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Technical Assistance for Assessment of Turkey's Potential on Transition to Circular Economy

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What are circular economy business models? Industrial Symbiosis as a Key Model

Ferda Ulutaş İşevi - Business Council for Sustainable Development (BCSD) Türkiye (SKD)

Circular Economy Training
12th May 2022, Antalya, Turkey

REPUBLIC OF TURKEY
MINISTRY OF ENVIRONMENT, URBANIZATION AND CLIMATE CHANGE

Environment and Climate Action Sector Operational Programme

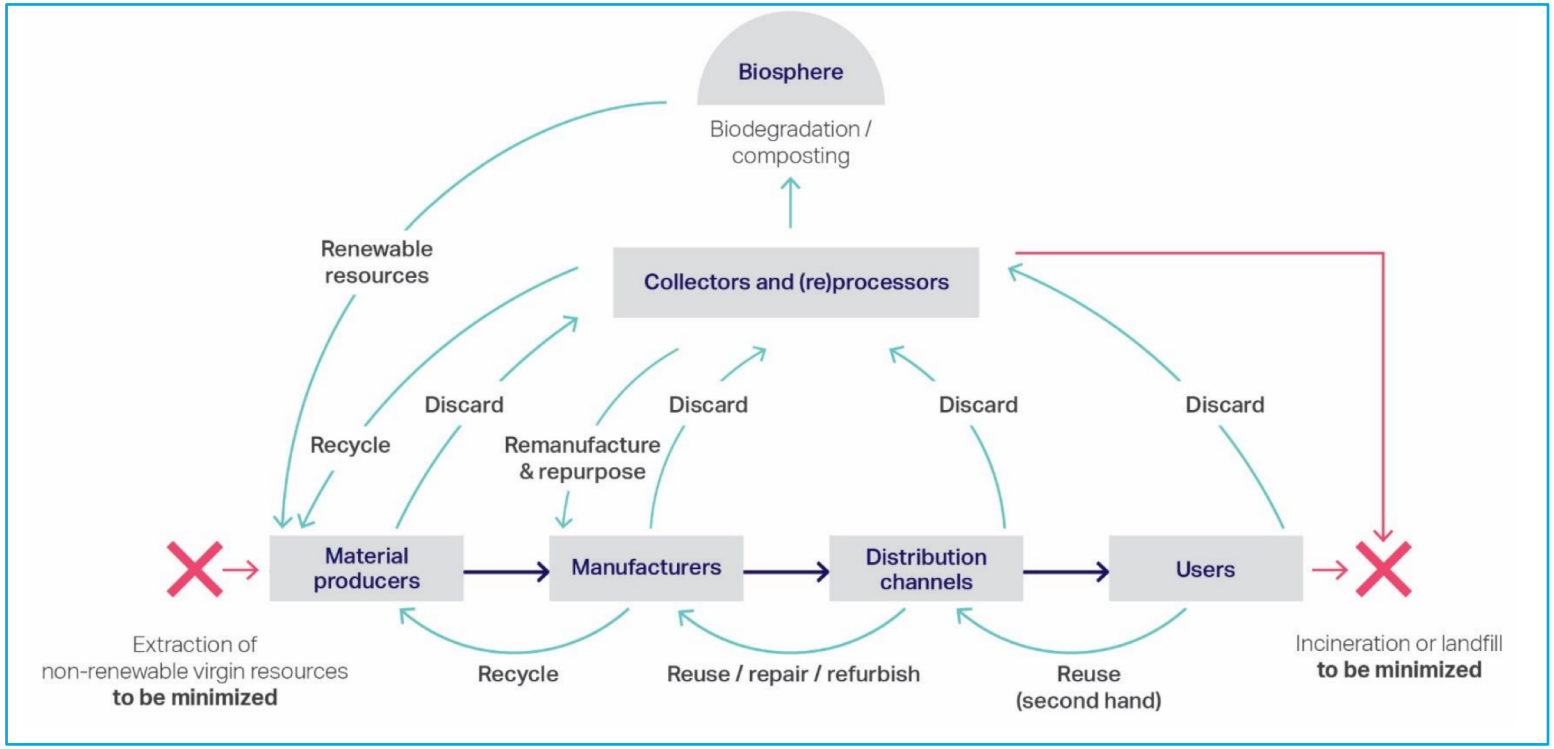
deep Circular Economy Action Plan

DAI

Content

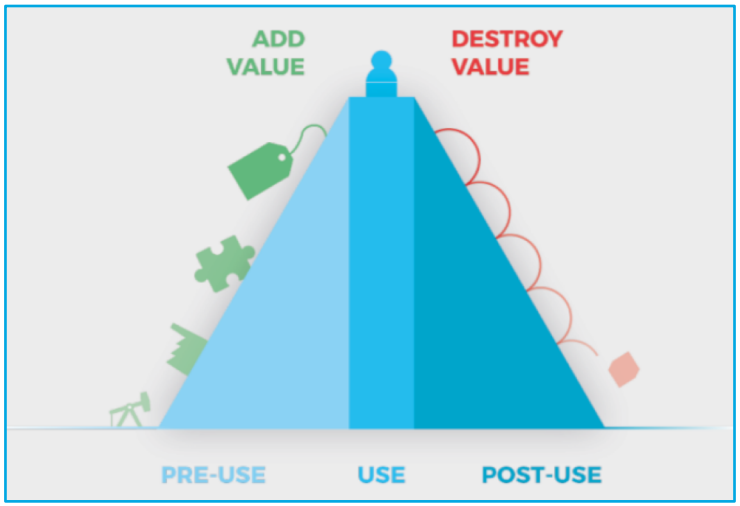
- Basics
- Circular economy strategies
- Circular economy business models and examples
- Circular economy business models benefits and opportunities
- Industrial symbiosis as a circular economy business model
  - Conceptual framework, implementation steps, bottlenecks and challenges
  - Turkey Circular Economy Platform – industrial symbiosis examples
- Requirements for transitioning to circular economy

