

DSCE Circular Economy 2022 Report

Enabling a circular economy transition through energy, water, transport and waste management

Dubai Supreme Council of Energy

December 2022



Dubai government has put concerted effort to understand the state of circularity in Dubai and to advance it through DSCE CE Committee

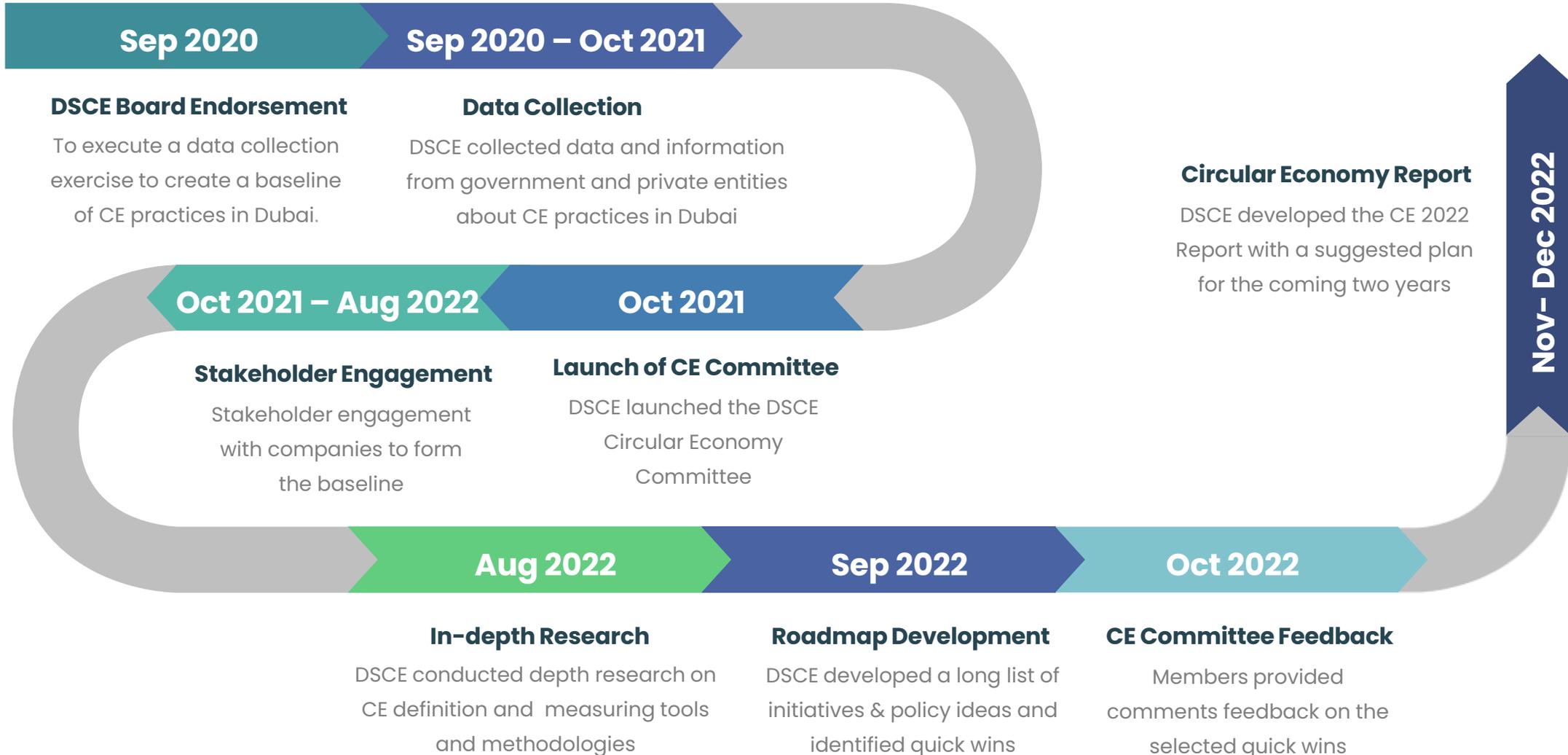
DSCE Circular Economy Committee

- Brings public and private entities together to support the circular economy in Dubai
- Develops and launches innovative tools, initiatives and policies to promote circularity
- Support start-ups and develop the capabilities of entrepreneurs in the sector
- Encourage the utilization of modern technologies capabilities
- Enhance the efficiency of natural resources and promote sustainable practices





DSCE led engagement on circularity and developed the first DSCE Circular Economy Report



Report includes review of circularity principles and methodologies, benchmarking analysis, overview of data collected, plan development and a data bank of CE companies

DSCE CIRCULAR ECONOMY REPORT

- Definition of circularity
- Measuring circularity, review of KPIs
- UAE Circular Economy Landscape
- Benchmarking analysis
- The state of circularity in Dubai
- Data Collection
- Plan Development
- CE companies data bank





Report and plan were developed based on review of government strategies, stakeholder input, publications, studies, benchmarks and SMEs feedback

Analysis of existing policies and strategies

DIES, DSM 2030, Dubai Clean Energy Strategy, Integrated Water Management Strategy, UAE Circular Economy Policy, UAE partnership with WEF on "Scale 360"....

Alignment with federal and local initiatives

Policy from MOCCA, Dubai Executive Council committee, Hack Report from Dubai Department of Economy Development, CE strategy from DEWA, Draft import and export law of recyclables



Desktop research

50+ publications were analyzed



Sources of Input

Feedback from committee members

Feedback collected from members about challenges, policy ideas and initiatives to advance CE



Indicators & Benchmarking

Identified KPIs and Tools to evaluate CE and analyzed best practices in Europe and China



Stakeholder Engagement (private & public)

30+ meetings, roundtable discussions and interviews were conducted during the process



Data Collection Exercise

18 provided input provided detailed input



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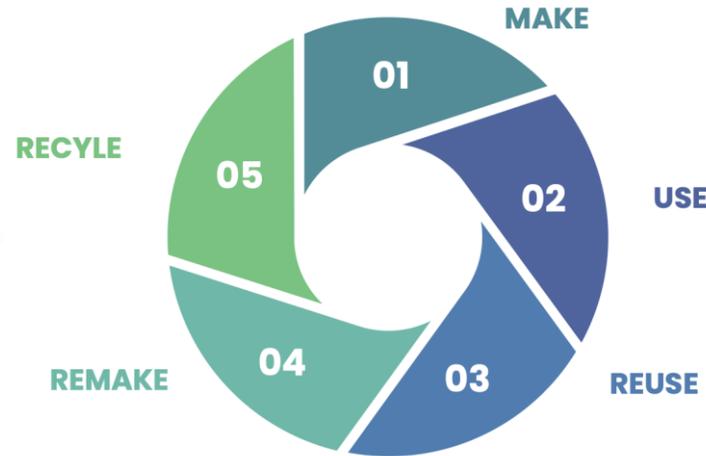
Definition of the circular economy



Energy from finite sources

Linear economy

90+% of today's economy



Energy from renewable sources

Circular economy

- In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually **decouple growth from the consumption of finite resources**.
- A circular economy is an economy that is restorative and regenerative by design.
- It gives us the tools to tackle climate change and biodiversity loss together, while addressing important social needs.
- It gives us the power to grow prosperity, jobs, and resilience while cutting greenhouse gas emissions, waste, and pollution.

“There is no waste in nature, it is a concept we have introduced”

Source: <https://ellenmacarthurfoundation.org/>



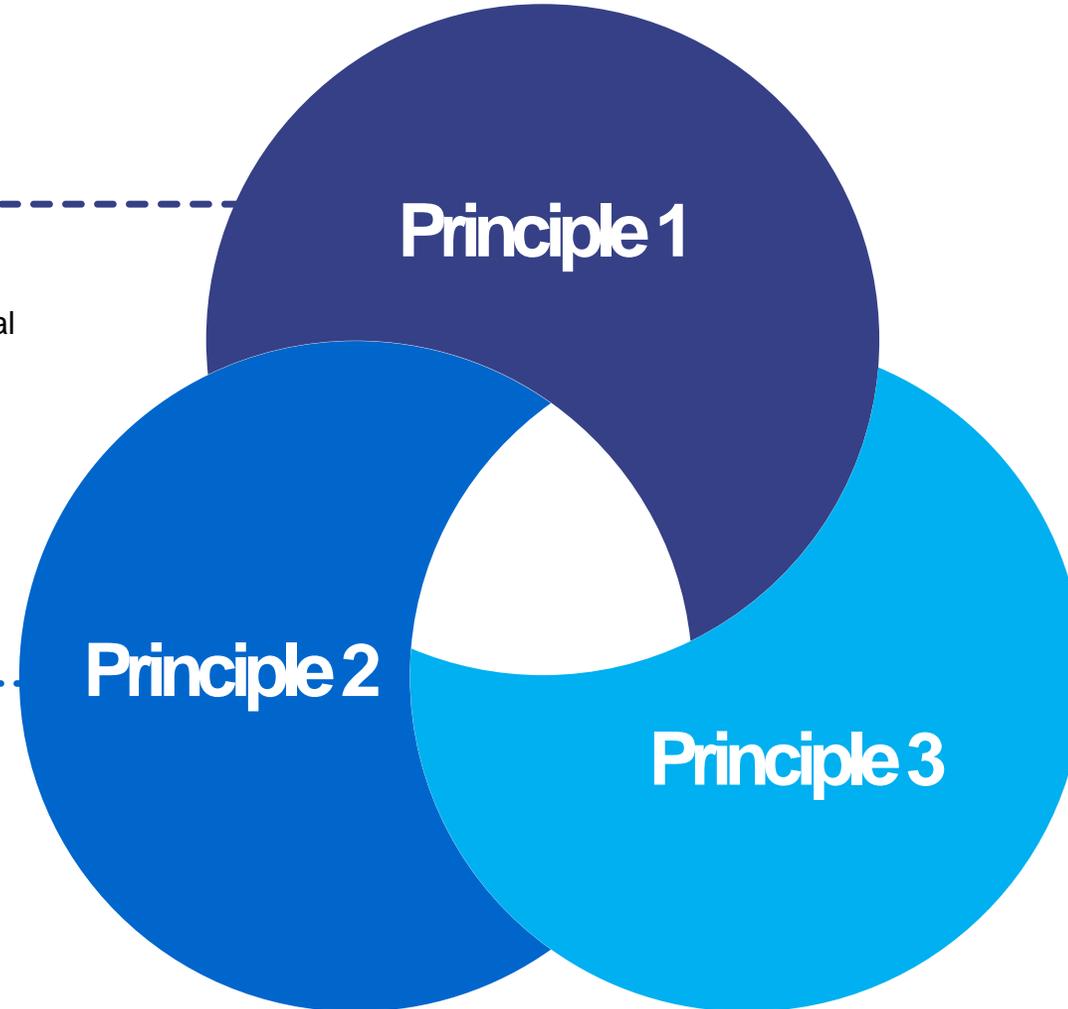
Basic principles of Circular Economy

Eliminate waste and pollution

A circular economy designs out the negative impacts of economic activity that cause damage to human health and natural systems. This includes the release of greenhouse gases and hazardous substances, the pollution of air, land, and water, as well as structural waste such as traffic congestion.

