Circular Economy in Cities of the MENA Region:

Prospects and Challenges for Material Circularity

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About FES Regional Climate and Energy Project MENA
The Regional Climate and Energy Project MENA advocates for an energy transition into renewable energy and energy efficiency. It continues to search for just transition solutions in the energy sector that ensure both, the protection of the planet and the people.

As the MENA region is one of the most affected areas by climate change, we contribute to policy advising, research, and advocacy in the areas of climate change policy, energy transition, and urban sustainability, with the support of research institutions, civil society organizations, and other partners in the region and in Europe.

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1. Background

Global levels of material extraction and consumption have been rising exponentially since the beginning of the twentieth century. In 2018, the amount of raw materials extracted was estimated at 92 billion tonnes. It is predicted that this number would increase to 177 billion tonnes by 2050 based on the current trajectory, mainly as a result of the linear economy model of production and consumption presently adopted in the global economy. It is estimated that 91.4% of all materials are used only once (Circle Economy, 2021).

The linear economy, where raw materials are mined and processed into products that are used then discarded, is occasionally described as a 'take - make - use - dispose' model. It not only exhausts scarce resources, but its manufacturing processes are also responsible for increased levels of energy use, increased emission of greenhouse gases (GHG) due to reliance on fossil fuels, the generation of significant volumes of solid waste, and air, water, and soil pollution that endanger ecosystems vital to biodiversity and human existence.

The current levels of consumption and associated materials extraction in many locations exceed human needs, which, in turn, risk transgressing Earth's planetary boundaries. These boundaries indicate the "safe operating space" for humanity (Stockholm Resilience Centre), and some of them, such as biosphere integrity, biogeochemical flows, climate change, and land system change, are already experiencing mounting pressure. These changes are endangering the ecosystems and the human communities they support.

Applying a circular approach to the global economy and its production and consumption processes is an attempt to alleviate pressure on raw materials, energy, and water resources and to minimise waste generation, pollution, and carbon emissions. It is offered as a solution to address several failures resulting

from the linear model. According to the Ellen MacArthur Foundation (2019), the circular economy aims to redefine growth and to build economic, natural, and social capital by gradually decoupling economic activity from the consumption of finite resources (see Figure 1). It encourages creating closed loops of materials, water, nutrients, and energy to mimic natural cycles while also offering economic and social benefits, particularly important in low-income countries.