Value Chain Approach

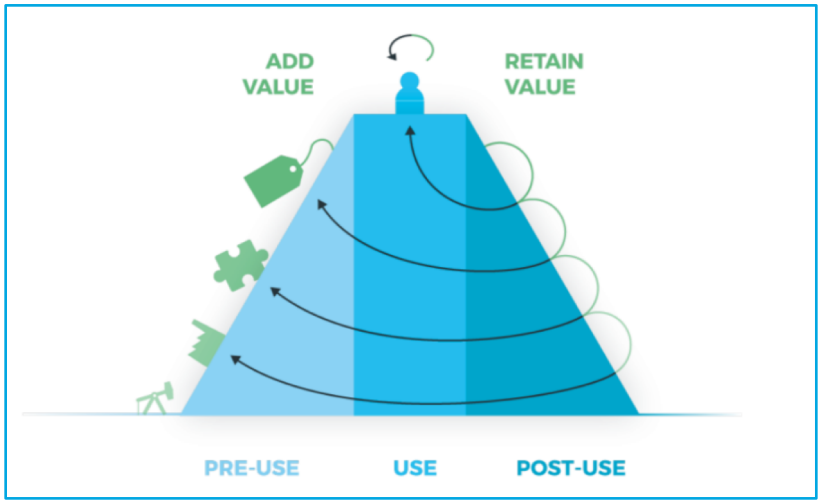


Source: WBCSD

Value hill



Linear



Circular

Source: Master Circular Business with Value Hill (TuDelft, 2016)

Value chain actors

- Designers
- Manufacturers
- Parts producers, subcontractors
- Sellers/ retailers
- Raw material extractors, processors and suppliers
- Equipment, machinery and technology suppliers
- Software and digital service providers
- Packaging producers
- Waste collectors, separators and recyclers
- Secondary raw material producers and suppliers
- Repair, maintenance, renewal, resale, rental businesses

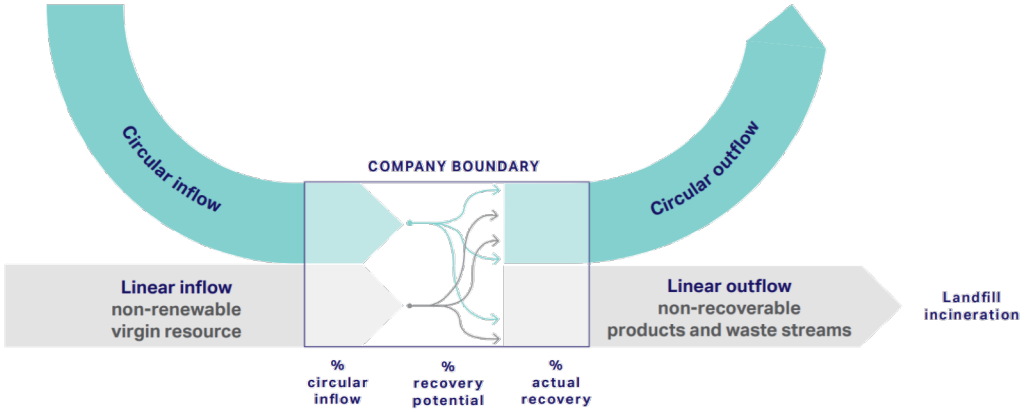
Circularity analysis

- **How circular are the inflows?**

  Renewable? Non-virgin (secondary, recovered)?

- **How circular are the outflows?**

  Recovery potential? Actual recovery?

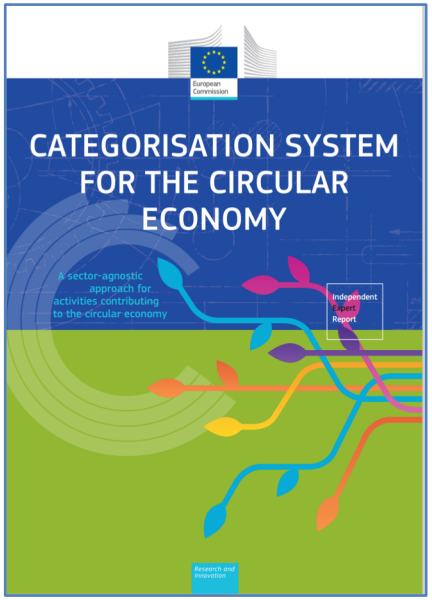


Source WBCSD

Circular economy strategies – 9R

- **R1: Refuse** – Make product redundant by abandoning its function or by offering the same function by a radically different product or service
- **R2: Rethink** – Make product use more intensive (through product-as-a-service, reuse and sharing models or by putting multi-functional products on the market)
- **R3: Reduce** – Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
- **R4: Re-use** – Re-use of a product which is still in good condition and fulfils its original function (and is not waste) for the same purpose for which it was conceived
- **R5: Repair** – Repair and maintenance of defective product so it can be used with its original function
- **R6: Refurbish** – Restore an old product and bring it up to date (to specified quality level)
- **R7: Remanufature** – Use parts of a discarded product in a new product with the same function (and as-new-condition)
- **R8: Repurpose** – Use a redundant product or its parts in a new product with different function
- **R9: Recycle** – Recover materials from waste to be reprocessed into new products, materials or substances whether for the original or other purposes *(does not include energy/fuel)*