Circulate products and materials

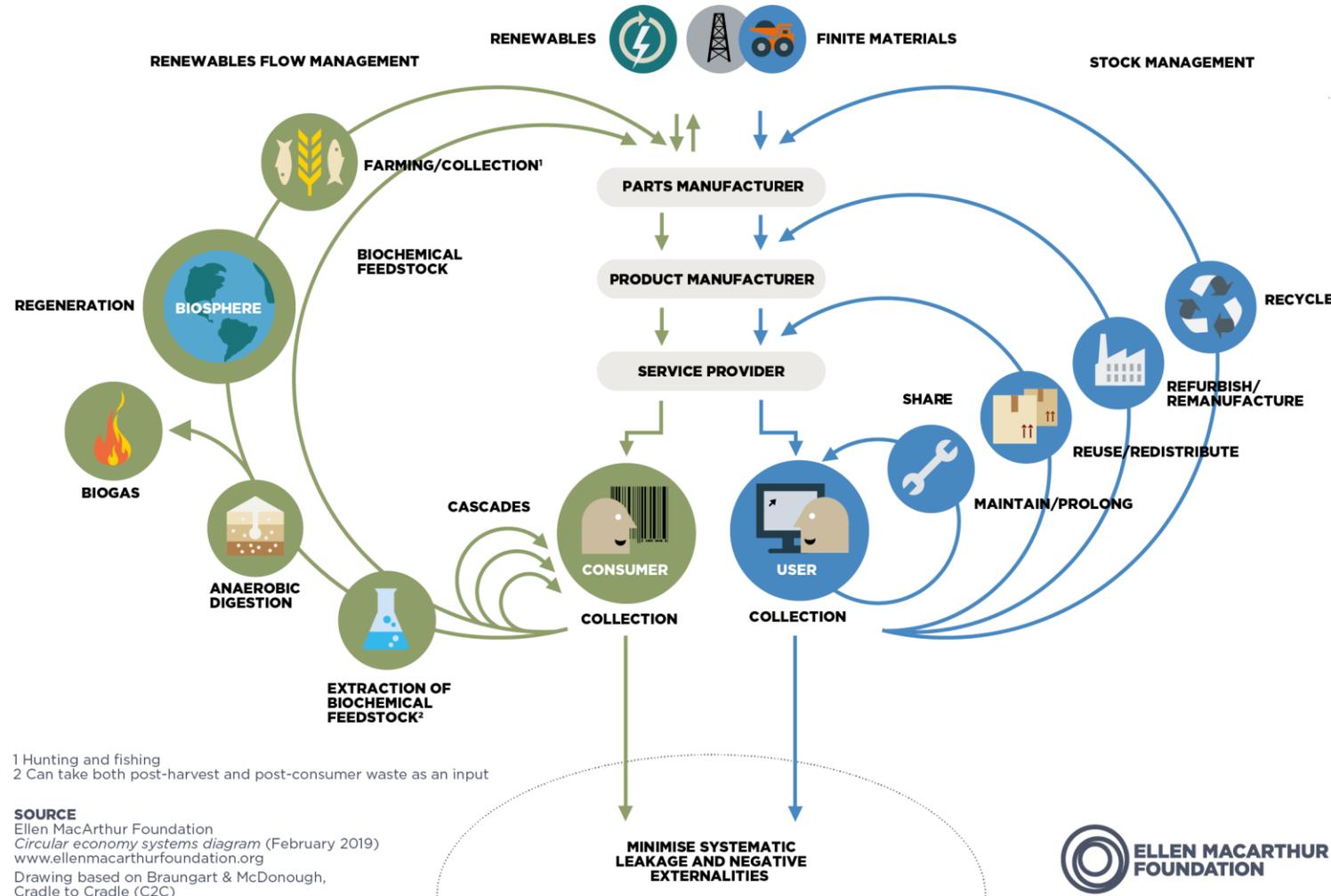
- Keeping materials in use, either as a product or, when that can no longer be used, as components or raw materials.
- Products are reused, repaired, remanufactured, and recycled
- Biodegradable materials are returned to the earth through processes like composting and anaerobic digestion.



- Shift the focus from extraction to regeneration
- Employ farming practices that allow nature to rebuild soils and increase biodiversity and return biological materials to the earth.
- Avoid the use of non-renewable resources and preserves or enhances renewable ones

Regenerate Nature

The butterfly diagram



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input

SOURCE
Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough,
Cradle to Cradle (C2C)



The Ellen MacArthur Foundation tried to capture the essence of the circular economy in the '**butterfly diagram**'.

- ❑ The diagram tries to capture the flow of materials, nutrients, components, and products, whilst adding an element of financial value.
- ❑ It is mostly influenced by Cradle to Cradle's two material cycles.

Two main cycles – the **technical cycle** and the **biological cycle**.

- ❑ In the technical cycle, products and materials are kept in circulation through processes such as reuse, repair, remanufacture and recycling. Designing out waste is the best option while recycling is last resort.
- ❑ In the biological cycle, the nutrients from biodegradable materials are returned to the Earth to regenerate nature.

Source: <https://ellenmacarthurfoundation.org/>



A circular value chain opens possibilities for new products and services

- In an increasingly ESG*-aware world, consumers, investors and governments increasingly drive the need to shift towards a circular economy
- Brand owners are also now capable of providing products and services with less environmental impact and more positive social impact
- Technology enables tracking data needed to fulfill these new requirements, unlocking new opportunities across the value chain
- Role of the government is to facilitate and stimulate business cases across the circular value chain, at each of its links
- CE has the potential to make supply chains localized and resilient, supporting creation of new jobs



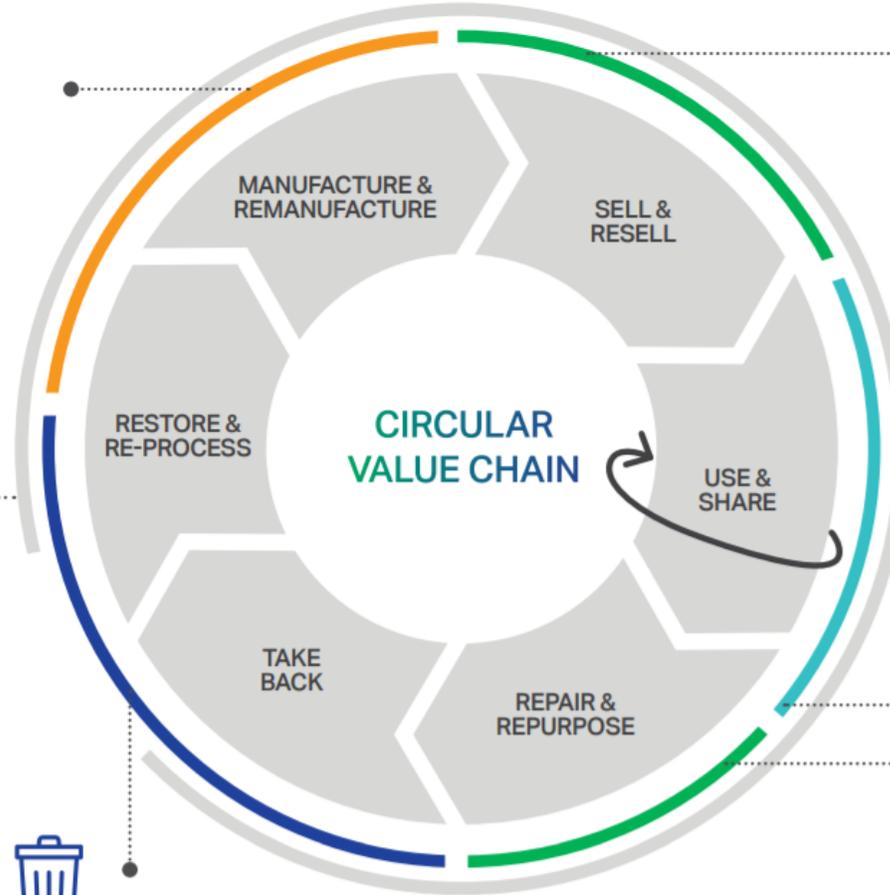
CIRCULAR SUPPLIES: Use renewable energy, bio-based or fully recyclable input material to replace toxic and single-lifecycle inputs



PRODUCT AS A SERVICE: Offer product access and retain ownership to internalize benefits of circular resource productivity



RESOURCE RECOVERY: Recover materials, resources and energy from disposed products or by-products



PRODUCT LIFE-EXTENSION: Extend working lifecycle of products and components by reselling, repairing, remanufacturing and upgrading



SHARING PLATFORM: Enable increased utilization rate of products by making possible shared use/ access/ownership

* ESG = Environment, Society, Governance

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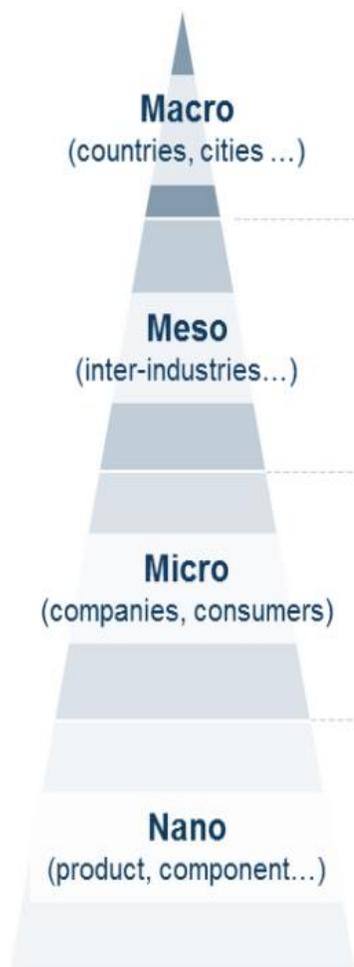
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Measuring Circularity – Review of KPIs