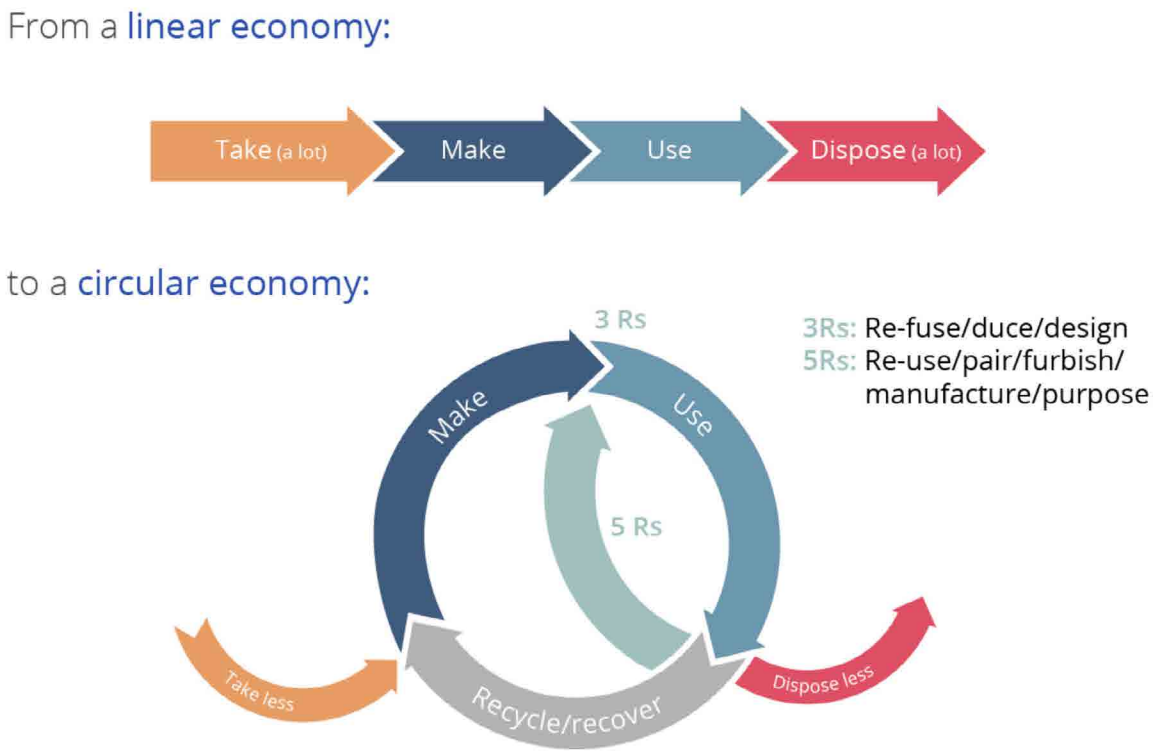

Figure 1 Linear Economy vs Circular Economy, (Source: Byström, 2018)

A circular economy is built on three main principles: designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (Arup and Ellen MacArthur Foundation, 2020). A circular economy also requires that products are produced and consumed in a non-polluting, waste-free, resource efficient, low-carbon, and socially inclusive manner.

The principles of the circular economy can apply to all sectors and activities of any given economy. However, material circularity is probably its main application. It requires a complete reassessment of products, assets, and

services in such a manner that they become durable, reusable, repairable, and recyclable.

This study focuses on the circularity of materials, especially in the context of cities in the Middle East and North Africa (MENA) region. It covers the current state of waste management in the region and the supporting policy context as well as the opportunities available for the countries and cities of the region to raise their ambitions. It also highlights the recommended next steps to be taken to transition into a circular economy.

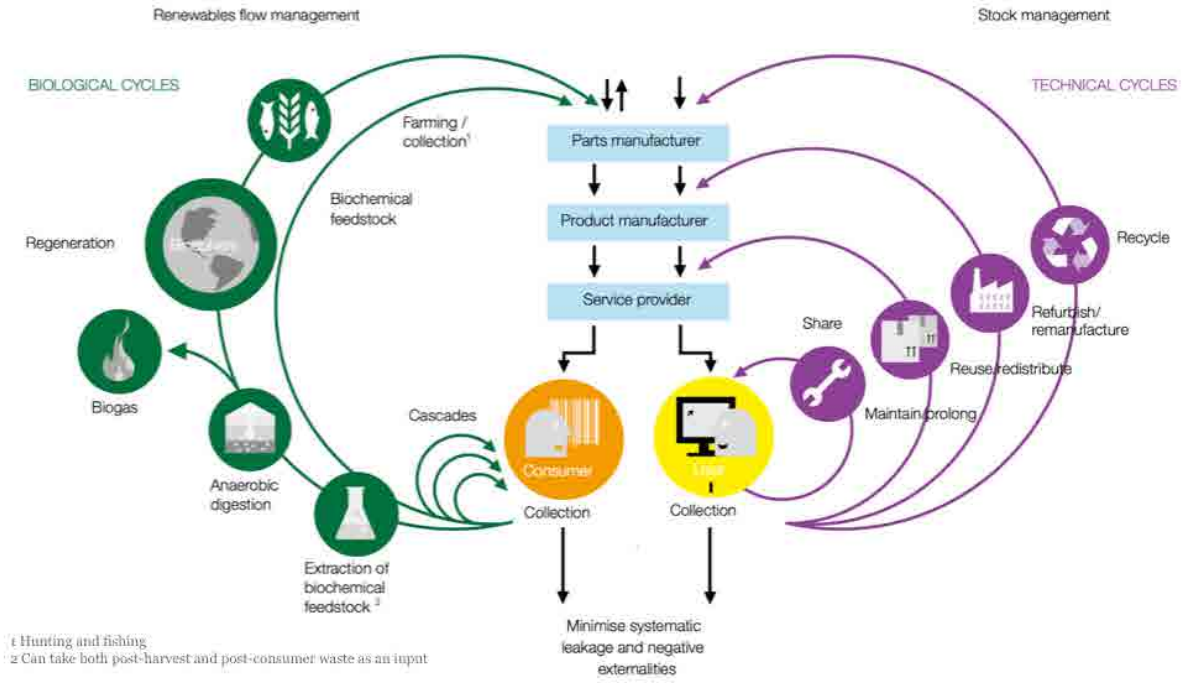

Figure 2 A system diagram illustrating the flow of technical and biological materials, (Source: Ellen MacArthur Foundation, 2019)

2. The State of Waste Management in the MENA Region

Seeing as the MENA region consists of developing countries at different stages of development, it could benefit from a more circular approach to economic development. This approach could address the region's current struggles with basic waste management issues, including solid waste and pollution. It could also tackle the region's scarcity in natural resources and high dependency on imported materials.