Circular economy business models

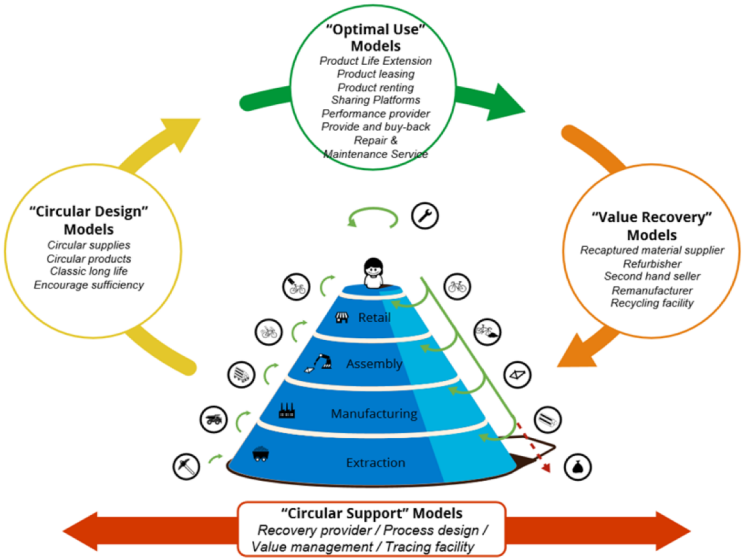


1- Circular Design and Production

2- Optimal use

3- Value recovery

4- Circular support

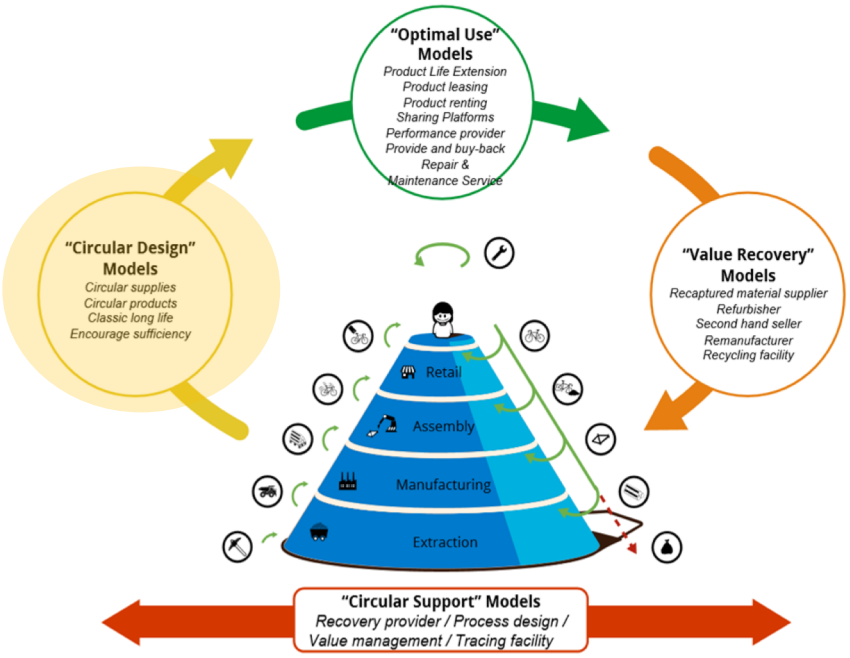


Source: Achterberg, ve ark. (2016) ve Avrupa Birliği (2020)

Circular economy business models

1- Circular Design and Production

- Circular supplies (secondary, alternative or recycled inputs)
- Circular products (recyclable, reusable products)
- Long life products

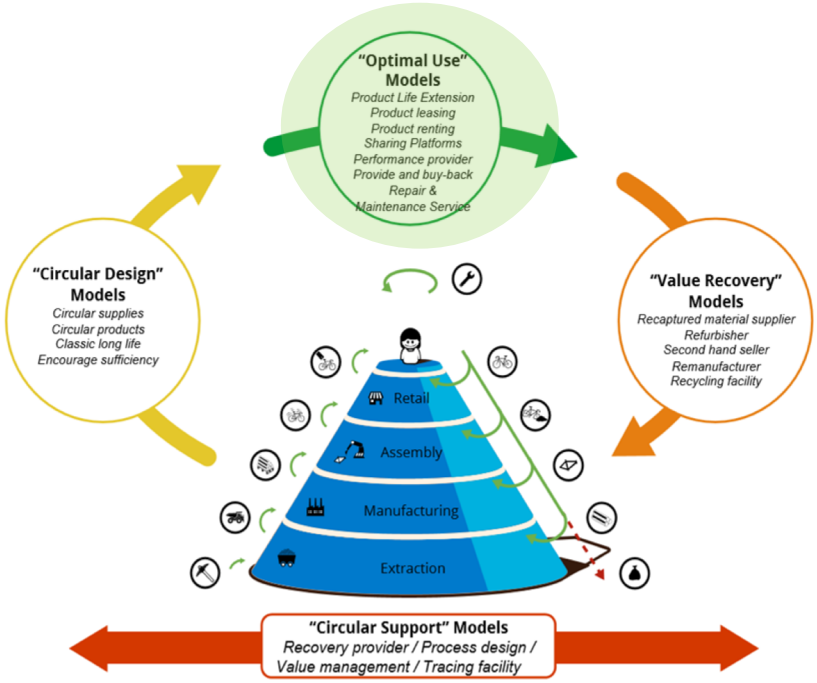


Kaynak: Achterberg, ve ark. (2016) ve Avrupa Birliği (2020)

Circular economy business models

2- Optimal use

- Extending the product use
- Increasing the utilization rate
- Renting, leasing, sharing, repair and maintenance services, upgrading facilities

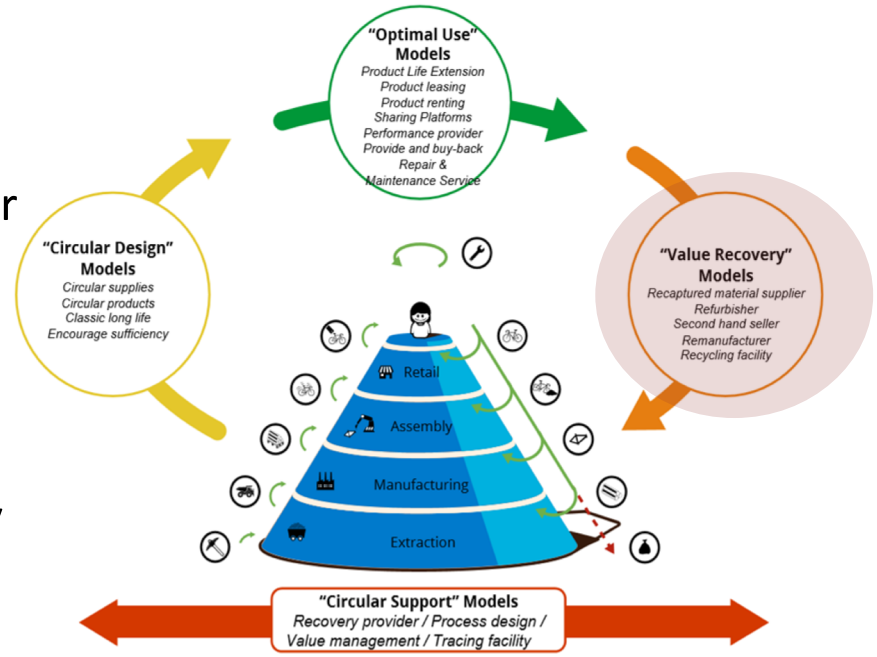


Kaynak: Achterberg, ve ark. (2016) ve Avrupa Birliği (2020)

Circular economy business models

3- Value recovery

- Value recovery from wastes, end of life products, parts, unemployed product or materials, etc.
- Collection, reverse logistics and re-use, remanufacturing, recycling
- Production of new products, secondary raw material, etc.