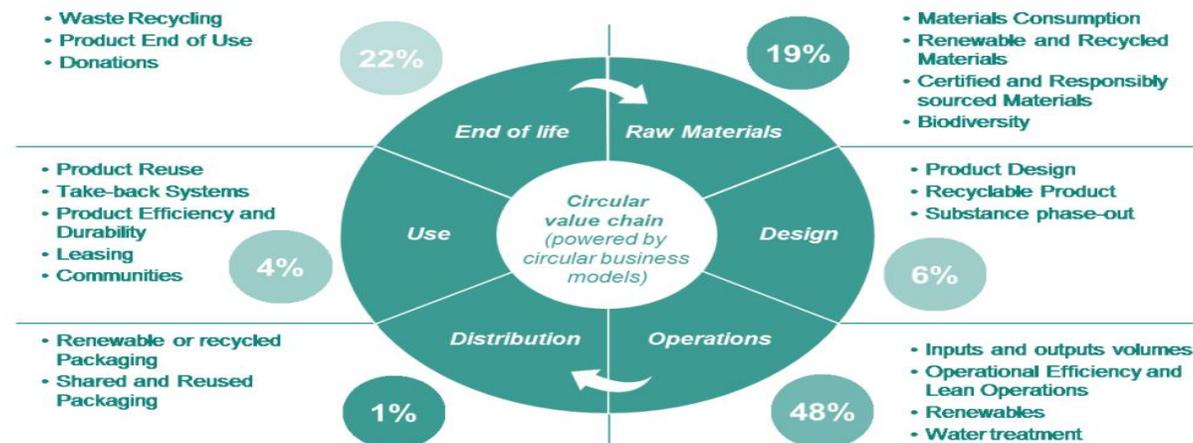
Measurement Levels



- A circular economy is a broad concept involving numerous stakeholders, as such it is relevant to define goals based on different level: namely **macro, meso, micro, and nano** levels.
- The private sector can evaluate their performance across three levels: **Nano, micro and meso**. Micro is the most common evaluation
- However, **Meso evaluation** can be used to evaluate the circularity of a portfolio which is composed of multiple companies or micro entities.
- Positive impacts of different level of metrics include:
 - ❑ Macro: limit resources rarefaction and dependency on importations for **countries and cities**
 - ❑ Meso: Increase dynamism as well as attractiveness of **territories**
 - ❑ Micro: Provide competitive advantage for **companies**
 - ❑ Nano: Increase value of second-use **materials and goods**

Measuring circularity in businesses – Scope of Measurement

Figure 7 - Circular metrics along the life cycle



Source: Review of 140 annual reports of worldwide companies

- **Scope of measurement:** Based on a WBCSD survey of 140 annual reports, all companies consider Materials in the KPIs, followed by Energy, Water, Emissions, Land, Minerals
- Measuring circularity at the company level is also related to the **position in the value chain or Lifecycle:**
 - ❑ 48% of the circular metrics identified relate to the internal operations or processes of a business (140 annual reports analyzed)
 - ❑ 19% and 22% of the circular metrics analyzed qualify under the Raw Materials and End of Life phases of the life cycle, respectively (140 annual reports analyzed)

Measuring Circularity – Review of KPIs

Measuring circularity in businesses – Differences between industries and sectors

Figure 8 – Environmental indicator types by industry. Source: Review of 140 annual reports of worldwide companies

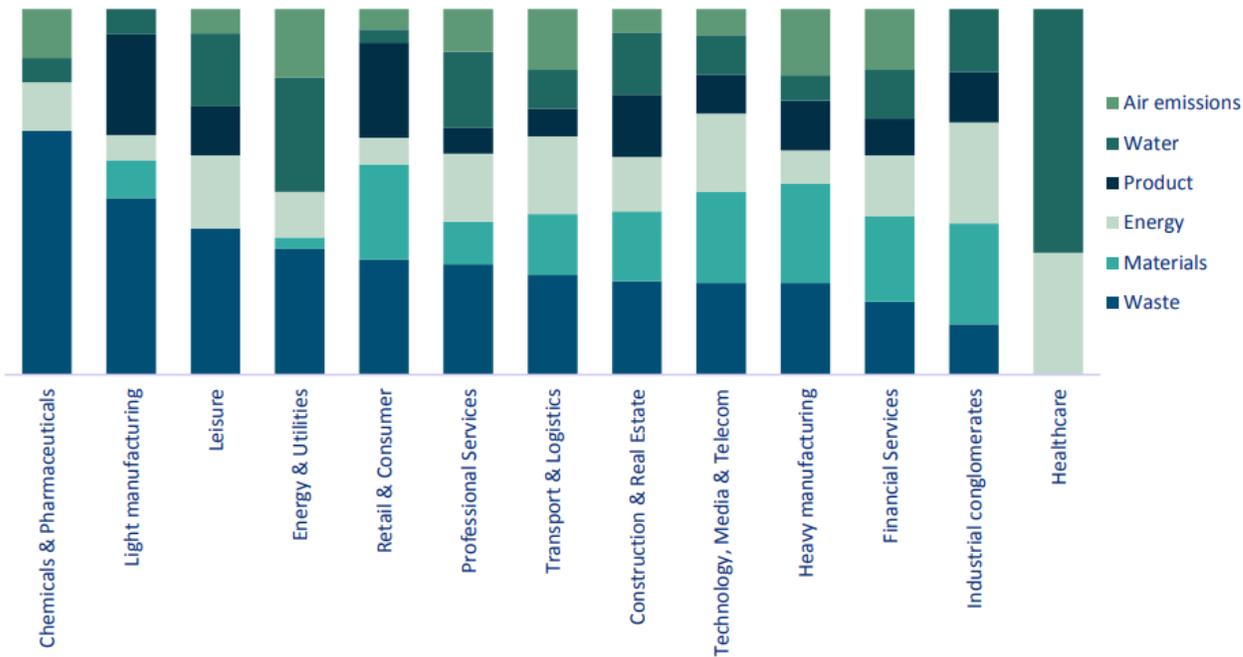


Table 1 - Sector priorities

Each sector may ask: what is our key unlocking move to a circular economy? For example:

Agriculture	→	Soil fertility (improve)	Healthcare	→	Hazardous waste (reduce)
Construction	→	Virgin materials (reduce)	Manufacturing	→	Close loop (ensure)
Waste management	→	Down-cycling (minimize)	Mining	→	Urban mining (leverage)
Financial services	→	Circularity of portfolio (increase)	Transport & Logistics	→	Fleet use and lifetime (maximise)

- A framework for measuring circularity should recognize **relative criticality of some metrics over others**, depending on industrial or geographical contexts.
- For example, water efficiency indicators are likely to be **more material** to a chemical company than they may be to financial services company.
- **Energy** plays a vital role in circular economy activities across different sectors. For instance, the measurement of circularity of materials needs a proper consideration of the power and heat used in production.

Measuring Circularity – Review of KPIs

Measuring circularity in businesses – Evolution of Metrics

Table 5 - Sample circular metrics by category

	Operational Efficiency	Sustainability Performance	Circular Value Creation
Environmental	<ul style="list-style-type: none"> Energy efficiency Water efficiency Material efficiency 	<ul style="list-style-type: none"> Recycled content Circular projects Waste diverted from landfill 	<ul style="list-style-type: none"> Valorization of residues Preserved value EP&L intensity
Social	<ul style="list-style-type: none"> Labor hours per unit Productivity level Supply chain transparency 	<ul style="list-style-type: none"> Local stakeholders engaged Customers reached # of Accidents or Incidents 	<ul style="list-style-type: none"> Jobs created (direct and indirect) Social enterprises started Total economic contribution
Financial	<ul style="list-style-type: none"> Energy cost per unit Price per resource unit Landfill tipping fees 	<ul style="list-style-type: none"> Carbon credits Circular procurement Resource cost savings 	<ul style="list-style-type: none"> Circular revenue Circular percentage of portfolio Remanufactured goods sold



- Globally, companies are at **different stages of maturity**
- **Operational Efficiency Metrics:** standard performance metrics that may be tracked even before a corporate sustainability program is adopted (resource efficiency, energy consumption, water and waste).
- **Sustainability Performance Metrics:** take it a step further by looking at some of the environmental endpoint and social impacts (GHGs, local stakeholders engaged or biodiversity impact)
- **Circular Value Creation Metrics:** track how the business is improving through circularity initiatives (circular revenue, circular percentage of portfolio and preserved value).
- Companies are at **different stages of maturity** with respect to their ambitions in the circular economy
 - ❑ Many are **beginning their circular journey** by weaving a circular economy narrative into their current operations.
 - ❑ A smaller portion is **integrating circular thinking** into their sustainability strategy, taking a more ambitious step in their circular journey.
 - ❑ Few companies have reevaluated their corporate strategy to **base it on circular principles**.
- Given this evolution, there is a trend for companies to adopt operational efficiency and sustainability reporting indicators **prior to** circular value creation indicators.

Measuring Circularity – Review of KPIs

Measuring circularity in businesses – Tools



Circularity Check

- ❑ Developed by Ecopreneur.eu
- ❑ Free, online scan tool with a questionnaire of about 60 questions that determines a circularity score for a specific product and/or service.

- ❑ Board of Innovation is a strategy and business design firm which developed a circular framework & visual rating system.

Board of Innovation



Circulytics

- ❑ Developed Ellen Macarthur Foundation
- ❑ Over 1250 businesses have signed up to complete a Circulytics assessment.
- ❑ Methodology: Goes **beyond assessing products and material flows**, it measures the extent to which a company has achieved circularity across its entire operations.



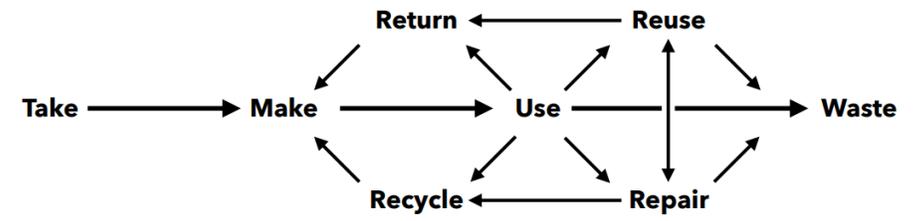
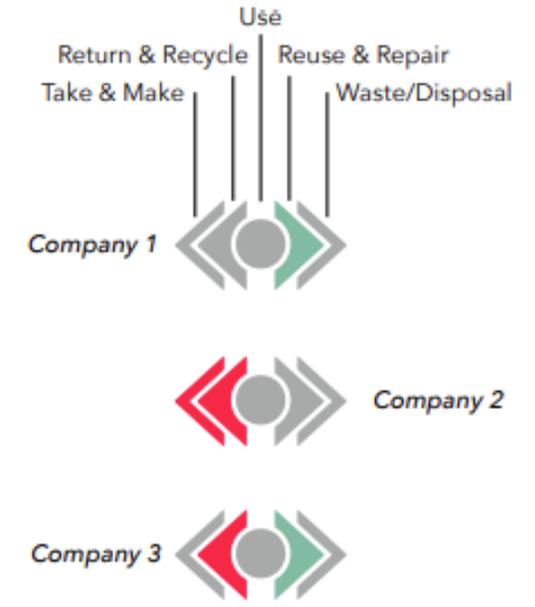
Circular Transition Indicators (CTI)

- ❑ Developed by 30 global companies and WBCSD
- ❑ Used by around 2000 organizations from around 100 countries
- ❑ Methodology: Assessment of material flows **within company boundaries**, combined with **additional indicators on resource efficiency and efficacy**, as well as the **value added** by circular business. Online tool developed in partnership with Circular IQ that guides companies through the CTI process.