The MENA region can be divided into three subregions: the Mashreq (Iraq, Jordan, Lebanon, Syria, Palestine (West Bank and Gaza), and Israel); North Africa (Egypt, Morocco, Algeria, Libya, and Tunisia); and the Gulf Cooperation Council (GCC) countries (Saudi Arabia, the United Arab Emirates (UAE), Qatar, Oman, Kuwait, and Bahrain). In addition, the region includes Sudan and Yemen, which are often classified as Least Developed Countries.

By examining the state of Municipal Solid Waste (MSW) management in these three subregions, a clear distinction becomes apparent between the GCC countries on the one hand and the Mashreq and North African countries on the other. This distinction is most evident when comparing between solid waste generation rates per capita across the region. With an average of 1.5 kilograms of solid waste generation per person per day in the GCC, waste generation is more than double that of the average Mashreq and North Africa resident, which is estimated at 0.7 kilograms. One exception to this difference is Israel, which at 1.77 kilograms of solid waste per capita per day, is closer to the GCC than the Mashreq (The World Bank, 2018). This disparity is often attributed to higher levels of consumption.

However, the distinction between the GCC and Mashreq and North Africa is less pronounced in regard to the composition of waste. The largest component of MSW

in the MENA region consists of organic food waste, representing approximately 55% of all total MSW, followed by paper and cardboard (13%) and plastics (12%). In addition, around 10% of overall plastics, metals (3%), woods (1%), and glass (3%) can all be recycled to a certain extent with proper segregation and suitable material recovery facilities (The World Bank, 2018). The financial feasibility, however, ultimately depends on the quantities and quality of segregated waste material.

In fact, recovery of recyclable solid waste in the MENA region remains limited, with overall recycling rates estimated at an average of 9% across the region. Israel currently holds the highest recycling rate at 25% followed by the UAE at 20%. This low rate of recycling is mostly attributed to the lack of mandatory waste segregation and extremely limited internalisation of waste collection and waste management costs.[1]

Indeed, in the majority of the region's countries, governments bear most of the costs of solid waste collection and management. There are only a few exceptions such as Algeria, Egypt, Jordan, Syria, Palestine, and Morocco where governments have attempted to recover the costs of waste collection and management through municipal fees. While the majority of the region's countries have an appointed government entity responsible for the enforcement of waste regulations, they remain limited with regard to requirements for segregation, recycling, and overall waste minimisation.

The quality of waste infrastructure is another key regional challenge. Around 53% of overall waste generated is discarded in open dumps. Another 25% is sent to controlled or sanitary landfills, and only 9% are recycled. Despite organic waste representing more than half of all solid waste, only 4% of total MSW generated is composted across the region.

This leads to environmental health risks, which can have long term impacts on exposed communities if unmanaged. For example, of the 459 tons disposed of daily in open dumps in Lebanon in 2014, it is estimated that 290 tons were open-burned, while 169 tons were deposited into existing dumps (MOEL/EU/UNDP, 2014).

1 Global Recycling. Waste management in the Arab region: Recycling on trial. https://global-recycling.info/archives/2620

Open-air waste burning became more widespread in the capital, Beirut, following the waste crisis of 2015 (Azzi, 2017). A study performed by Baalbaki et al. (2016) explored the effects of open burning on air quality and public health between October and December 2015. The study indicated that the short-term cancer risk increased by an alarming factor of 20 during the days that waste was being burned.

Waste generation and management are key contributors to an economy's overall carbon footprint, an aspect that countries are increasingly seeking to reduce to mitigate climate change. Biodegradable waste, such as food waste, paper and cardboard, and landscaping waste, all release methane, a potent GHG. Proper organic waste management can mitigate methane generation, while waste reuse and recycling help prevent additional emissions from sourcing and manufacturing raw materials into new products. Recent studies show that methane emissions from waste in the MENA region are expected to exceed 350,000 GgCO2eq by 2050 (Dumble, 2017; Bertolini and Brakez, 2008). This demonstrates how the negative impacts caused by poor waste management and material use include missed economic opportunities, health repercussions on local communities, and hindering the fight against climate change.