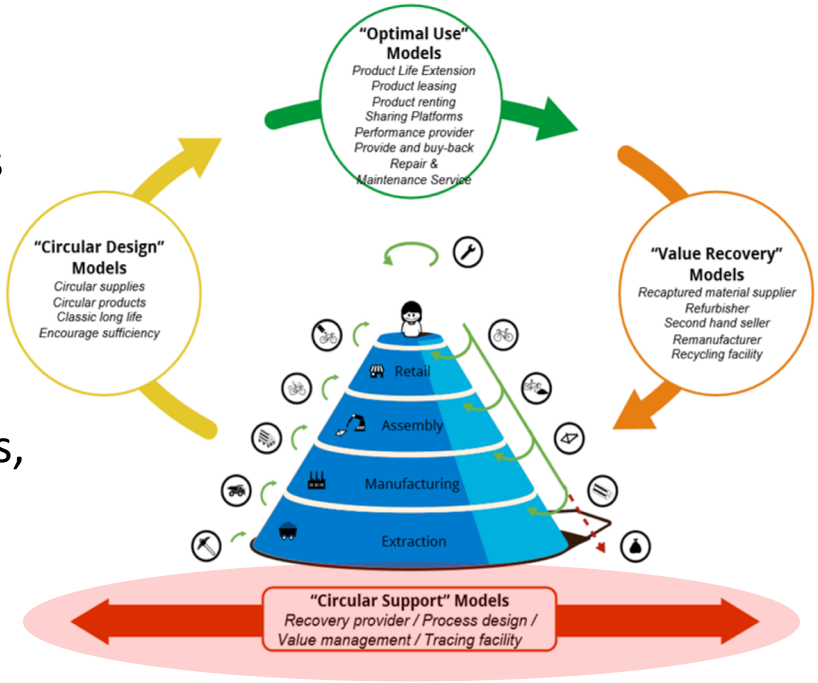


Kaynak: Achterberg, ve ark. (2016) ve Avrupa Birliği (2020)

Circular economy business models

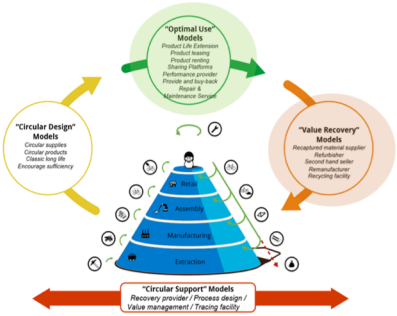
4- Circular support

- Related with all circular models
- Supportive tools, activities and services for circular businesses and networks
- Collection services, digital tools, material platforms, material tracing, circular design and consultancy services, secondary material certification services, etc.



Kaynak: Achterberg, ve ark. (2016) ve Avrupa Birliği (2020)

Circular economy business models/ Examples



Envie (France)

- Electrical-electronic equipment (mainly home appliances and medical equipment) which become out of use are received, priority is given to their repair.
- If this is not possible, new equipment is re-manufactured by bringing together parts from different equipment.
- Second hand sales with fair prices and guarantees.

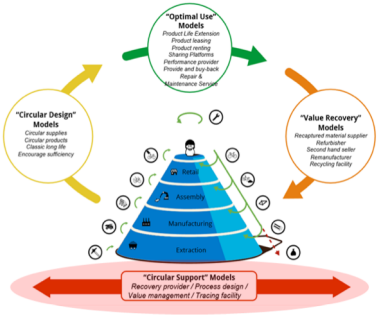
https://www.connexionfrance.com

Circular economy business models/ Examples

Terracycle – Loop (USA)

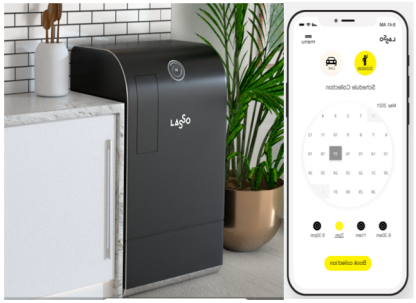
- Loop is a program implemented by Terracycle for eliminating single-use packaging of FMCG (fast moving consumer goods).
- Products of the brands and retailers which join the program, are delivered to the consumers in durable, reusable packaging.
- Loop started in the USA and now exits in some European countries as well.

Circular economy business models/ Examples

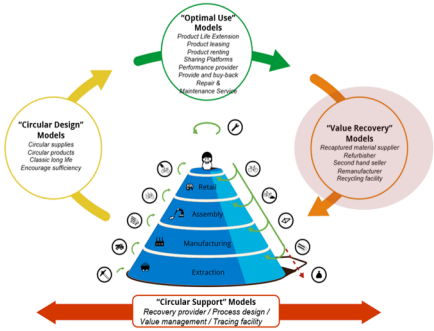


Lasso (Australia, USA, UK)

- Empowers people to properly closed-loop recycle their used materials in the home or workplace.
- Plastic, metals and glass are broken down separately, reducing to a fraction of their size and maintaining valuable purity throughout
- One by one, used materials become valuable products. Processing delivers the consistency and purity required for close-loop recycling and remanufacture
- Lasso collects when it suits the user – the app suggests on-demand collection slots to fit any schedule
- Collaboration with recyclers



Circular economy business models/ Examples



Plasblock (Portugal)

- Plasblock is made 100% from upcycled resources dumped everyday on landfills, and also 100% recyclable, which at the end of its useful life allows for a total reuse of the materials used and ensuring a functional circularity of the raw materials used.
- It is used in logistics sector.
- Plasblock is the most solid and eco-friendly pallet block alternative that increases your pallet durability and performance.
- It can be reused for numerous times and is recycled by the producer at the end of its life

Circular economy business models/ Examples

Desso (The Netherlands)

- Carpet producer Desso implements a carpet tile leasing model through which the tiles are rented for 5-7 years.
- At the end of the leasing period Desso collects the tiles and recycles them as a closed loop cycling.
- Desso cooperates with a financial service company specialized in corporate building renting area for implementing this model.

Circular economy business models/ Examples

Tradecowall (Belgium)

- The cooperative company manages construction and demolition waste in the Belgian Walloon region and comprises a network of companies working with inert waste recycling centers in the region.
- Mixed wastes of concrete, brick and ceramic are received, crushed, washed and screened using innovative methods and sorting techniques, until it meets official standards for materials useable for backfill, roadside layers and construction.
- Tradecowall manages the partnership between the construction confederation, scientific and research centres and 160 companies in the construction sector.