Measuring Circularity – Review of KPIs

Measuring circularity in businesses – Examples of company level KPIs based on Board of Innovation methodology

	Take, Make	Return, Recycle	Use	Reuse, Repair	Waste
Increase	<ul style="list-style-type: none"> % renewable energy in production & distribution % products designed with recyclability/repairability in mind 	<ul style="list-style-type: none"> % compliance with local recycling regulations # kg products/materials collected € value of products/materials collected % purity of products/materials collected availability of return points % products with a take-back program 	<ul style="list-style-type: none"> product lifetime (years) product utilization (%) # users sharing product 	<ul style="list-style-type: none"> \$ value on secondary market % of products that can be upgraded to keep value over time # repairs executed (professional, consumer) availability of spare parts & repair information after sales service quality (NPS) 	<ul style="list-style-type: none"> % products captured as feedstock to downstream businesses \$ value of products as feedstock to downstream businesses % data available: information on where installed base (products) ends up
Decrease	<ul style="list-style-type: none"> % or # kg virgin material input (sourced from the environment) % or # kg waste to landfill in manufacturing 	<ul style="list-style-type: none"> # kg collected products to landfill or incineration \$ cost of return \$ cost and time sorting and processing 	<ul style="list-style-type: none"> \$ cost of maintenance/operating a product % year over year value depreciation % idle time # energy needed to operate emissions and environmental discharge # of products in the field (lower footprint) 	<ul style="list-style-type: none"> \$ cost and time of repair # discarded products cost of spare parts (% compared to new) 	<ul style="list-style-type: none"> % products ending up in landfill % products incinerated % products discarded to nature



Measuring Circularity – Review of KPIs

Measuring circularity on City/Country level – Comparison between UAE and EU

UAE Circular Economy Policy

Economic Performance Indicators
The number of classified companies operating in the principles of the circular economy
The size of companies
The value of assets and investments for each company ▲
The contribution of rated companies to the GDP
The volume of import, export and re-export of classified companies ▲
The annual growth rate of the listed companies
The number of major import and export countries
Percentage of financing from local or international banks
The number of economic sectors served by the classified companies
The number of employees for each company classified ▲

Performance Indicators for Renewable Energy and Greenhouse Gas Emissions
Renewable and clean energy production as proportion of total production
CO2 emission per unit of GDP

Performance Indicators in Resource Productivity
Domestic material consumption per unit of GDP
Energy consumption per unit of GDP
Water consumption per unit of GDP

Performance Indicators in Waste Generation
Hazardous waste generated per unit of GDP ▲
The per capita hazard of waste generation and the proportion of hazardous waste treated, according to the type of treatment
Construction and demolition waste generated per unit of GDP (or per unit construction value added) ▲
Municipal solid waste generation intensity (kg / person / day) ▲
Global food loss index ▲

Resource Productivity Indicators
Percentage of recycled waste as proportion of the total waste generated (hazardous and non-hazardous) ▲

EU Indicators to measure CE development

Indicator	Sub-indicator
1. Self-sufficiency for raw materials	–
2. Green public procurement	–
3. Waste generation	Generation of municipal waste per capita ▲ Generation of waste per GDP Generation of waste per DMC
4. Food waste ▲	–
5. Recycling rates	Recycling rate of municipal waste ▲ Recycling rate of all waste ▲
6. Recycling / recovery for specific waste streams	Recycling rate of overall packaging Recycling rate of packaging waste by type Recycling rate of wooden packaging Recycling rate of e-waste Recycling of biowaste
7. Contribution of recycled materials to raw materials demand	Recovery rate of C&D waste ▲ End-of-life recycling input rates Circular material use rate
8. Trade in recyclable raw materials	Imports from non-EU countries ▲ Exports to non-EU countries ▲ Imports from EU countries Exports to EU countries
9. Private investments, jobs and gross value added	Gross investment in tangible goods ▲ Number of persons employed ▲ Value added at factor cost
10. Patents related to recycling and secondary raw materials	Patents of recycling and secondary materials

▲ Same or similar KPIs

- Many KPIs are same or similar especially the ones related to **waste generation per capita** and **investments in CE businesses**
- Both focus on food waste. UAE uses **Global food Loss Index** as indicator
- UAE has some KPIs related to energy production, CO2 emissions, energy consumption and water consumption which can be interpreted as what we've seen before the KPIs of **beginners on the circularity journey**

- UAE focuses on **hazardous waste** while EU focuses on **different types of waste** (packaging, wooden packaging, ewaste. Biowaste...). Both on **recycling rates**.
- EU metrics has some interesting KPIs, such as Self sufficiency for raw material, Green public procurement, Trade in recyclables, Circular material use rate, Number of patents, etc.

Measuring Circularity – Review of KPIs

Measuring circularity on City/Country level – Alignment with the principles of Circular Economy

UAE Circular Economy Policy

Economic Performance Indicators
The number of classified companies operating in the principles of the circular economy
The size of companies
The value of assets and investments for each company
The contribution of rated companies to the GDP
The volume of import, export and re-export of classified companies
The annual growth rate of the listed companies
The number of major import and export countries
Percentage of financing from local or international banks
The number of economic sectors served by the classified companies
The number of employees for each company classified

Performance Indicators for Renewable Energy and Greenhouse Gas Emissions
Renewable and clean energy production as proportion of total production ▲
CO2 emission per unit of GDP ▲

Performance Indicators in Resource Productivity
Domestic material consumption per unit of GDP ▲
Energy consumption per unit of GDP ▲
Water consumption per unit of GDP ▲

Performance Indicators in Waste Generation
Hazardous waste generated per unit of GDP ▲
The per capita hazard of waste generation and the proportion of hazardous waste treated, according to the type of treatment ▲
Construction and demolition waste generated per unit of GDP (or per unit construction value added) ▲
Municipal solid waste generation intensity (kg / person / day) ▲
Global food loss index ▲

Resource Productivity Indicators
Percentage of recycled waste as proportion of the total waste generated (hazardous and non-hazardous) ▲

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5. Recycling rates ▲	Recycling rate of municipal waste Recycling rate of all waste
6. Recycling / recovery for specific waste streams ▲	Recycling rate of overall packaging Recycling rate of packaging waste by type Recycling rate of wooden packaging Recycling rate of e-waste Recycling of biowaste Recovery rate of C&D waste
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8. Trade in recyclable raw materials ▲	Imports from non-EU countries Exports to non-EU countries Imports from EU countries Exports to EU countries
9. Private investments, jobs and gross value added	Gross investment in tangible goods Number of persons employed Value added at factor cost
10. Patents related to recycling and secondary raw materials ▲	Patents of recycling and secondary materials

▲ Eliminate waste and pollution ▲ Circulate products and materials ▲ Regenerate nature

- Under Ellen MacArthur Foundation's basic principles:
 - ☐ UAE Metrics focus more on **eliminating waste and pollution (Principle 1)**

P1: A circular economy designs out the negative impacts of economic activity that cause damage to human health and natural systems.

P2: Keeping materials in use, either as a product or, when that can no longer be used, as components or raw materials.

P3: Shift the focus from extraction to regeneration. Avoid using non-renewable resources. Preserves or enhances renewable ones.

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UAE – Policy Landscape Overview

Circular economy in UAE

- **April 2019** – MOCCAIE partnered **Coalition CIRCLE** consisting of private sectors and NGOs, including BASF, Borouge, Tetra Pak, Majid Al Futtaim, Coca-Cola, Dow, Gulf Petrochemicals and Chemicals Association, McDonald’s UAE, Nestlé, Procter & Gamble, PepsiCo, Unilever and Emirates Nature – WWF
- **November 2019** - UAE government collaboration with World Economic Forum on “**Scale 360**” initiative towards a more circular economy, in line with UAE Vision 2021 and Centennial Strategy 2071
- **June/July 2020** – DEWA tender for **Circular Economy Strategy**, leading introduction in Dubai
- **September 2020** – UAE Federal Advisory Board for the Circular Economy
 - ❑ Numerous sustainability initiatives and projects within Dubai govt entities, some aligned with circular economy
- **January 2021** – Formation of the **UAE Circular Economy Council** and approval of **UAE Circular Economy Policy**
 - ❑ Provides a **framework for identifying the priorities** in terms of consolidating the concept of the circular economy within several priority sectors, most notably green infrastructure, sustainable transport, sustainable manufacturing, sustainable food production and consumption, in addition to other areas
 - ❑ The policy comprises several **key objectives**, including promoting environmental health, supporting the private sector in adopting clean production methods, and reducing natural environmental stress, to achieve the country’s vision to be a global pioneer of green development.
 - ❑ The policy and its **outcomes** are expected to generate considerable economic proceeds for the country, mitigate environmental pressures, ensure the supply of raw materials, increase competitiveness, motivate innovation, strengthen economic growth and create job opportunities.

DSCE position

- **October 2021** – DSCE launches Circular Economy Committee to promote circular economy across different sectors in Dubai
 - ❑ Circular economy principles already in DSCE guiding strategy DIES (renewable energy supply) and associated DSM Strategy (energy, water circularity, transport) and initiatives (i.e. Green Procurement)
 - ❑ Well-connected with Dubai and UAE government entities to participate in the dialogue
 - ❑ Ongoing waste-to-energy project, building retrofit projects, Shams Dubai and district cooling

Mapping of CE initiatives with DSM programs and existing supply chain

(based on received responses and online research)

Current programs focus more on **distribution, reusing, and reprocessing**, whereas programs involving manufacturing process are limited

DSM program	Material producers	Manufacturers	Distribution	Use/reuse	Collecting / reprocessing
P1: Building regulations			Use of recycled materials during construction, design for “living locally” Use of UPVC systems in windows and doors (sometimes made of recycled material)		
		Focus on LEED-platinum certification & similar			Re-use of construction waste in open spaces (art, playgrounds, etc.)
P2: Building retrofits				Extending building lifetime through retrofits (AC systems, LED lighting, water efficient laundry systems)	
P4: Efficient cooling				District Cooling, Use of energy efficient AC	
P5: ESMA standards & labels					Material recovery facilities for handling municipal solid waste and extraction of metals, plastics, polymers, waste paper and glass
P7: Shams Dubai				Installation of solar panels	
P9: RW & GW demand mgmt	Collection of wastewater and rainwater, treating and reuse for non-human consumption Treatment and reuse of wastewater in carwashes				
P10: Efficient mobility & smart charging				Use of electric vehicles and bikes EV car sharing for area residents, use of EV for guest/visitor transport	
P11: Fuel & Engine efficiency		Production of biodiesel, reprocessing waste oil, used filters, oil containers Recycling used cooking oil into biofuel Reductions of use of conventional fuels (i.e. Fleet management)			
Outside the scope of DSM Strategy	Plastic recycling, alternate materials		Indoor vertical farming		Waste-to-energy projects
	Recycling of spent pot lining, recycling of aluminium		Farm-to-table collaborations, food waste management programs, focus on locally sourced food ingredients,		Paperless office management systems, waste paper recycling



