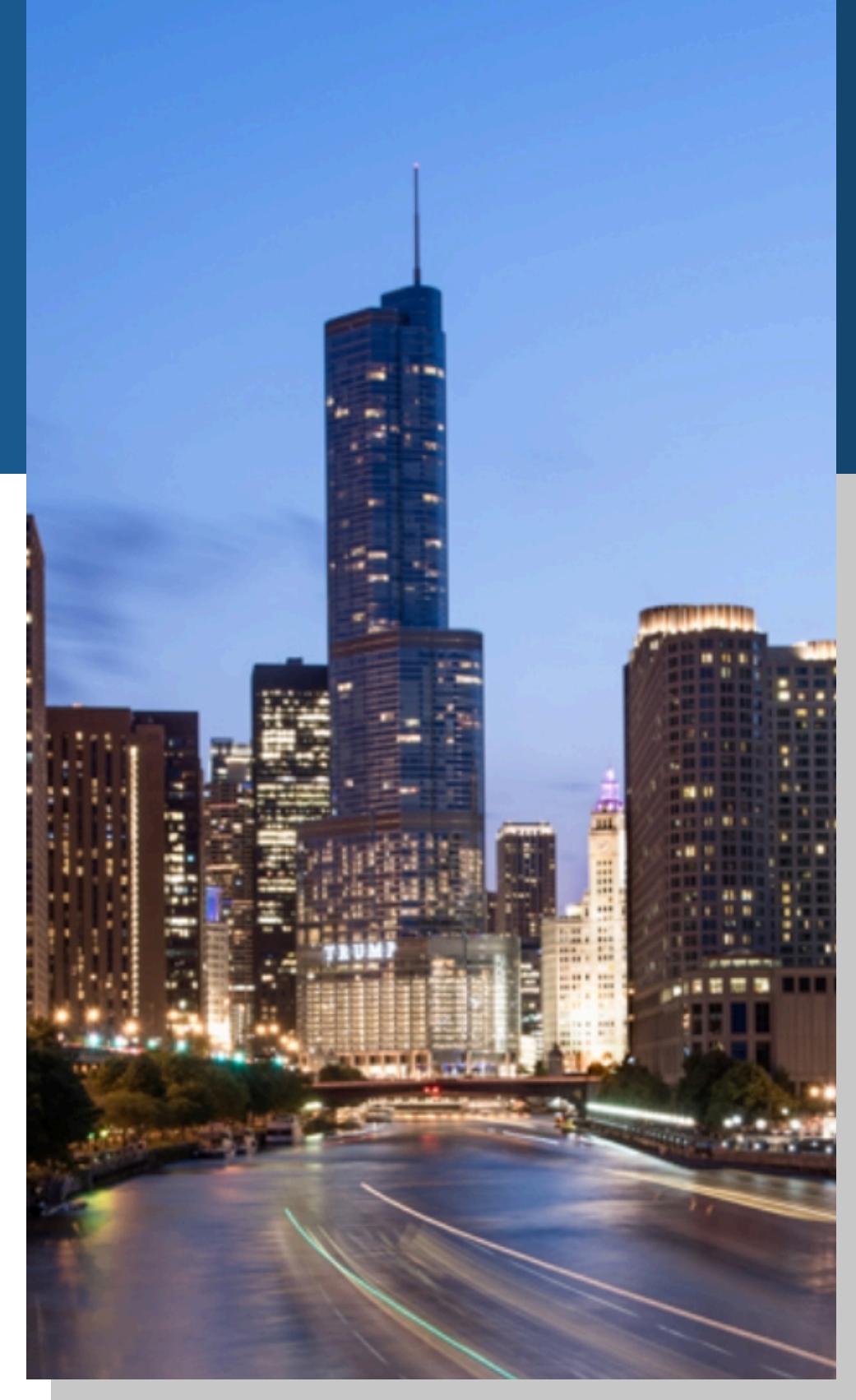
of businesses highlighted a lack of skills and knowledge as a significant obstacle to implementing circular economy principles
-Ellen MacArthur Foundation

Given the global and complex nature of value chains, it can be difficult for most parties to coordinate and achieve symbiosis





This has led to an emerging sector of platforms that help to optimize this synergy within networks to reduce net cost and increase overall benefit.