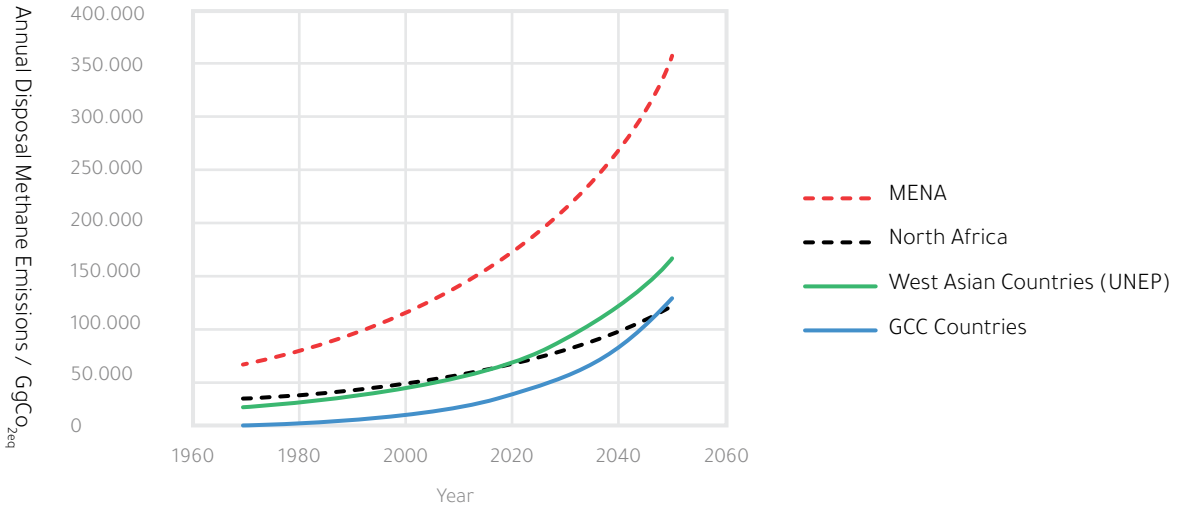

Figure 3 Unmitigated methane emissions from MSW disposal in the MENA region and subregions, (Source: UNEP, 2019 based on Dumble, 2017)

3. Current Efforts

Across the MENA region, there are continuous efforts to improve waste recovery, with a focus on waste to energy recovery. Qatar was the first to explore this approach at a large scale through the development of the Mesaieed waste to energy plant in 2014, which has a capacity to treat 2,300 to 2,500 tonnes a day and an energy generation capacity of 42 MW. More recently, the UAE has announced the construction of several waste to energy plants in Umm Al Quwain, Sharjah, and Dubai. There are also plans for Abu Dhabi to have its own waste to energy plant. Other countries exploring waste to energy include Egypt, Saudi Arabia, and Jordan.

However, large-scale efforts to maximise recovery at the higher end of the value chain of the waste management hierarchy, namely by focusing on reuse and recycling before opting for recovery through incineration, remain limited in the MENA region, with the exception of Saudi Arabia. The Kingdom aims to divert all municipal waste from landfill by 2035 by recycling 81% of it and using the rest to generate energy. It also plans to divert 60% of construction and demolition waste and 85% of hazardous waste. In 2017, Saudi Arabia's Public Investment Fund announced the establishment of the Saudi Recycling Company. The company aims to significantly improve local recycling activities, covering all recyclable materials within the waste portfolio[2]. The UAE has also set ambitious targets, with the Emirate of Sharjah on track to reach 100% by 2022 [3]. In early 2021, the UAE launched its national Circular Economy Policy and formed the Circular Economy Council, which comprises representatives from federal and local government

2 Aguilar, Joey. (2014, September 21). Generating electricity from waste. Gulf Times. https://www.gulf-times.com/story/409221/Generating-electricity-from-waste

3 The United Arab Emirates' Government Portal. Waste-to-energy. https://u.ae/en/information-and-services/environment-and-energy/water-and-energy/types-of-energy-sources/waste-to-energy-

entities as well as the private sector. It aims to develop detailed sectoral plans to implement the country's national circular economy policy.[4]

There is also a noticeable growing interest in Extended Producer Responsibility (EPR) legislation, primarily targeting Waste from Electrical and Electronic Equipment (WEEE). This took the form of a number of voluntary schemes in countries such as Jordan and Egypt. In Jordan, this ultimately found its way into legislation with a newly mandated law (Chaabane, 2021).