Motivation to launch a DSCE circular economy initiative comes from a broad overview of overview of challenges to circular economy in Dubai

Findings on challenges in current state of linear economy

Regulatory

- Reforming and ending tipping fee subsidy of landfill
- Need for additional support to CE business initiatives
- Absence of regulatory restrictions on import and use of non-recyclable materials (i.e. plastic packaging)

Supply chain

- Scaling of recycling infrastructure needs to be accelerated
- Services enabling transparency of supply chains needed (enabling choice between re-using or purchasing new)
- Lack of local recyclable materials, both supply and demand

Capacity for change

- Lack of awareness on business case for CE & best practices
- Incorrect perception of high cost of change
- Lack of motivation for investors to engage in CE projects

Funding & innovation

- Currently very few budgets allocated for CE on govt level
- Absence of incentives for re-use of materials and products
- No platform for data and digital infrastructure on circular economy

Opportunities for DSCE & Dubai

- Reduction of waste by supporting projects with a positive bottom line
- Promotion of sustainable businesses and practices
- Establish leadership in applying circular economy focused on energy, water and fuel use
- Establish collaboration with key partner entities for a broader move towards circular economy in Dubai
- Capitalize on established knowledge of developing, launching and monitoring strategy implementation (i.e. DSM Strategy, Green Mobility Strategy)
- Expand the link of policy making with technology towards a more sustainable Dubai
- Increase the visibility of Dubai for international investors by directly impacting environmental, society and governance (ESG) ratings of Dubai



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Global Benchmarking

- Many countries have initiated and developed CE-related policy, dating back to 1990s in Germany and Japan, and most recently in European Union (2020). Practices in **China and EU** are studied for Dubai's Circular Economy development.
- China:
 - ❑ Laws and Regulations: China has published a number of laws since 2002, most notably the **Circular Economy Promotion Law of 2009**, where they contends that CE strategies will be implemented **only if it is viable** in technology, economy, and suitable in protecting the environment.
 - ❑ Measurement: China adopts an altered version of the **European Union's (EU) material flow analysis (MFA)**, whose measurement can range from whole cities to single rivers. The system categorizes data in **four categories**: Resource output, Resource consumption, Integrated resource utilization, Reduction in waste generation
- European Union:
 - ❑ Objective: To ensure that the resources are **kept in the EU economy for as long as possible**.
 - ❑ Initiatives: EU manages initiatives along the entire life cycle of products, particularly focus on the sectors **that use most resources** and where **the potential for circularity is high**
 - ❑ Monitoring Framework: Multiple indicators, incl. EU self sufficiency for raw materials, green public procurement, waste generation, recycling rates, trade in recyclable raw materials, investments, jobs and patents on CE



Global policy leadership on circular economy

1991	Germany	Closed substance cycle and waste management act
1996	Japan	Resource efficiency law
2001	Japan	Law for the promotion of effective utilization of resources (3Rs)
2009	China	Circular economy promotion <u>law</u>
2012	United Kingdom	Resource Security Action Plan: Making the most of valuable materials
2012	Germany	Resource Efficiency Programme (ProgRes)
2014	European Commission	Circular Economy Package & Resource Efficiency Roadmap
2014	Netherlands	Waste to Resource strategy
2015	European Commission	1st Circular Economy Action Plan (CEAP) - implementation completed in 2019
2020	European Commission	2nd Circular Economy Action Plan (within the European Green Deal)



Circular Economy Development models – example of China

Enabling policies and laws of circular economy in China

2002	Cleaner Production	Cleaner production promotion law
2004		Methods of cleaner production audit and review
2004	Pollution and Waste Management	Law for environmental pollution of solid waste
2005		Amended law on pollution prevention and control of solid waste
Ongoing		Laws and regulations for reuse and recycling specific solid waste
2016		Amended law of the prevention and control of environmental pollution by solid waste
2018		Environmental Protection Tax Law
1997	Energy Conservation	Law for energy conservation
2005		Medium- and long-term plan for energy conservation
2005		Law for renewable energy
2009	Circular Economy	Circular economy promotion law

Circular Economy Development models – example of China

Circular Economy Promotion Law, 2009

- Objective: The Law aims to achieve sustainable development by **raising resource utilization rate and increasing resource recovery** in production, circulation, and consumption.
- Practicability: The Law contends that circular economies strategies will be implemented **only if it is viable** in technology, practical in economy, suitable in saving resources and protecting the environment.
- Any new industrial policies created by the Government must meet the criteria for promoting a circular economy.
- Industries must implement **management systems** that reduce resource usage and waste generation, while improving resource recovery and recycling.
- Through the Law for the Promotion of the Circular Economy, the Chinese Government encourages **research, development, promotion and international cooperation of science** relating to circular economies, as well as supporting the **education, publicity and popularization of scientific knowledge**.
- Administration:
 - ❑ The general administration for promoting circular economy under the **China State Council** is responsible for organizing, regulating affairs in relation to the **national** circular economy promotion.
 - ❑ The general departments under **local people's governments** above the country level are responsible for organizing, coordinating and regulating affairs in relation to circular economy promotion in areas under their respective jurisdiction.

Circular Economy Development models – example of China

Measurement Indicators

- The Chinese government has extensively studied the EU's and Japan's models of material flow analysis, where they have adapted it to fit their needs using the input of various actors and government agencies
- The main indicator system used to measure China's circular economy is an altered version of the **European Union's (EU) material flow analysis (MFA)** - a quantitative method of measuring the flow of natural resources and material through various scales of economy, which can **range from whole cities to single rivers**.
- The Chinese indicator system utilizes **macro and meso level** measurement - **macro** level measurement takes into account recycling at the regional level. Both indicator systems categorize quantitative data in the same four categories:
 - ❑ **Resource output** - measure of GDP produced from consumption of land, energy and water, where higher ratios indicate resource efficiency.
 - ❑ **Resource consumption** - the measurement of resources consumed **per unit GDP** level, where lower ratios indicate that less resources were used by the economic system, demonstrating that there are fewer impacts on the natural environment, while having high economic returns
 - ❑ **Integrated resource utilization** - measures the rates of **re-using industrial water and recycling industrial waste**, where high ratios indicate efficient resource recycling and regeneration of those material back into the economy.[21][22] Having a high ratio on the integrated resource utilization indicator demonstrates a reduction in the use of natural resources and waste being sent to landfill sites.[21]
 - ❑ **Reduction in waste generation** - measures the total amount of **waste disposal and emission of pollutants**, where lower ratios indicate that there are low levels of waste needed to be disposed and low levels of toxic emissions.
- China has also experimented with other measurement indicators, such as life cycle analysis (LCA), CO2 emissions and economic returns, **though MFA continues to be the most widely used**.
- There has been research on a new measurement system called **the emergy indicator**, thought as more effective than MFA

European Commission - 2nd Circular Economy Action Plan – summary highlights

- **Initiatives along the entire life cycle of products**, targeting design, promoting circular economy processes, fostering sustainable consumption, and aiming to ensure that the resources used are **kept in the EU economy for as long as possible**.
- Legislative and non-legislative measures target areas where EU action brings real added value:
 - Make sustainable products **the norm** in the EU;
 - Empower consumers and public buyers;
 - Focus on the **sectors that use most resources** and where **the potential for circularity is high** such as: electronics and ICT; batteries and vehicles; packaging; plastics; textiles; construction and buildings; food; water and nutrients;
 - Ensure less waste;
 - Make circularity work for people, regions and cities,
 - **Lead global efforts** on circular economy.
- Addresses key product value chains:
 - Electronics and ICT
 - Batteries and vehicles
 - Packaging
 - Plastics
 - Textiles
 - Construction and buildings
 - Food, water and nutrients
- Circularity is presented as a **prerequisite for climate neutrality**, the overarching goal of the EU and signatories of Paris agreement.
- **Monitoring framework** includes multiple CE indicators:
 - EU self sufficiency for raw materials
 - Green public procurement
 - Waste generation
 - Recycling rates (total and per waste stream)
 - Trade in recyclable raw materials
 - Investments, jobs and patents on CE

Global examples about circularity in different industries (1/2)

Energy

- Optimization of energy and water consumption (**demand side management**)
- Extensive introduction of renewable energy sources
- Waste-to-energy
- Decarbonisation of transport **through promotion of electric vehicles**, possible reuses of EV batteries
- Phasing out of fossil fuel use & promotion of **renewable energy and associated technologies**

Oil & gas

- **Exploration:** Remote sensing, data science (analysis/simulations), innovative drilling technologies
- **Mining/processing:** Automating for energy & water efficiency, innovations in gas injections, pinch technology for heat transfers, wastewater treatment, reuse of heavy oil, water, thermal energy
- **Recycling waste stream & by-product production:** Generating products which contain process waste materials, reuse of materials where possible
- **Land remediation & maintenance:** Biological treatment, recycling compounds, water and mud treatment, real-time monitoring
- **Corporate:** Including circular economy in purchasing policies (Green procurement)
- **Carbon capture and storage**

Global examples about circularity in different industries (2/2)

Textiles	<ul style="list-style-type: none"> • Clothes and fibers continually recycled, to re-enter economy instead of becoming waste. • One of the most common case studies, involves clothes rentals, design change, re-purchase/re-furbishment...
Construction / buildings	<ul style="list-style-type: none"> • Labelled as one of the largest waste generators • Recycling of materials in construction, management and maintenance during use and planning for “2nd life” after decommissioning (i.e. Expo sites) • “Buildings as material banks”, modular construction, local material production (i.e. 3D printing)
Automotive	<ul style="list-style-type: none"> • Use of parts made from recycled materials, remanufacturing, design for circular economy • Alternative ownership models (i.e. “Care by Volvo”) • Reuse of electric vehicle batteries in other use cases (i.e. Tesla Wall from Tesla cars) • Car sharing – i.e. Uber, Careem and others, with or without autonomous vehicles
Logistics	<ul style="list-style-type: none"> • “Reverse Logistics model” – enabling circular flow of goods, collecting used products for recovery, linking markets and providing transparency in supply chains • Sustainable packaging materials, sustainable modes of transport, etc.
Agriculture	<ul style="list-style-type: none"> • Increasing yields while using less resources through vertical farming, hydroponic farming, etc. • Netherlands as leader – reusing waste, reducing use of artificial fertilizers, uniforming methods for soil quality measurement
Furniture	<ul style="list-style-type: none"> • Takeback schemes, recycling of materials, redesigning furniture to reduce production phase waste, offering remade and refurbished furniture to market • Identified in EU as a major potential for implementing circular economy

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The State of Circularity in Dubai – Summary

- Dubai in general is at early stage for an integrated CE strategy, facing with challenges to reap full benefits of a circular economy.
- **Challenges** of Dubai in transitioning towards CE include:
 - Lack of supporting infrastructure
 - Limited Organizational preparedness
 - Concern over financial return and risk
 - Insufficient regulatory support
 - Reshaping Consumer Behaviour
 - Higher cost of recycled materials.
- The **benefits** by transitioning into a more circular economy would be:
 - Positive impact on environment
 - Improving resource efficiency
 - Reduced energy & water consumption
 - New revenue stream opportunities
 - Lowered cost and risks of disruptions
 - Engaging the consumers as partners
- The **connection of CE** with existing strategic and policy framework:
 - The new CE strategy align well with framework within DSCE.
 - On the broader perspective, CE strategy is in line with overarching Dubai government policy towards a more circular and sustainable economy.