Circular economy business models/ Benefits and opportunities

Efficiency and Costs

- Decoupling of growth and resource consumption
- Reducing costs and improving endurance against cost fluctuations through decreasing inflows and/or using alternative (local) inflows

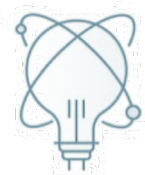
Market and Competiteveness

- Creating new markets and business opportunities
- Involving in sustainable product value chains (international standards, clients)
- Improving image and customer relations

Circular economy business models/ Benefits and opportunities

Environment and legislation

- Reducing environmental impacts and carbon footprints
- Complying with waste legislation and its consequences

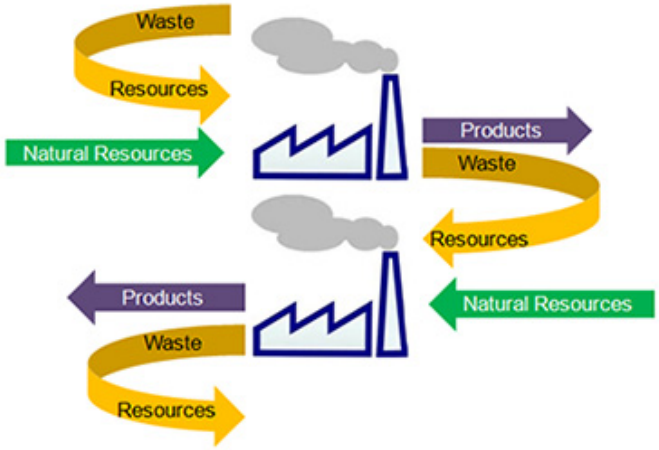


Innovation

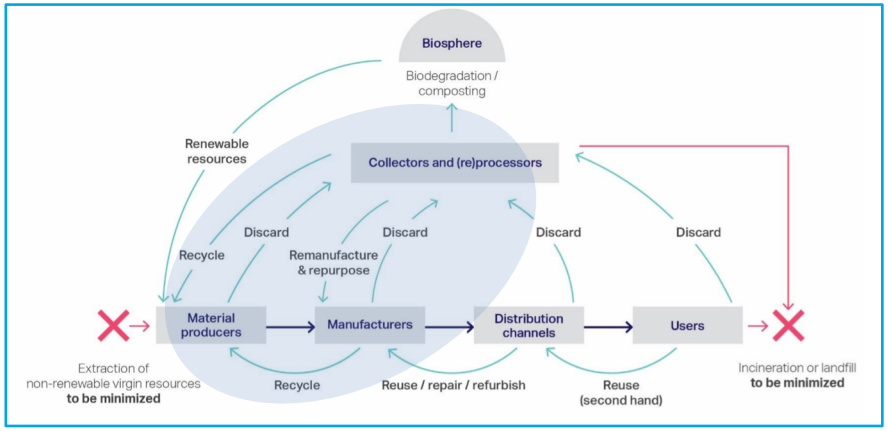
- Triggering innovation through circularity approach (new product, new process, new business models, etc.)

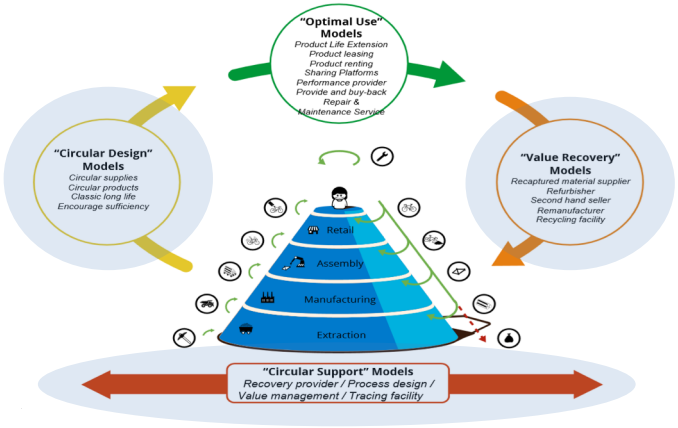
«Industrial Symbiosis» as a circular business model

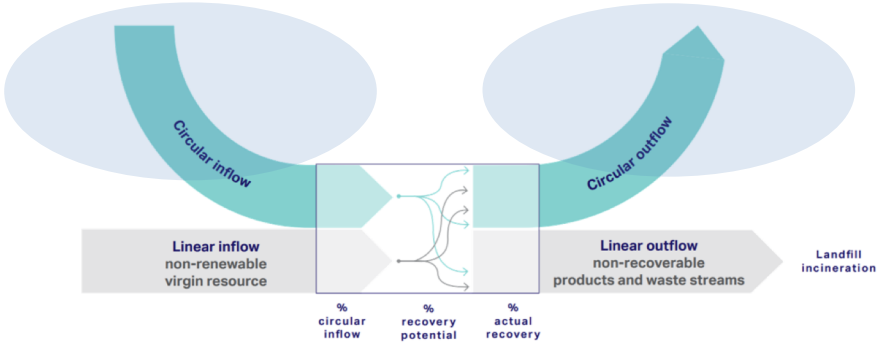
The process by which wastes or by-products of a facility become the raw materials for another. Application of this concept allows materials to be used in a more sustainable way and wastes to be reduced.