Plastic waste is another aspect of waste management currently gaining attention in the region. In 2015, Morocco introduced a ban on plastic bags and is currently developing a draft policy for EPR covering plastics packaging. In addition, the UAE announced plans to establish a polyethylene terephthalate (PET) plastic recycling facility, while Saudi Arabia, Bahrain[5], and Tunisia are attempting to regulate the use of single-use plastic bags and mandate the use of environmentally friendly alternatives (UNEP, 2018).

4 The United Arab Emirates' Government Portal. https://u.ae/#/

5 Bahrain News Agency. (2019, June 12). The Kingdom of Bahrain to ban plastic bags in July. https://cutt.ly/6TeS5UI

Waste Management City Case Study 1: Sharjah, UAE

Bee'ah - A regional success in waste management

Bee'ah was founded in 2007 as a public-private partnership in the Emirate of Sharjah, UAE, and it mainly focused on waste management. It has become a leading waste management company in the region and is credited for Sharjah's exceptional performance in waste management with a 67% diversion rate of waste from landfill.

The company has adopted an integrated approach to waste management, which combines infrastructure development and soft interventions to maximise the reintroduction of waste materials into the local economy.

Bee'ah built the third largest material recovery facility in the world, capable of processing 2,000 tons of waste per day. It also developed a tyre recycling facility, where tyres are recycled into crumb rubber, which is then used to produce playgrounds, children playing areas, and miniature golf courses. Its construction and demolition waste facility treats more than 75% of the emirate's construction and demolition waste. It also includes a compost plant to treat organic and landscaping waste. Its latest infrastructure project consists of delivering the UAE's first waste to energy plant, the power from which it will use to produce green hydrogen.

In addition to its hefty investment in waste management infrastructure, Bee'ah has endeavoured to engage with the community in order to entice a change in behaviours. This has been achieved through programmes such as the Bee'ah School of Environment.

The success of Bee'ah has encouraged several other cities in the region, including Cairo and Riyadh, to contract the company to manage the waste of large areas of their cities. The company has also expanded into air quality management, wastewater management, and energy service provision[6].

6 Bee'ah Headquarters. https://beeah.ae

Waste Management City Case Study 2: Zarqa, Jordan

Project Tadweer - A local pilot for a national policy

Under the umbrella of the Jordanian Ministry of Environment, the municipality of Az-zarqa town embarked on a pilot project, project Tadweer, to implement an EPR scheme, which informed the development of a nation-wide policy.

The main objectives of Project Tadweer, which is supported by the German government, were to increase awareness about the challenges of waste management, improve the community's understanding of the principles of EPR and sustainable waste management, and implement waste segregation amongst the community and businesses in order to improve recycling rates.

The project engaged representatives from the private sector as well as representatives from the relevant national and local government entities and non-governmental organisations (NGOs). Private sector companies notably included food and beverage companies, waste management service providers, packaging importers, bottling companies, and technical consultancy firms. Educational service providers were also part of the pilot project, which began with ten schools and expanded to the broader community and commercial activities of the town. This was one of two main pilots in Jordan which helped inform the newly launched national EPR scheme.[7]

7 The Jordanian Association for Recycling the Consumer Packaging Material. (2020). http://www.jordan-epr.org

Waste Management City Case Study 3: Fez, Morocco

Managing Organic Waste

Over the past few years, the city of Fez in Morocco has been actively striving to close the loop of its waste management practices and to reduce the volumes of waste sent to its landfill every year, estimated in 2016 at 350,582 tons (Saghir and Naimi, 2019). To optimise recovery of its waste, it developed an automatic sorting facility for the treatment of waste, which covers an area of 6 hectares and has a capacity of 300 tons of waste per day expandable to 500 tons, and an estimated recovery rate of 28.2%. The MAD 54 million investment required was funded through a partnership between the Ozone Environment & Services Group, the municipality of Fez, and the Moroccan Foreign Trade Bank (BMCE).

Since 2015, organic waste has been used to produce methane, which is used to generate electricity for the municipality of Fez using a biogas power station. The city currently produces more than 1 megawatt from its organic waste, covering nearly 30% of public lighting energy demand. The electricity generation capacity is planned to reach 5 MW to produce 43,300 MWh and to recover 26 million m^3 of methane each year and to process 800 tonnes of household waste per day.

In 2020, a dedicated research platform for biogas and biomass was opened in the city of Fez. According to the Institute for Research in Solar and Renewable Energies (IRESEN), this research platform will house laboratories that research the production of biogas from both household and agricultural organic waste with new technologies adapted to the Moroccan context.