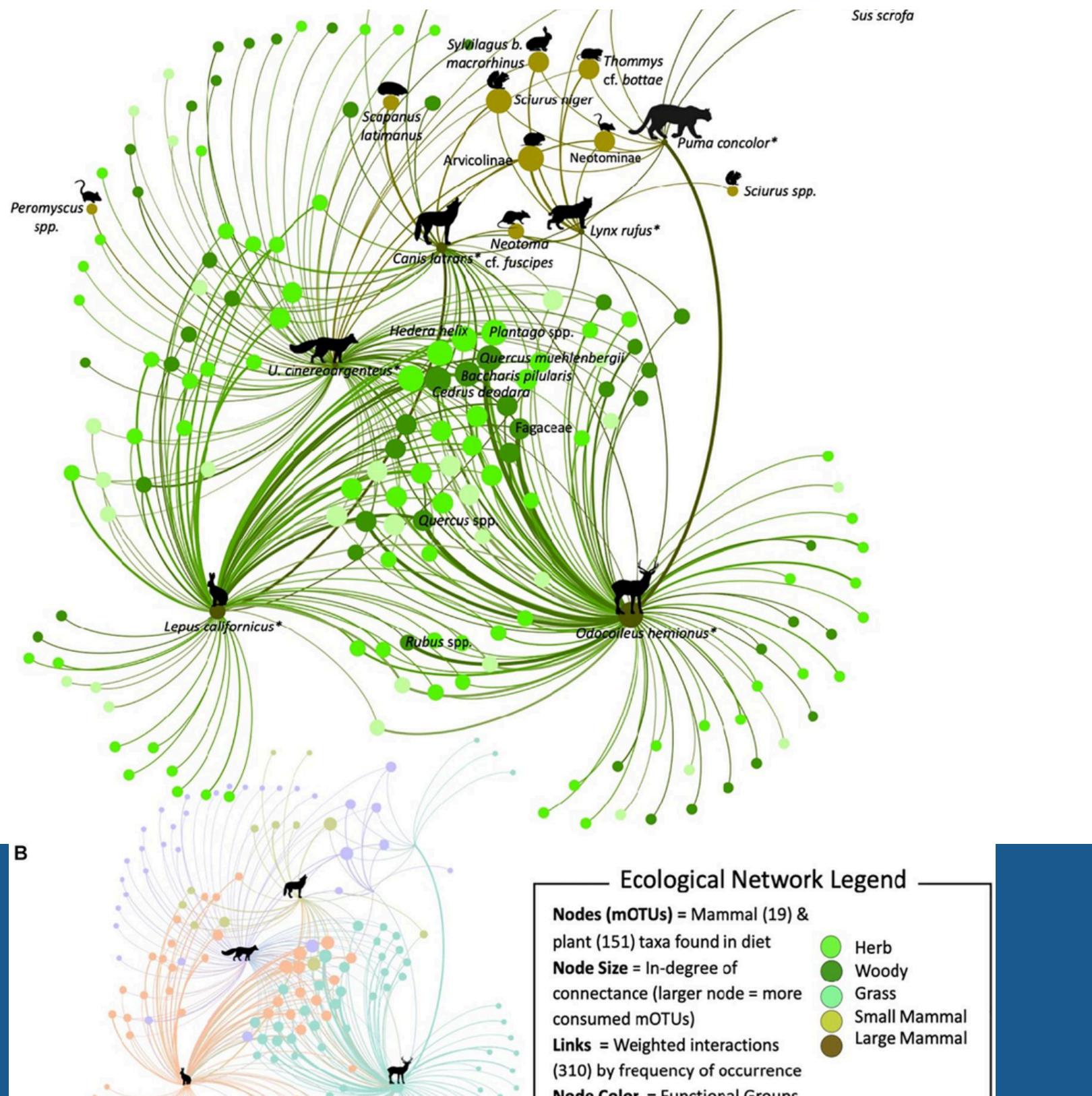
Metabolic

Founded in 2012, Metabolic is a Dutch consultancy and think tank dedicated to tackling global sustainability challenges.

- Metabolic has launched several impactful projects, such as the Circular Charlotte initiative, which aims to transform Charlotte, North Carolina, into a zero-waste city.