«Industrial Symbiosis» as a circular business model







Circular business models

1- Circular Design and Production

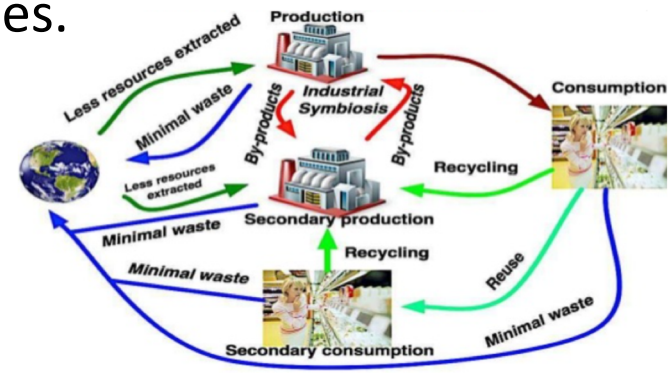
2- Optimal use

3- Value recovery

4- Circular support

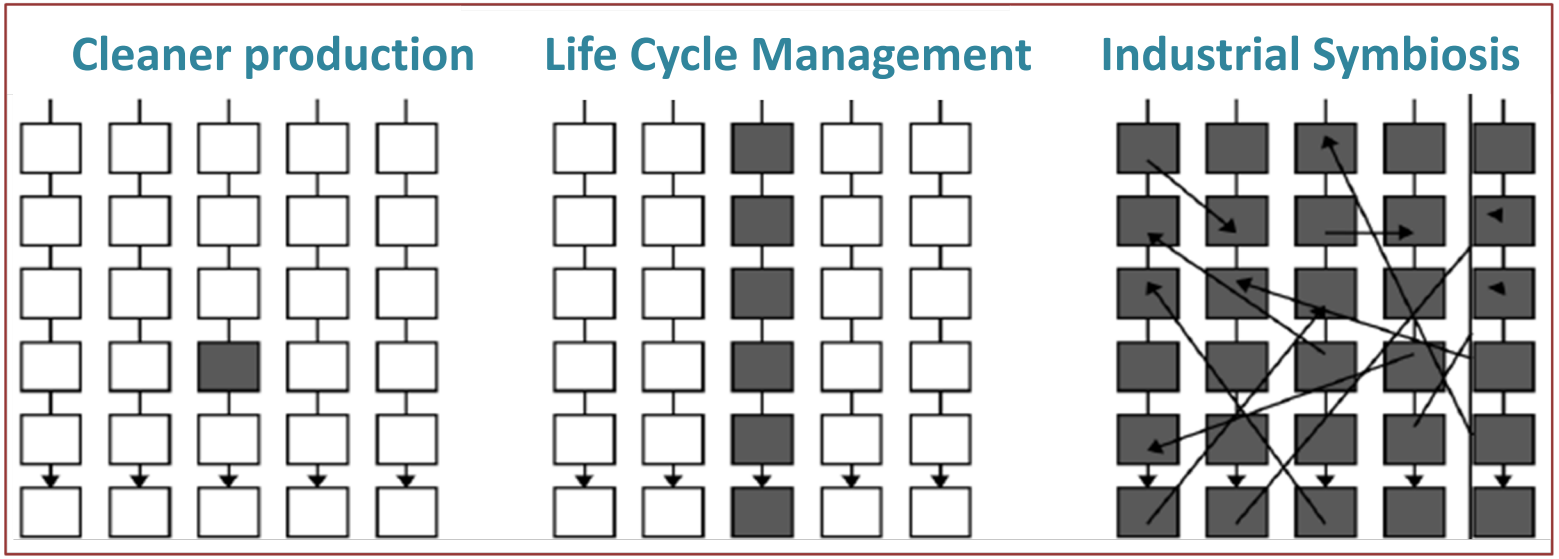
«Industrial Symbiosis» as a circular business model

- Emerged in 1990s as a concept, but had started to be developed as a practice much earlier.
- It is based on the approaches of "industrial ecology" and "industrial ecosystem".
- It is the establishment of symbiotic relations that provide mutual benefits between two or more businesses.



«Industrial Symbiosis» as a circular business model

A different point of view to businesses and interactions among industries



Source: Professor Annik Magerholm Fet, Norwegian University of Science and Technology

«Industrial Symbiosis» as a circular business model

- It is one of the major strategies and implementation areas for circular economy and resource efficiency
- Numerous studies, publications and R&D projects have been conducted for developing relevant methodologies and mainstreaming practices
- It is continuosly developed through eco-industrial parks, use of digital tools and facilitation activities.

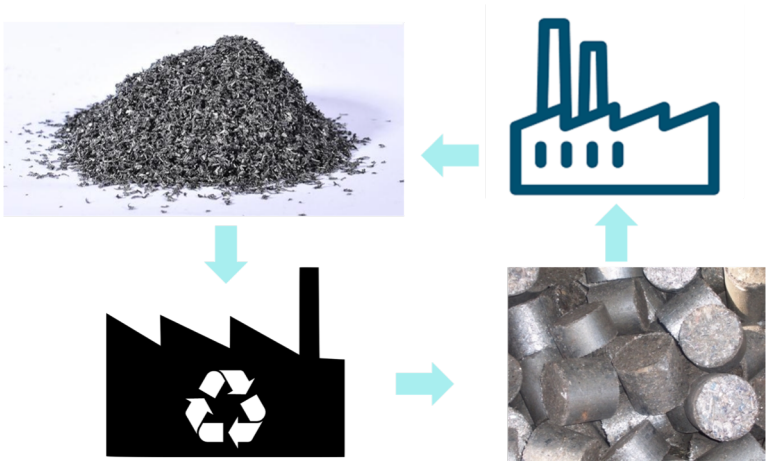
Industrial symbiosis – added value

- Composting of eggshell wastes together with contaminated cardboard wastes, instead of sending to incineration (UK NISP 2009)

- Production of natural food preservatives and calcium supplements from eggshell powder (ground and sterilized) (Turkey Circular Economy Platform, 2019)