This focus on organic waste is particularly relevant, given that it represents 75% of all urban household waste and 85% of rural household waste, according to IRESEN estimates. As mentioned in the Ministry of Energy's statement in 2019, biomass projects could generate around 7,600 to 10,310 jobs and promote the reduction of 6.2 to 8.5 million tonnes of CO^2 of GHG emissions (Observatory Climate Chance, 2020).

4. Raising The Ambition: Waste Management to Material Circularity

In recent years, the conventional ambitions of diverting waste away from landfill and toward reuse, recycling, composting, and energy generation have been overridden by the advent of circular economy, especially as it relates to material circularity. Waste management - traditionally a public health issue, with some material recovery measures, such as recycling and composting, associated with it - has, so far, played a limited role in reducing virgin material use and improving resource efficiency. Nevertheless, material circularity promises to dramatically reduce virgin material use and the associated environmental footprint of its extraction and manufacturing.

By advocating a major restructuring of how materials are manufactured, consumed, and disposed of from a linear model into a more circular economy, material circularity aims to redesign entire supply chains to create products that can be reused, refurbished, remanufactured, or recycled. In this way, material circularity offers an opportunity to revisit and reduce current demand for materials. It also helps increase systems' resilience by reducing stresses caused by materials shortages as well as reducing import dependency. A case in point is the Netherland's aim to reduce its material imports by applying material circularity (see Box 5).

Material circularity in cities, however, does not only apply to consumable products, but it also applies to fixed assets and services, such as delivery services. Its introduction supports the retrofitting and reuse of existing buildings instead of constructing new buildings. It also examines the sustainability of current models of urban development that abandon existing buildings in favour of buildings on virgin land using raw materials.

Material circularity in cities supports the design and construction of adaptable buildings that can be repurposed and encourages the adoption of efficient construction techniques whereby building components can be maintained and renewed when needed. It also limits virgin material use.

Seeing as some countries of the MENA region continue to struggle to transition from disposing waste into open dumps towards landfills, a complete reassessment of the way products are made and a complete transformation of material and waste flows may appear out of reach. However, pursuing such a goal is strengthened, if waste were to be conceived as a precious local resource.

Regional Circular Economy Case Study: The European Union (EU)

The EU has risen as an innovator in its ambition to transition to a circular economy, mainly as a means to improve its economic competitiveness and to balance economic growth with environmental protection. The European Commission, the executive arm of the EU, adopted a new Circular Economy Action Plan in 2020, which is an essential cornerstone of its Green New Deal aiming to reach carbon neutrality by 2050. The Action Plan consists of three main objectives:

1. Designing circular products: pursuing this objective will improve product durability, reusability, and reparability, increase recycled content in products, enabling remanufacturing and high-quality recycling, restrict single-use products, and counter premature obsolescence, as well as ban the destruction of unsold durable goods and incentivise product-as-a-service.
2. Empowering consumers and public buyers: this goal focuses on providing information regarding products' lifespan and availability of repair services, spare parts, and repair manuals. It also establishes a new 'right to repair'. This is coupled with strengthening consumer protection against greenwashing and premature obsolescence as well as setting minimum requirements for sustainability labels/logos.
3. Circularity in production processes: this aim concentrates on facilitating industrial symbiosis (whereby the wastes of a given industry are used as input resources into another), supporting the sustainable and circular bio-based sector, and promoting the use of digital technologies for tracking, tracing, and mapping of resources.

The Action Plan also places a large of emphasis on creating local markets for the secondary life of waste products.[8]

8 European Commission. Circular economy action plan, https://ec.europa.eu/environment/strategy/circular-economy-action-plan_fr

Country Circular Economy Case Study: The Netherlands

The Netherlands is one of the prominent countries known for adopting a successful circular economy. In 2020, the Dutch economy was estimated to be 24.5% circular (Circle Economy, 2020), almost three times the global economy, which is estimated to be 8.6% circular (Circle Economy, 2021). In addition to its commitments under the EU's Circular Economy Action Plan, the Netherlands has developed its own government-wide Programme for a Circular Economy for 2050. The Programme's interim objective is to achieve a 50% reduction by 2030 in the use of primary raw materials, including minerals, fossil, and metals (Government of the Netherlands, 2016).

The Netherlands Environmental Assessment Agency (PBL) estimates that the Netherlands has 85,000 activities involving 420,000 jobs contributing to the circular economy, out of which about 1,500 innovative initiatives. Although the country had a high baseline waste generation per person, it has continued to reduce its per capita waste production and improve its municipal recycling rate and circular material use rate. There are also 14 EPR schemes in the Netherlands covering five sectors (European Sustainable Business Federation, 2019).