Data Collection and Initiatives Summary

- In order to obtain a comprehensive understanding of current CE status, DSCE sent a query on circular economy initiatives and/or data to a select mix of public and private entities in Dubai and UAE
- Along with additional research and data inputs, we summarize the initiatives and map them against the three principles of CE by Ellen MacArthur Foundation:
 - The results indicate relatively abundant efforts related to Principle 1, whereas more effort may be needed in Principle 2.

Challenges of Circular Economy in Dubai

Lack of supporting infrastructure

CE requires **appropriate infrastructure**, ranging across data and supporting services, demand and supply ecosystems. Dubai is still at early stages and requires further support.

Limited organizational preparedness and lack of robust market

On an overall basis, organizations are not prepared to move towards a CE approach and **divert away from the linear way of thinking**. This is a fundamental restraint that needs to be addressed in any initiatives for moving to a CE.

Concern over financial return and risk

Moving to CE may incur **higher costs**, thus generating concerns over ROI. Moving to a CE approach is also associated with worries over **higher risks**. We need create incentives and raise awareness for funding CE transition.

Insufficient regulatory support

Most economies globally that have successfully migrated to a CE have required some level of **regulatory support**, either to kick start the required initiatives, or to attain critical mass.

Reshaping consumer behaviour

In addition to organizations, moving to a CE requires **reshaping consumption and living style** in daily lives. More incentives are needed to motivate and encourage a circular life-style

Inadequate education and innovation

In general, there is an absence of formal CE training in public, private, and social organizations. Dubai also need more technology innovations in areas such as recycling materials, developing products from natural ingredients, etc.

Higher cost of recycled materials

Primary materials are still seen to be **cheaper** than secondary ones, creating a barrier at a fundamental level to mover towards a circular approach.

Overview of Perceived Benefits of Circular Economy in Dubai

Benefits of Circular Economy

Mechanisms of capturing benefits

Positive impact on environment

- Reducing the need for new, virgin raw material to be extracted from nature
- Reducing or removing landfills and/or emissions associate with waste management

Improving resource efficiency

- Reducing losses and waste in manufacturing
- Reducing waste throughout the rest of the supply chain

Reduced energy & water consumption

- Energy efficiency measures reduce needed input resources while maintaining output levels (quality of product or service)

New revenue stream opportunities

- New business models (i.e. Product-as-a-service, reverse logistics) and revenue streams in the public sector through certifications, waste fees, etc. CE is also estimated to generate 700 billion dollars of benefits by 2050 and save 138 billion dollars for GCC by 2030.

Lowered cost and risks of disruptions

- Increasing use of recycled content in products reduces reliance on supply chain and de-risks the manufacturing processes (important during disruptions)

Engaging the consumers as partners

- Stronger connection between brands and environmentally concious consumers
- Longer relationships through engagement beyond sales (i.e. Patagonia)

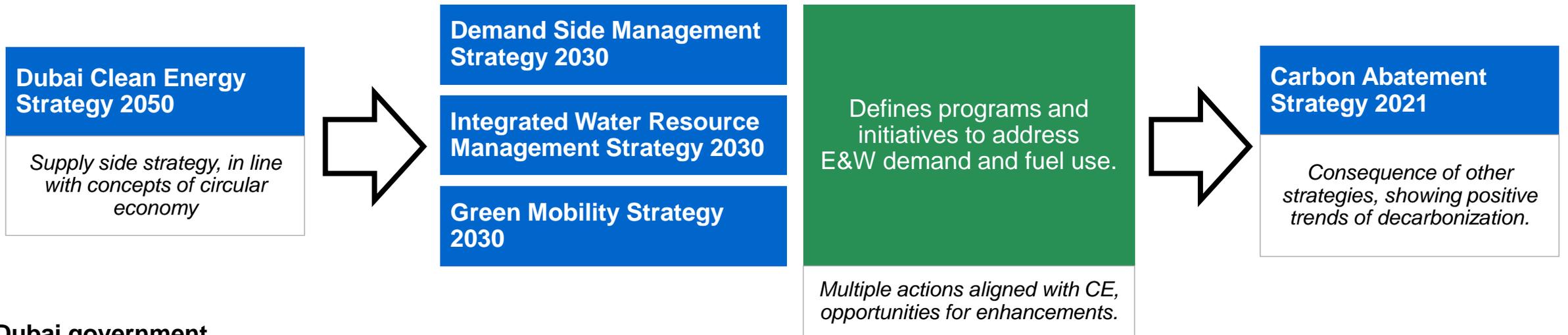
Increased supply chain resilience

- Transitioning to CE represent higher usage of recycled materials from local sourcing. This will increase resiliennce of supply chain amidst distortions and fluctuations.

Connection of CE with Existing Strategic and Policy framework (1/2)

- Circular Economy principles very align well with existing strategic and policy framework **within DSCE as well as the overarching Dubai government policies** towards a more sustainable economy.

Dubai Supreme Council of Energy



Dubai government

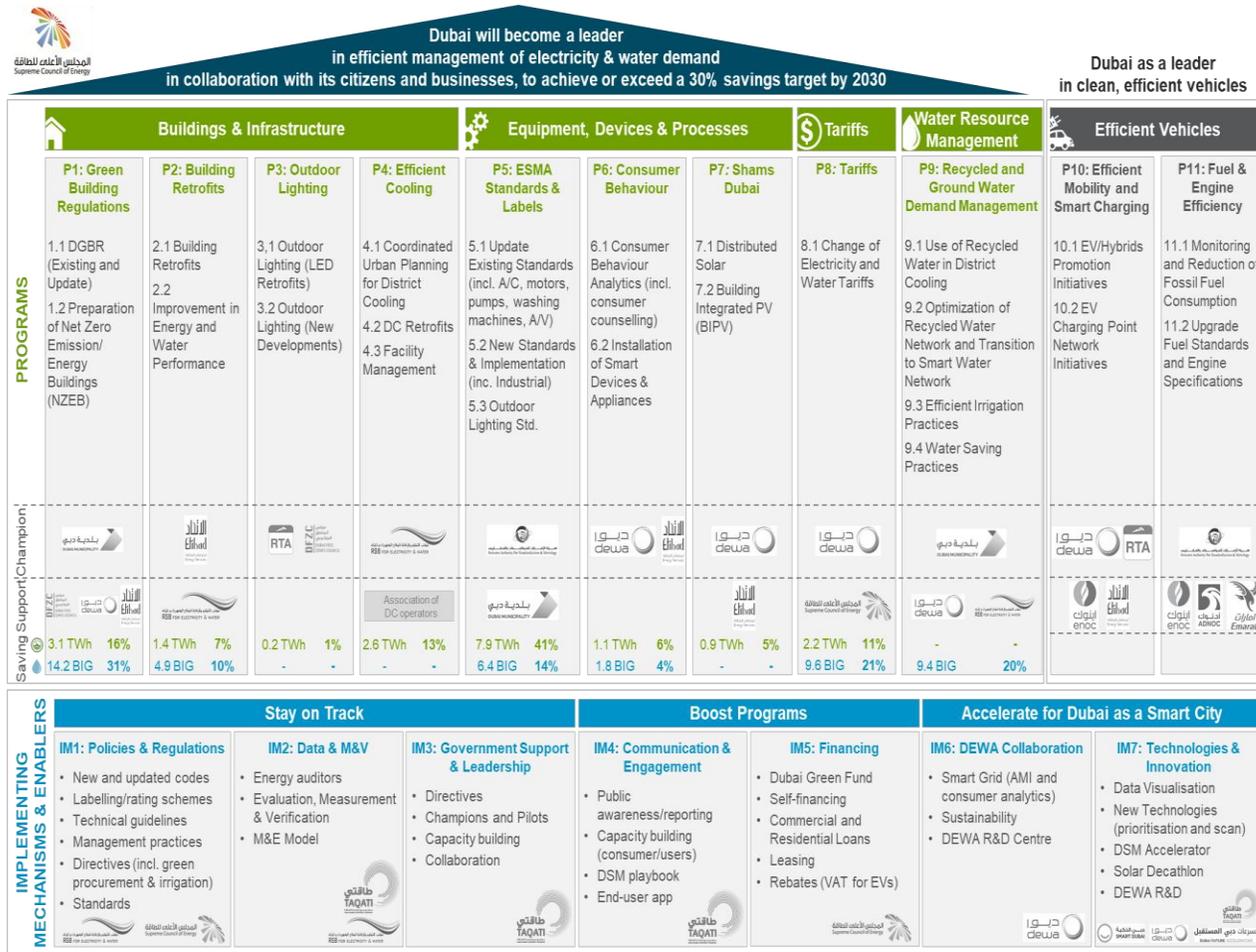
Broader governmental policy framework

- Multiple strategies on leveraging technologies to create the best city in the world
- Focuses on environmental protection, sustainable use of resources
- Alignment with global climate change agreements / coalitions (i.e. Paris Agreement, C40...)

Already aligned with ideas of CE and sustainable development.

Connection of CE with Existing Strategic and Policy framework (2/2)

- Main components of the DSCE-Demand Side Management Strategy can serve as a **platform for circular economy** in DSCE focus areas



- DSM Strategy segmented activities into portfolios and programs according to main electricity, water and fuel use consumption areas
- Each program has a champion and supporting entities, which utilize own resources to execute the set roadmap, approved by DSCE Board
- Some benefits of circular economy are already being captured within DSM Strategy activities – they should be recognized
- In a separate workstream, focusing further on **expanding actions of individual program champions within circular economy**, may unlock new opportunities
- Focus on business case and return on investment has proven a good approach with DSM Strategy, same should be utilized for circular economy

Data collection methodology and overview (1/3) - Background

Continued Engagement

Following the data collection exercise, the DSM team in 2022 engaged with several stakeholders and CE committee members to have a better understanding of CE activities and practices in Dubai

2022 onwards

2020-2021

Data Collection

Subsequently, the DSCE DSM team connected to a wide range of key public/private stakeholders in 2020 - 2021 to learn about their best CE practices and form a baseline understanding of state of CE in Dubai.