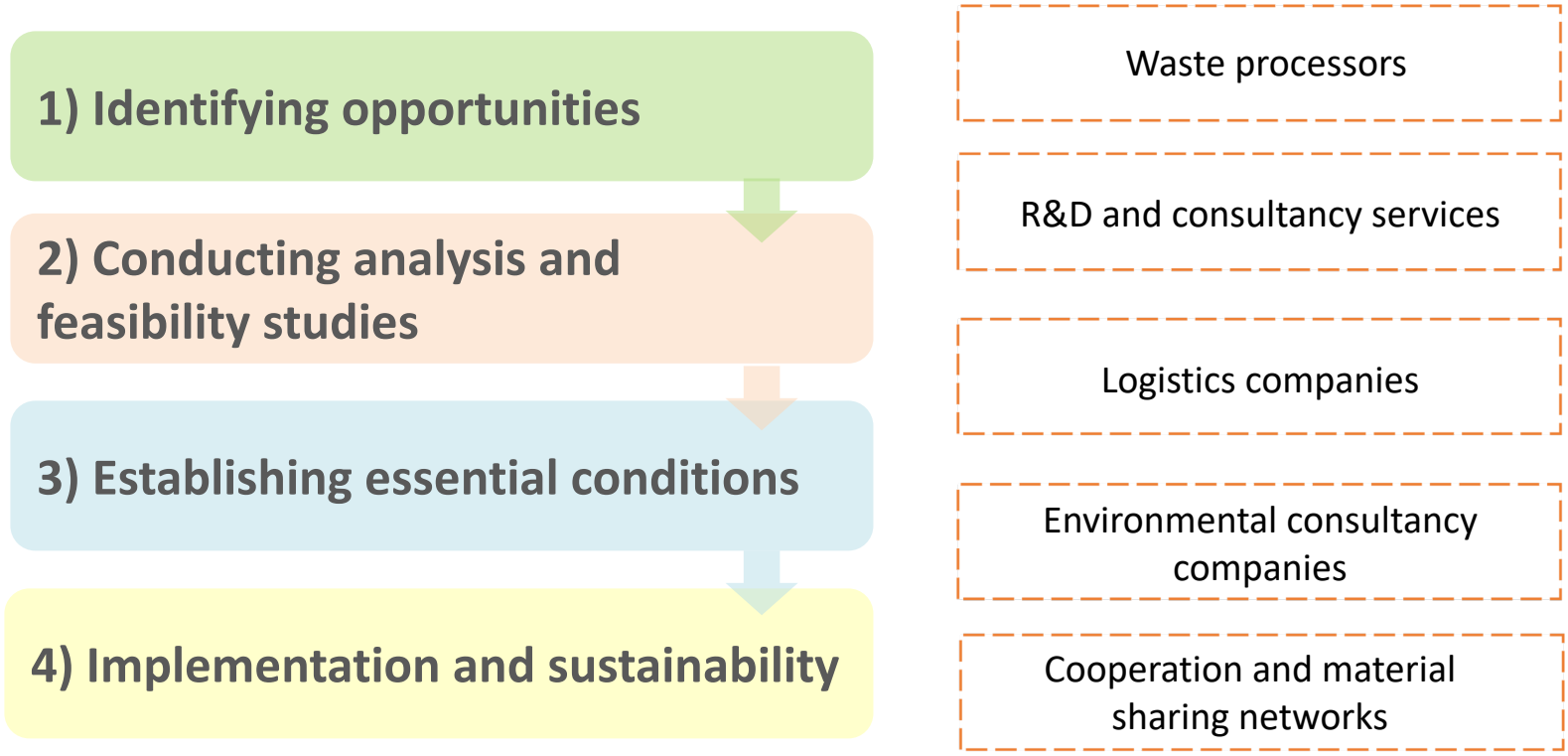
Industrial symbiosis – added value

- Recycling swarf wastes back to metal production through pressing and briquetting.



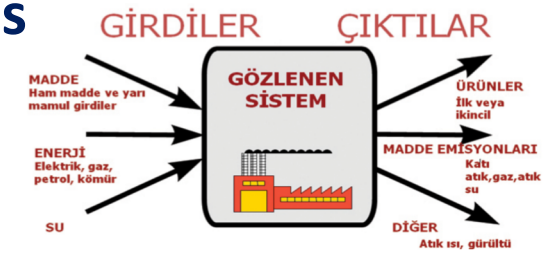
- Using iron powder generated in metal processing (laser cutting) in biogas production for H_2S removal (industrial test) (Turkey Circular Economy Platform, 2019)

Industrial symbiosis – implementation steps

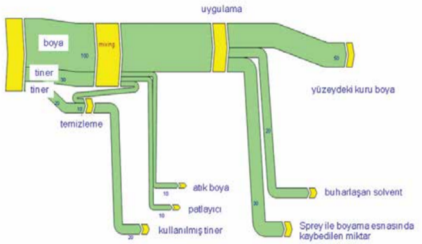


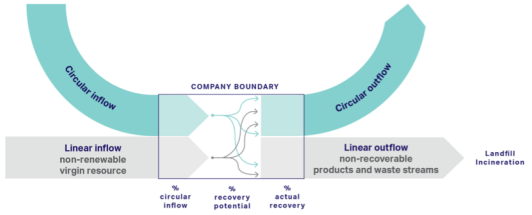
Industrial symbiosis – implementation steps

1) Identifying opportunities



- Input – output, material flow analysis
- Cost analysis (input costs, waste disposal costs)
- Value flow/lost analysis
- Circularity analysis (inputs and outputs)
- Review of literature and good practices
- Benefitting from existing platforms/ networks, facilitat and experts
- Identifying opportunity areas and first screening





Industrial symbiosis – implementation steps

1) Identifying opportunities

- Inputs, amounts, costs
- Virgin material, recycled, recylable?
- Products are recyclable?
- Waste and by-products, amounts
- Recyled/recylable internally? (%)
- Disposed off? (%)
- Diverted to recycling/ recovery? (%)

Industrial symbiosis – implementation steps

1) Identifying opportunities

- What are the potential areas as per the amounts and percentages?
- What are the opportunities?
- Alternatives better than existing opportunities?

Industrial symbiosis – implementation steps

2) Conducting analysis and feasibility studies

- **Identifying collaboration parties:** potential recepients andsuppliers, intermediries
- **Technical feasibility:** analysis, measurement, laboratory work, pilot studies tests
- **Legislative compliance:** compliance with environmental and other legislation, product and material standards, permits, certificates and licences to be acquired
- **Economic feasibility and market survey:** investment need, opertional costs, savings, pay back periods, continuity of buyers and sellers, supply-demand status
- **Environmental assessment:** environmental impacts and risks

Industrial symbiosis – implementation steps

3) Conducting analysis and feasibility studies

- **Agreements: identifying parties** (recipient/supplier, intermediary, logistic service provider, etc.), making agreements
- **Investments:** completing investments (plant, storehouse, equipment, etc.)
- **Legislative requirements:** acquiring permit, license, report and other certificates
- **Operational revisions:** process, waste separation/collection, area needs, relevant staff, training, implementation procedures, quality limits, etc.

Industrial symbiosis – implementation steps

4) Implementation and sustainability

- **Control mechanisms:** waste/material quality control and maintaining stability
- **Sustainability of collaborations:** efficient communication and developing new collaborations
- **Tracing and reporting:** tracing and reporting benefits and impacts through up to date data

Industrial symbiosis – challenges and bottlenecks

- Specific expertise and analysis need
- Challenge of developing new points of view
- Resistance to change
- Compliance with environmental legislation
- Investment need
- Not finding appropriate parties
- Challenges in communication and agreements between companies

Turkey Circular Economy Platform – Example practices

- Producing natural food preservative and calcium supplement from eggshell powder
- Using specific types of food processing wastes together with chips production waste in biogas production and optimization of biogas generation efficiency
- Using wastewater treatment sludge from fruit juice production in biogas generation
- Using wastewater treatment sludge from chemicals sector in cement production as RDF
- Using residual sand from clay separation process in cement production
- Using by-products from chromium enrichment process in refractory production
- Valorization of shampoo and conditioner wastes (out of spec products) to produce detergents for car and carpet washing
- Recycling various types of yarn and fabric wastes generated from the production process.