Metabolic



Metabolic's strategy revolves around **systems thinking**

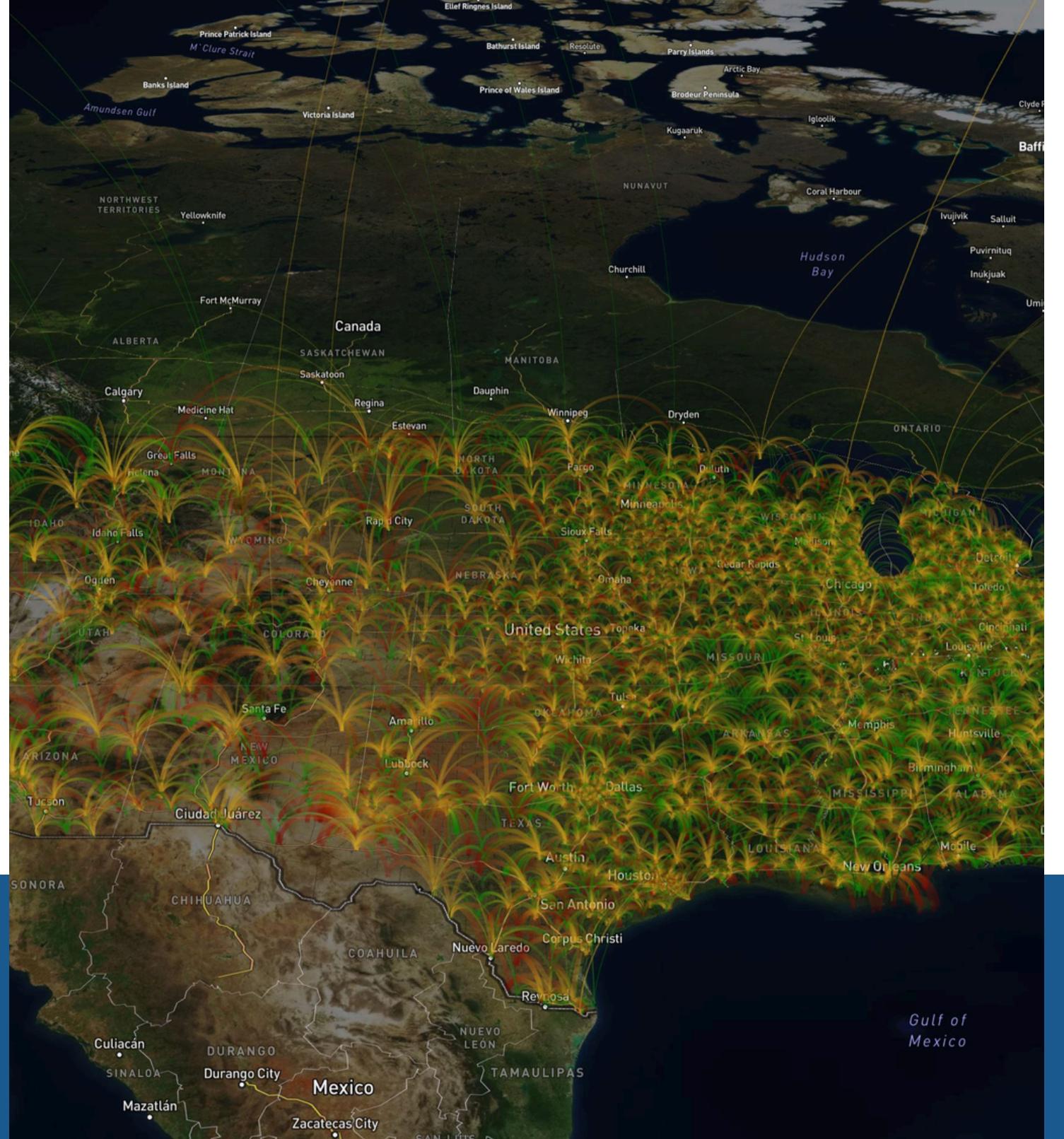
They focus on creating circular economies by applying natural ecosystem principles to urban and industrial systems. They work on developing scalable solutions and providing tools and strategies for decision-makers to realize sustainable, real-world projects.

TerraNexum

Founded in Evergreen, CO, TerraNexum aims to optimize our transition to sustainability by providing data for businesses seeking to be more sustainable.

- Their efforts revolve around maximizing net benefit for geothermal and other renewable energy projects.





TerraNexum's strategy revolves around **data-driven visualization and analysis**

Through the use of their Quantum Global Optimizer platform, TerraNexum can identify the ideal locations for successful and profitable renewable energy initiatives. They optimize through their integrated analysis of multiple environmental, social, economic, and legal factors within a network.

THE FUTURE...

Potential

Ultimately, both platforms offer promising solutions to optimizing our journey towards achieving industrial symbiosis

No one product will be the only path to a circular economy, it is the collaboration and communication across networks that will allow for true industrial symbiosis

Thanks For
Watching