A City in Focus: Amsterdam

A further aspect that indicates how the Netherlands is one of the world's leading countries on circular economy measures is the 2015 Sustainability Amsterdam Agenda. The Agenda sets an ambition for the city to become a global leader in the transition towards a circular economy.

Amsterdam was the first city to perform a comprehensive scan of the city's material flow and economic benefits of becoming more circular. The scan focused on two value chains: construction and Biomass and Food. The scan estimated that in the construction sector alone, material savings of 500,000 tonnes are possible, a third of annual material imports. This would potentially translate into a saving of half a million tonnes of carbon dioxide every year, roughly 2.5% of the city's current annual emissions. So far, the city has created a roadmap on circular buildings, applied circular criteria successfully to four development tenders and over 70 projects, developed networks for partnerships and training for the supply chain, commissioned research, and established 'living labs' (Climate-KIC and C40, 2018).

The more recent Amsterdam Circular 2020-2025 Strategy builds on the aforementioned and focuses on three value chains:

- Food & Organic Waste Streams value chain: this value chain concentrates on establishing short food chains, healthy and sustainable food consumption, and high-quality processing of organic waste streams.

- Consumer Goods value chain: this value chain aims to develop a circular procurement policy and create an efficient infrastructure for sharing, repairing, reusing, and reprocessing end-of-life products.

- Built Environment value chain: the focus in this area is on reducing the use of primary raw materials through circular development at the city and district levels, circular municipal procurement policies, and circular upgrading of the city's existing built environment (City of Amsterdam, 2020).

5. Material Circularity: A Clear Case for the MENA Region

In the MENA region, there is a growing need for resource optimisation, given the scarcity of natural resources and the high reliance on imports. In 2019, a study performed by the consultancy firm 'Strategy&' estimated that GCC countries alone could save up to USD 138 billion by 2030 and reduce emissions by 150 million tons of CO2e as a result of a circular approach to their economies (Bejjani et al., 2019).This highlights the dual opportunity of applying circularity in the region; an opportunity for financial gain as well as reduced environmental footprint, both of which are of prime importance, especially in the post-coronavirus disease 2019 (COVID-19) era.

Indeed, COVID-19 has negatively affected the MENA region's economies. The World Bank further expects the region's economy to grow by only 2.4% during 2021, which is below the average regional growth rate and only half the recovery rate the region experienced following the 2008 economic crisis (World Bank 2021).

Most countries in the MENA region have set or are in the process of setting their recovery plans and are seizing opportunities to make local economies more resilient to shocks. This entails optimising the use of available resources and reducing dependence on external resources, both of which are key objectives of applying material circularity and the wider circular economy principles.

With around 70% of total solid municipal waste available for reuse in an effective manner, including organic food and landscaping waste, quick wins become possible. An analysis carried out by 'Strategy&' estimates that the GCC countries can generate up to USD 6 billion from improving their recycling efforts, if they can increase their recycling rates from the current average of

10% to 40%[9]. This is particularly timely in light of the economic shock caused by COVID-19 that has affected the entire world.

There are, however, growing pressures on all countries to increase their climate commitments and reduce their carbon emission. All signatories to the Paris Agreement have committed to submit increasingly ambitious emissions reduction targets every five years in order to reach a global warming limit of 1.5°C (Paris Agreement, 2015). Adopting material circularity could play a major role in meeting emissions reduction targets. A study by Circle Economy suggests that circular economy scenarios have the potential to reduce resource extraction by 28% and to cut global carbon emissions by 39% (Circle Economy, 2021).

By designing out waste, the material circularity reduces both the use of raw materials and the carbon emissions associated with extracting, manufacturing, and transporting them. It also decreases the emissions associated with collection, transportation, and processing of waste. For example, if 'refill' containers were to be applied to all personal care and home cleaning products, this could lead to 80-85% reduction in packaging and transport emissions compared to single-use bottles (Ellen MacArthur Foundation, 2019).

Material circularity also has the potential to increase resilience to the physical effects of climate change. For instance, "in keeping materials in use, businesses can decouple economic activity from the consumption of raw materials vulnerable to climate risks" (Ellen MacArthur Foundation, 2019) and the resulting disruption to supply chains. This could build greater robustness in an import-dependent region, such as the MENA region, that possesses limited natural resources.