Recommendation Endorsed

The Board endorsed the recommendation to execute a **data collection exercise to gauge the level of Circular Economy in the Energy Sector, forming a baseline of implemented practices and projects among the private and public stakeholders.**

Sep 2020

Sep 2020

Initial Presentation to DSCE

In September 2020 session of the DSCE Board, the DSCE DSM Directorate presented the concept of Circular Economy (CE) as a principle to influence collective management of resources with a focus on optimizing use of materials and regeneration to avoid wastage.

CE Idea Initial Preparation

Data collection methodology and overview (2/3)

Selection criteria with entities to approach with query

1. DSCE member entities
2. Government entities in Dubai which may support transition to circular economy, based on DSCE internal expert judgement
3. Other public and entities which previously publicized their actions in line with circular economy
4. Multinationals with presence in Dubai, which on a global level advertise their alignment with principles of circular economy

Overview of query

- Requested feedback on:
 - Insights or assessments of circular economy value proposition that organization has or may have examined;
 - Projects that can be considered as examples of circular economy,
 - Examples of positive business case was identified and executed by entity or in partnership with others;
 - General feedback on perceived value of circular economy by your teams;
- No specific form for response was provided, giving freedom to entities to present their actions
- Two-page basic brief on circular economy with examples of technologies and applications provided to ensure similarity of responses
- Online meetings setup with select entities which requested further clarifications

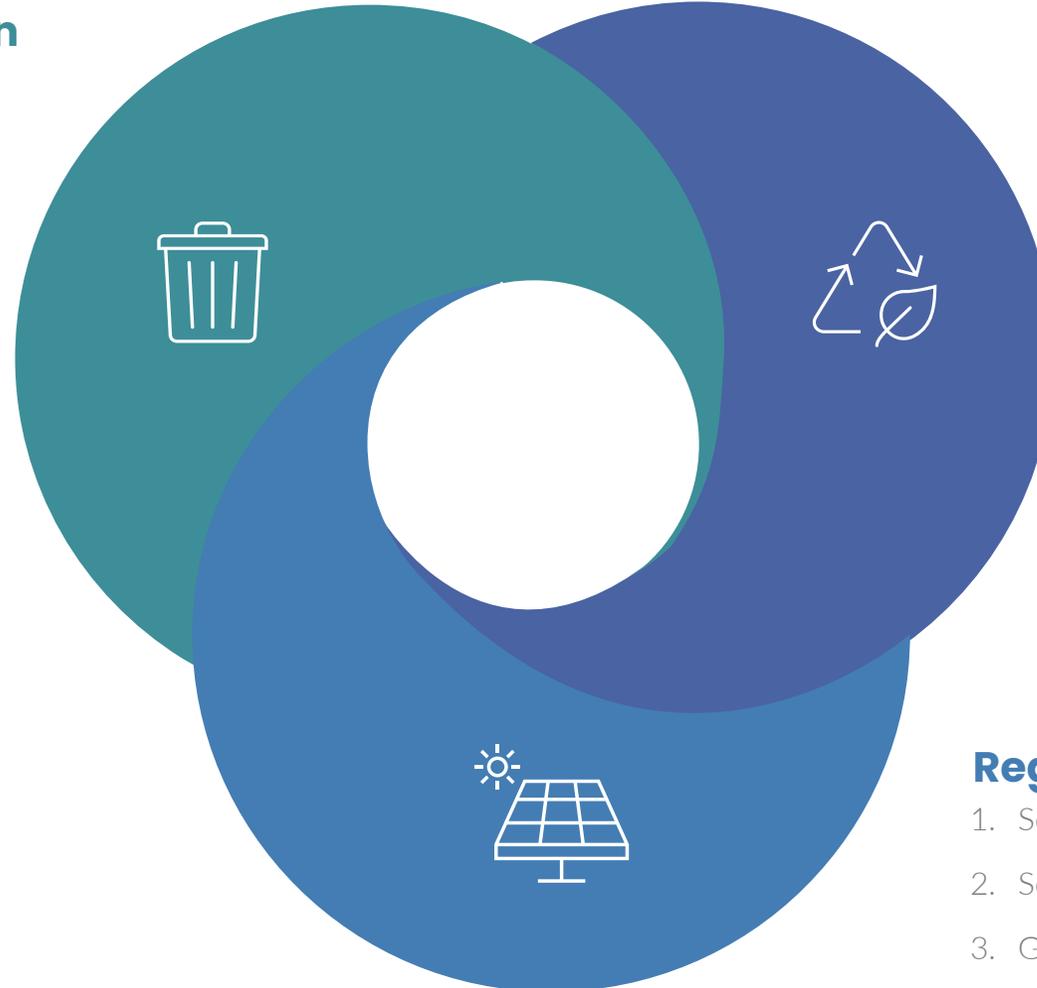
Processing responses

- Detailed review by DSCE DSM team, based on criteria of usability for alignment with circular economy in Dubai
- Analysis focused on areas of interest to DSCE – electricity, water and fuel use, while other examples were included in broader examinations and communicated to partner entities in Dubai government, where applicable

Summary of received examples of CE initiatives mapped against Ellen MacArthur Foundation's basic principles

Eliminate Waste and Pollution

1. Retrofitting buildings and lighting system to increase EE
2. Sustainable construction and green building
3. Implementing efficient cooling
4. Waste management practices
5. Waste to energy power plant
6. Use of recycled water
7. Improving water efficiency in power plants
8. Use of EVs and Installation of charging plants
9. Devices and equipment to increase water efficiency and recycling water



Circulate products and materials

1. Use recycled materials during construction
2. Products completely made of recycled materials
3. Turn waste from aluminum and other materials into value for other industries
4. Turn plastic bottles into clothing and bags
5. Recycling of gypsum boards
6. Use materials developed from natural ingredients
7. Extract municipal / construction waste for recycling
8. Recycling motor lube oil

Regenerate nature

1. Solar power on buildings and in communities
2. Solar power-utility scale
3. Green Hydrogen pilot project
4. Innovation and usage for renewable fuel such as biodiesel, hydrogen, and electricity

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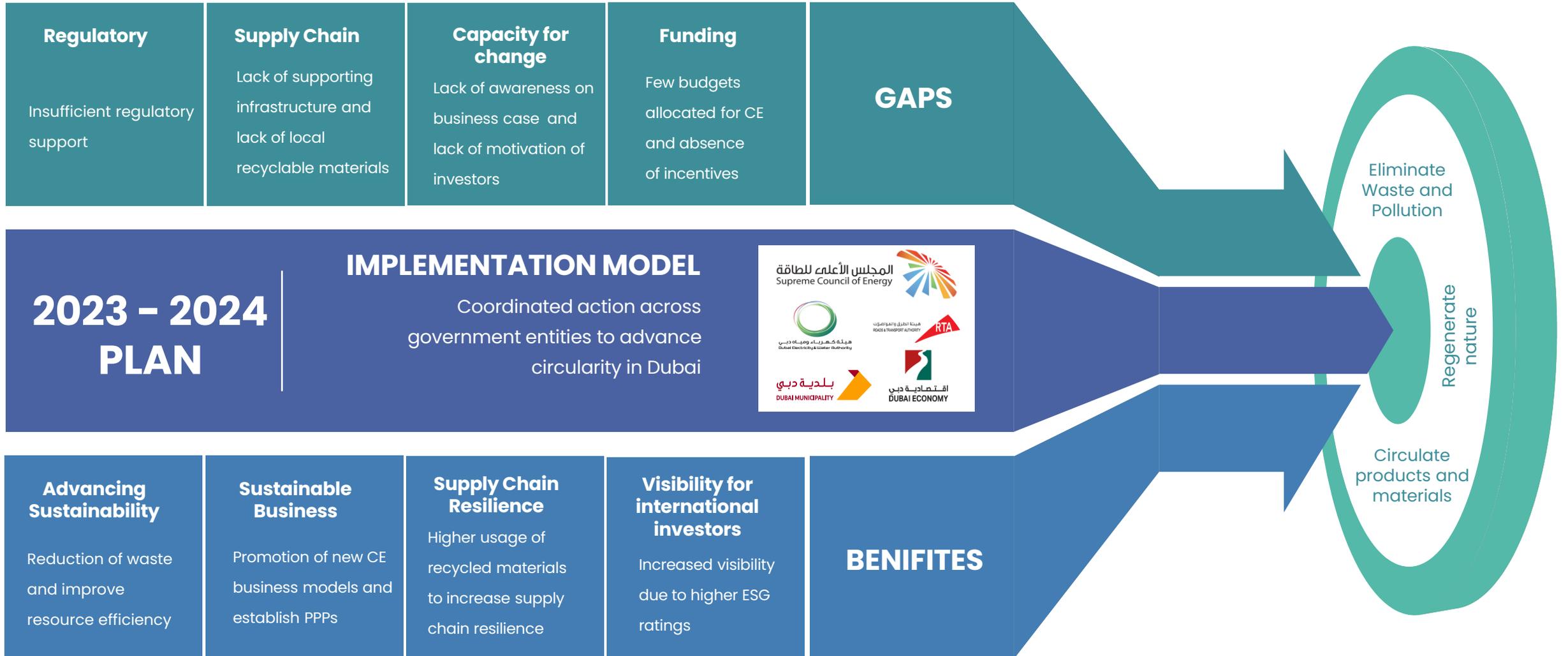
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Coordinated action across Dubai government entities is required to unlock the benefits of Circular Economy



Plan developed based on engagement with CE Committee members and industry stakeholders