Türkiye Döngüsel Ekonomi Platformu

Türkiye materials marketplace

Turkey Circular Economy Platform – Feasibility examples

SEKTÖR	PROJE SAHİBİ	PROJE KONUSU
Tekstil	Delta Alfa Çorap Tekstil San. Tic. A.Ş.	Üretim sırasında çıkan çorap ve iplik atıklarından elyaf geri kazanımı ve geri kazanılmış elyafın tekrar üretimde kullanılması.
Tekstil	Kadifeteks Mensucat San. A.Ş.	Üretim sırasında çıkan iplik ve kumaş atıklarının geri dönüştürülmesi.
Tekstil	Yünsa Yünlü San. ve Tic A.Ş.	Üretim sırasında oluşan kumaş atıklarının geri dönüştürülerek yeni bir eko-kumaş koleksiyonun oluşturulması.
Tekstil	Roteks Tekstil İhracat San. ve Tic. A.Ş.	Firma döngüsellik ölçümü ve döngüsel ekonomiye geçiş yol haritasının oluşturulması, denim yıkama prosesinden çıkan arıtma çamurunun yapı malzemeleri sektöründe değerlendirmesi
Gıda ve içecek	Sütaş Süt Ürünleri A.Ş.	Metal işleme (lazer kesim) projesinden çıkan demir tozun biyogaz üretiminde H2S giderimi için kullanılması.
Gıda ve içecek	Pepsico - Fritolay Kocaeli İşletmesi	Belli türdeki işleme gıda atıklarının, cips üretim atıklarıyla birlikte biyogaz üretiminde kullanılması ve biyogaz üretim veriminin optimize edilmesi.
Gıda ve içecek	Anadolu Efes A.Ş.	Bira üretiminin yan ürünü olarak ortaya çıkan malt posasının ileri dönüştürülmesi ile katma değerli ürünler elde edilmesine yönelik çalışmalar

Türkiye materials marketplace

Türkiye Döngüsel Ekonomi Platformu

Turkey Circular Economy Platform – Feasibility examples

SEKTÖR	PROJE SAHİBİ	PROJE KONUSU
Plastik	Rehau Polimeri Kimya San. A.Ş.	PVC-polimer üretiminde polimer dolgusu malzemelerin alternatif olarak ikincil hammaddeler ile ikame etmesi.
Plastik	BUDİN Kimyevi Maddeler San. ve Tic. A.Ş.	Plastik üretimi sırasında çıkan masterbatch atıklarından işlevsel tekstil elyafı elde edilmesi.
Geri Kazanım	MGD Marmara Geri Dönüşüm End. San. ve Tic. Ltd. Şti.	Standart dışı şampuan ve yumuşatıcı ürünlerin değerlendirilerek araba ve halı için yeni deterjan üretilmesi.
Geri Kazanım	ENG Mineral San. Tic. Ltd. Şti.	Alüminyum üretiminden çıkan cüruftan yüksek saflıkta alüminyum külçe üretilmesi.
Geri Kazanım	Efe Alüminyum San. Tic. Ltd. Şti.	İkincil alüminyum üretiminden çıkan ergitme cüruftan, demir çelik endüstrisinde cüruf yapıcı olarak kullanılmak üzere kalsiyum alüminat üretilmesi.
Maden	Tekmar Mermer ve Maden İşletmeleri Üretim İhracat ve Tic. A.Ş.	Kireç karbondioksit prosesine alternatif olarak, mermer atığından çöktürülmüş kalsiyum karbonat üretimi.
Maden	Eti Krom A.Ş.	Kromit zenginleştirme faaliyetlerinden yan ürün olarak çıkan olivinin refrakter hammaddesi olarak değerlendirilmesi

Türkiye materials marketplace

Türkiye Döngüsel Ekonomi Platformu

Turkey Circular Economy Platform – Feasibility examples

SEKTÖR	PROJE SAHİBİ	PROJE KONUSU
Ana Metal	Bilecik Demir Çelik A.Ş.	Demir çelik üretim fırınlarından çıkan alümina bazlı refrakter atıklarından ikincil hammadde olarak WFA (white fused alumina) üretilmesi.
Ana Metal	Ekinciler Demir ve Çelik San. A.Ş.	Demir çelik üretim fırınlarından çıkan dolomit refakter tuğla atıklarından ikincil hammadde üretilmesi.
Metal işleme - makina	Saueressig Baskı Öncesi Hazırlık Sistemleri San. Tic. A.Ş	Baskı silindiri üretiminden kaynaklanan atıklardan (ör: FeCl3) farklı sektörlerde kullanılabilecek yüksek performanslı koagülan üretilmesi.
Ahşap	Kastomonu Entegre Ağaç San. ve Ti. A.Ş.	Gazifikasyon tesisinden çıkan biyo-kömürden grafin, odun kömürü ve aktif karbon gibi katma değerli ürünlerin üretilmesi.
Kimya	Protecter & Gamble Tüketim Malları San. A.Ş.	Üretimden çıkan bebek bezi atıklarının geri kazanılarak absorban malzeme, selüloz ve plastik elde edilmesine yönelik fizibilite çalışması.
Tarım	Yapılcanlar Tohumculuk Hayvan San. Tic. Ltd. Şti.	Biyogaz üretiminden çıkan sıvı atığın, topraksız tarımda kullanılabilecek kaliteli ve verimli bir gübreye dönüştürülmesi

Türkiye materials marketplace

Türkiye Döngüsel Ekonomi Platformu

Conditions for transitioning to circular business models

Internal and external factors for companies

Internal


Knowledge and awareness


Technical capacity


Financial power


Organizational structure

External


Regulations and government support


Collaboration and networks


Existing markets and systems


Financing

Conditions for transitioning to circular business models

Do's for companies

- Review of current strategies with a circularity perspective
- Assessment of inflows, outflows,, processes and value chaind with a circularity pespective, identification of opportunity areas
- Integration of circularity perspective into R&D and innovation activities
- Capacity building for company staff
- Establishment of processes and infrastructure required for transformation
- Interaction with suppliers, customers, public and other related organizations, knowledge sharing
- Improvement of collaboration culture and trust, establishing commercial and legal conditions

Conditions for transitioning to circular business models

Do's for stakeholders

- Training programs
- Technical support programs
- Circular economy guidelines
- Circularity management and assessment
- Creating and disseminating best practices
- Access to technology
- Creating cooperation platforms
- Developing financing tools and incentives applicable for circular business models
- Integrating circular economy into current R&D, innovation and competitiveness programs
- Improving the capacity of the related interfaces
- Material sharing networks
- Secondary material standards

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