9 Ozeir, F., Rahimi, S., Moussalli, J., & Gupta, A. (2020). The $6 billion GCC recycling opportunity. Strategy&. https://www.strategyand.pwc.com/m1/en/articles/2020/the-six-dollar-billion-gcc-recycling-opportunity.html

The Way Forward

The transition toward a circular economy and material circularity requires changes to legislation and practices at a sectoral level and occasionally at an activity level.

In order for a transition to happen, there are several steps involved, namely the identification of the change needed, the development of the business case for such change, designing the change whether through policy or alterations to processes and materials, and finally implementation.

From a government perspective, the first step would consist of performing a screening of the city's (or country's) services and economic activities in order to identify the sectors which offer the biggest potential for waste minimisation and the regeneration of optimised materials, assets, and natural systems (Byström, 2018). Performing an urban metabolism mapping, consisting of the analysis of the flow of materials and energy within a city (Pincetl et al., 2012), would provide a holistic and detailed overview of these opportunities (Byström, 2018). Cities can, however, still identify many of the key opportunities without needing to perform an urban metabolism mapping, provided there is a good common understanding of the principles of circular economy, good quality data, and strong stakeholder engagement between the concerned government departments, the private sector, and the civil society. Civil Society Organisations (CSOs) can be instrumental in promoting the circular economy in local communities and, in some cases, can be more effective than public sector actions. Through a variety of actions such as advocacy campaigns and local training programs (e.g. on repairing and reuse), CSOs can help shift local consumers to ambassadors of - and contributors to - the circular economy. Such convergence of a broad set of actors concerned about the management of common resources could prove crucial in transitioning the current economic models towards circularity.

In order to optimise the impact of initiatives taken toward circularity, it is best to initially concentrate on the key opportunities with the highest impact potential rather than aiming to implement circularity in all areas of the economy. The

sectors most commonly targeted include construction, food and beverages, trade, electric and electronic equipment, and textiles (Byström, 2018). In urban settings, construction is linked to bigger challenges. This includes the need for a planning system that minimises the demand for new real estate and infrastructure as well as building codes and a real estate sector that encourages the development of low carbon and modular buildings. These buildings are designed for disassembly or repurposing, thereby acting as material banks for the city (Byström, 2018).

Given the complexity of the current economies of the MENA countries, governments are no longer able to lead alone in identifying the opportunities and challenges to transitioning toward a circular economy. Therefore, it is imperative that the private sector becomes more proactive in highlighting these opportunities. However, in order to enable this, governments need to provide clear signals that it is transitioning in the direction of a circular economy. As well as opening the doors for a continuous dialogue with the private sector, the basic interventions governments can introduce to move towards a circular economy would be imposing waste fees and other utility fees, such as water and electricity, that aim to recover costs and basic EPR policies.

Such environmental levies should ideally be structured in slab tariffs so as to incentivise reduction, reuse, and recycling over disposal (Byström, 2018). Governments can also use their purchasing power to catalyse a transition toward circularity in their local markets and supply chains. This would then drive all economic sectors as well as individual citizens to become more engaged in optimising the use of resources, at which point the importance of the broader community becomes key in transitioning towards circularity. Their buy-in as the main beneficiaries of the public policies is necessary to ensure effective implementation of the adopted policies and initiatives. Moreover, they are prompted to preserve the public services that they use and benefit from. In addition to the role of consumers, CSOs can also complement the plans and roles of public authorities and the private sector.

The enforcement of these measures by the government would provide a clear signal to the private sector about the willingness to transition into a more circular economy. This would prompt the private sector to identify the optimal circular opportunities in their relevant economic activity by determining the environmental, social, and economic levers and impacts. These assessments and ensuing recommendations would, in turn, become a crucial input into drafting the supporting policies by the government.

As such, a critical element underlying the successful transition towards circularity is a strong partnership between the public and private sector. This relationship should be supported by policies and regulations that encourage circularity and that are backed by the broader community. To achieve this, governments need to adopt an open-dialogue with the private sector and broader players such as academia and the NGOs, while the private sector and supporters of circularity must be proactive in gathering the supporting data and developing the relevant cases for change.

It is evident that the MENA region is displaying growing interest in the benefits the circular economy has to offer, based on the scattered initiatives executed and planned around the region. However, the integration of such initiatives into a comprehensive approach for material circularity that implements the principles of the circular economy and engages all stakeholders is yet to materialize. Like the UAE which has already embarked on this journey, the countries and cities of the region need to reassess their economy to realign it with the principles of the circular economy to reap its full benefits.

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