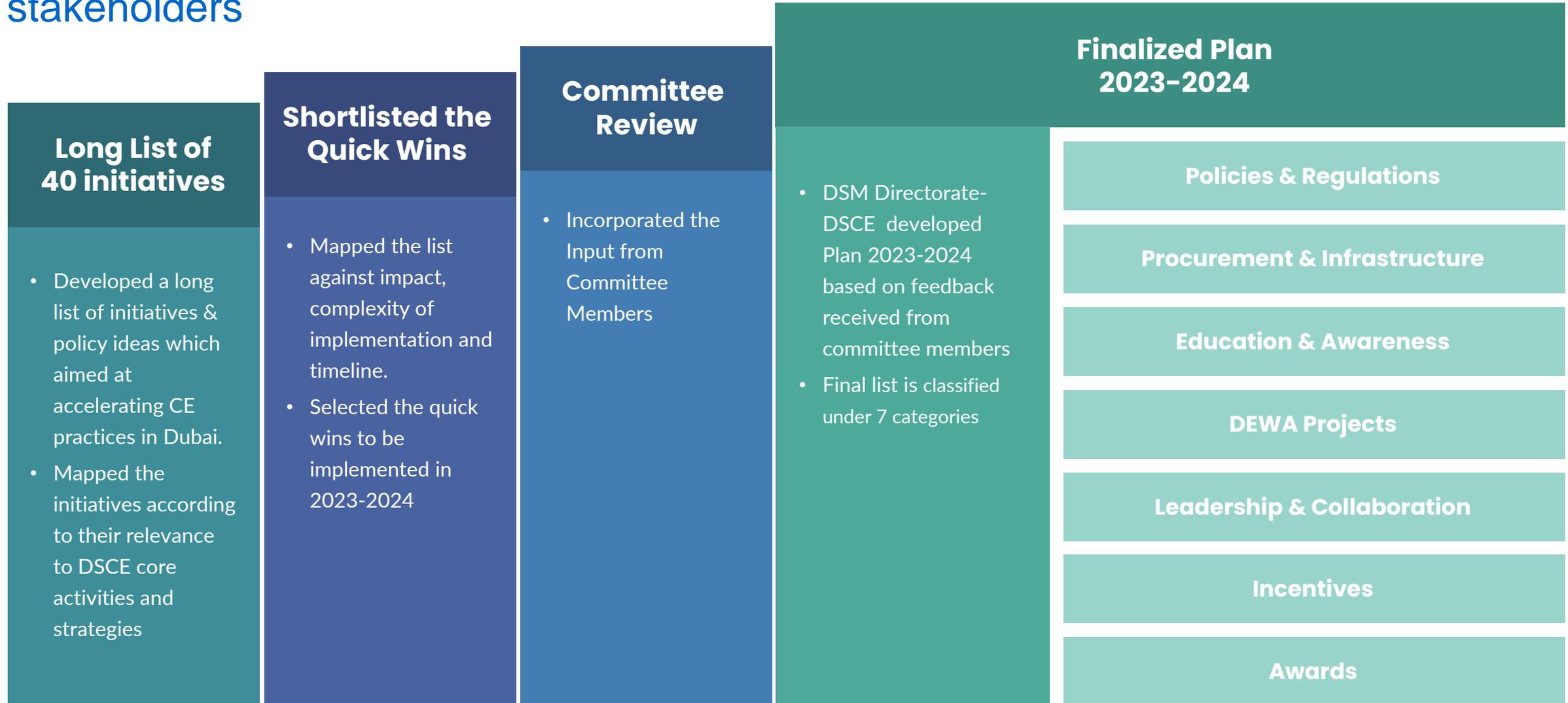




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Circular Economy Companies Data Bank (1/2)

The following is a list of key entities and examples about their involvement in circularity. The bank is an effort to create and grow a database of companies involved in CE in Dubai/UAE.

Government

1. [UAE Ministry of Climate Change & Environment](#):
2. [Dubai Municipality](#)
3. [Dubai Department of Economy and Tourism](#):
4. [Dubai Electricity and Water Authority \(DEWA\)](#):
5. [Roads & Transport Authority \(RTA\)](#):
6. [Dubai Science Park](#):
7. [Mohammad Bin Rashid Housing Establishment](#)
8. [Tadweer](#)

Construction and Real-estate Development

1. [EMAAR](#): Utilize recycled materials and alternatives to cements, significant waste diversion from landfill, energy centered maintenance...
2. [Diamond developers \(The Sustainable City\)](#): Comprehensive circularity operations in food, energy, waste, and products
3. [Dubai Retail \(subsidiaries of Dubai Holding\)](#): Reduce food and energy wastage
4. [Jumeirah](#): Reduce use of plastic and increase energy efficiency with more renewable sources involved
5. [Masdar](#): Large scale renewable energy usage , multiple waste-to-energy projects and green cities
6. [Majid Al Futtaim](#): Phase-out single use plastic and by 2025 and ensure main building elements undergo LCA assessment for sustainable operations
7. [Consolidated Contractors Company](#): Efficient energy, water, material and waste management during construction
8. [Zublin Construction](#): Reduce material usage and increase energy efficiency during construction

Waste and Facility Management

1. [Consent](#): Waste and recycling services
2. [Emirates Environment Technology](#): Environmental resource recovery and environmental technologies
3. [Industrium](#): Packaging services and integrated solutions
4. [Veolia \(Suez\)](#): Water, energy and waste management and technologies
5. [Dulso](#): Integrated environment management solutions
6. [Imdaad](#): Waste management
8. [Enviroserve](#): Integrated waste recycling hub
9. [Northladder](#): Digital selling platform for used electronics paired with convenient last-mile logistics
10. [Take my junk](#): Junk removal service

Circular Economy Companies Data Bank (2/2)

Engineering and Manufacturing

1. [BASF](#): Contributing to CE with new feedstock, new material cycles, and new business models
2. [Emirates Global Aluminum](#): Recycle majority of aluminum production waste and ultimately aiming for zero waste sent for landfill
3. [Emirates National Oil Company \(ENOC\)](#): Reduce and recycle materials such as plastic and minimize dispose of waste.
4. [Emdad](#): Integrated energy solutions and energy efficiency
5. [Saint-Gobain](#): Recycle and reuse gypsum boards
6. [Seacor Offshore Abu Dhabi](#): Utilize hybrid power solutions and green technologies to increase energy efficiency
7. [Fuse](#): Convert traditional and classic cars into electric ones

Consumer Goods and Farming

1. [IKEA](#): Products with circular capabilities, aiming to use only renewable or recycled materials by 2030.
2. [Unilever](#): Reducing materials from the start, making them easier to recycle or reuse, and strive towards waste-free ecosystem.
3. [HP Enterprise](#): Reduce materials usage and utilize recycled materials
4. [Mud Jeans](#): Organic cotton and recycled cotton are main materials for fabric in order to achieve high circularity.
5. [DGrade](#): Produce clothes with recycled materials
6. [Adidas](#): Sportswear production through recycling and materials from natural ingredients
7. [Masdar farms](#): Vertical farming
8. [Badia farms](#): Indoor vertical farming

Environmental Groups, NGOs, and Academia

1. [Emirates Nature-WWF](#): Launch campaign to reduce use of plastic waste
2. [Emirates Environment Group \(EEG\)](#): Operate Initiatives for recycling materials such as glass and mobile phone, and CE awareness-building programs
3. [Clean Energy Business Council](#): Platform for clean energy research and CE transition
4. [Emirates Green Building Council \(GBC\)](#): Research, technical, and education programs to increase energy efficiency and retrofits in buildings
5. [Herriot-Watt University in Dubai](#): Research in sustainability and CE

Social Enterprises, Professional Services, Internet Platforms

1. [Yes4Us / Ecobee](#): Environmental education and training programs to promote CE awareness
2. [Sacred groves](#): Conservation of forests and mangroves by fund-raising and supported by blockchain technology
3. [Dvk consultants](#): Consult for energy and environment sector clients
4. [Lockton](#): Provide insurance brokerage in energy and power sector
5. [Udrive](#): Car sharing and rental services to increase utilization level of vehicles
6. [Dubizzle](#): Provides platform for sale of second-hand electronics

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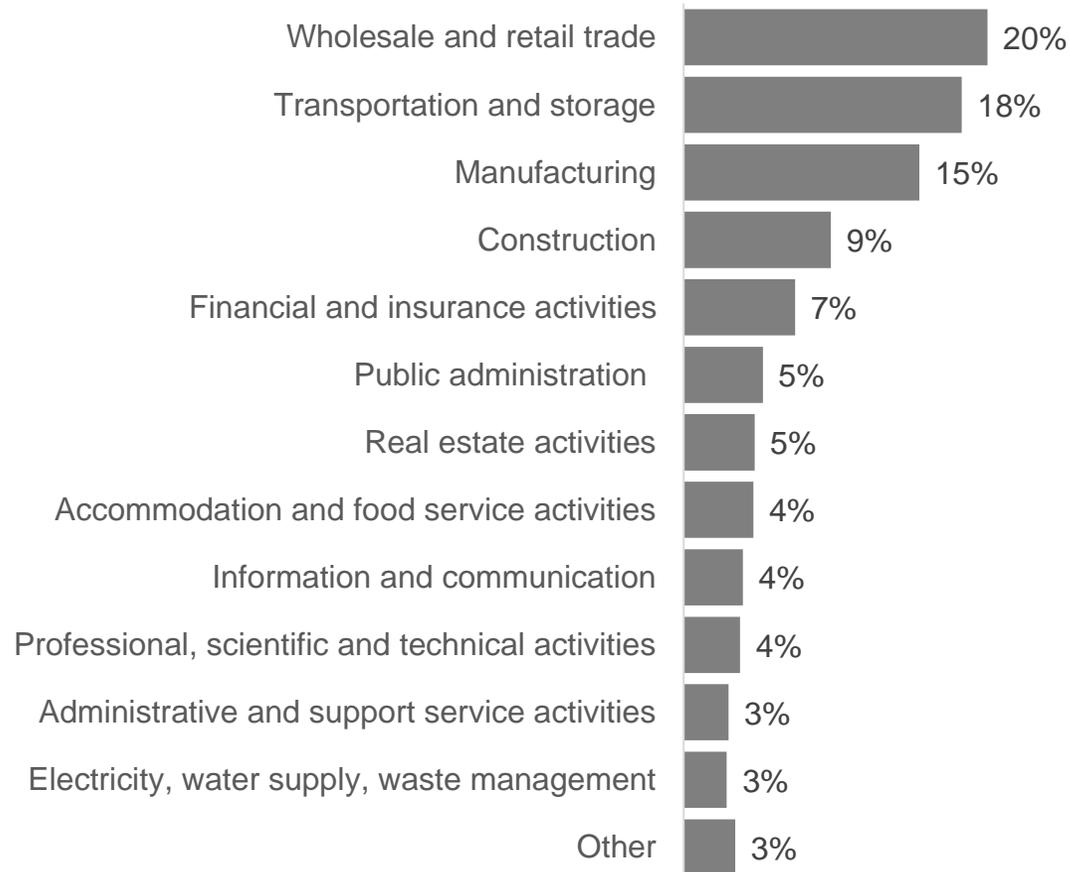
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Appendix: Overview of key economic, energy and GHG emissions indicators (2019)

Components of Dubai economic output (GDP), 2019



Source: Dubai statistics center

Components of Dubai electricity & water consumption

Sector	Electricity (GWh)	Water (MIG)
Commercial	49%	27%
Residential	29%	63%
Industrial	6%	3%
Power & aux	8%	
Others*	8%	7%

Source: DEWA annual report, 2019

Components of Dubai GHG emissions inventory

Component	% of total GHG emissions
Power & water	45%
Manufacturing	24%
Road transportation	23%
Waste	8%

Source: Carbon abatement strategy status overview, 2019



Appendix: Map of all engaged entities

