

Putting GCC cities in the loop

Sustainable growth in
a circular economy

Ideation Center insight

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Executive summary

Over the course of a single generation, the Gulf Cooperation Council (GCC) countries¹ have experienced rapid economic development and population growth. This has placed great pressure on the prevalent linear economic model of “take, make, use, waste.” The region is depleting its resources at an accelerated rate, whilst generating unprecedented waste and emissions, to the detriment of the region economically, environmentally, and socially.

GCC countries have started to explore sustainable solutions, such as seeking alternative sources of energy, curbing excessive consumption of resources, and expanding recycling efforts. However, reversing the current pattern of development requires a holistic approach.

The region must therefore adopt the concept of the circular economy, establishing a robust framework for sustainable growth. This involves creating closed-loop material cycles across the production and consumption value chain, and treating waste as leakage of value to be avoided.

The Ideation Center has defined a circular economy framework, governed by three principles: optimizing the consumption of finite resources, maximizing product utilization, and recovering by-products and waste. Given the huge expansion of urban areas and plans for mega-cities in the GCC, the journey should start with cities, focusing on the built environment, transportation, and households.

The GCC can save almost US\$138 billion by 2030 with this circular model, corresponding to nearly 1 percent of the region’s cumulative GDP between 2020 and 2030. It can also reduce emissions by 150 million tons, virtually the total CO₂ emissions of the Netherlands in 2015.²

GCC governments should create a national framework, establishing a strategic council to guide the transition to a circular economy. They should also educate their populations about the environmental impact of their consumption habits. Finally, governments themselves should lead by example, changing how they procure and consume assets.

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Circular economy models ensure sustainability and resource efficiency

As GCC countries take their place among the world's developed countries, they now face some of the same challenges that result from growth. Their economic development has gone hand-in-hand with a rapidly growing population, mostly concentrated in cities. At the same time, their economies still depend heavily on natural resources, the supply of which is finite. Hence, they need to move quickly to an alternative model that would bring about sustainability and efficiency in the use of resources.

The one-way linear production model is bound to end

To maintain their growth rate, GCC countries need to move away from the current linear model described as “take, make, use, waste” (see Exhibit 1). The linear economy model, the practice of choice since the Industrial Revolution, is a one-way production approach that places a strain on finite resources and introduces large amounts of waste. There are several

weaknesses with this model: material use during the production process is not optimized, product life is not maximized, and waste from the production and post-consumption phases is not reused.

Under the linear model, many natural resources that are vital for today's industries face the prospect of depletion. For example, there are eight metals at high risk of depletion in the near future that are deemed by the European Union (EU) to be essential for such technologies as electric vehicles, wind and solar energy, and lighting. These metals include gallium, which is used for LCD and LED screens and solar-photovoltaic panels.³

Companies and economies that rely on such scarce natural resources are more exposed to price volatility caused by disruptions in supply. The results are economic risks for countries and reduced economic growth and competitiveness for companies.

Natural resources in the GCC are likewise not immune to depletion, as current consumption practices are unsustainable. The region's households are responsible for the highest consumption rates of electricity in the

Exhibit 1: The one-way linear production model introduced “waste” and is bound to end



Source: Strategy&

world, while their gasoline consumption per capita compares to that of North America, the region with the most intensive usage of gasoline (see Exhibit 2).

Groundwater is also being pumped extensively to meet increasing agricultural and domestic demand. Both Kuwait and Saudi Arabia have among the highest water consumption rates in the world, reaching more than 300 liters per capita per day.⁴ A study by the World Resource Institute measured the ratio of water withdrawals to water supply for each country. The GCC states constitute six out of the nine countries that were predicted to be “extremely highly stressed” in terms of water by 2040.⁵

The linear model generates waste that has negative effects on economies, the environment, and people. Waste includes discarded or unused materials, as well as emissions. According to the World Bank, the total municipal solid waste generated globally in 2012 was

1.3 billion tons, and could reach 2.2 billion tons per year by 2025.⁶ The International Energy Agency reported that global energy-related carbon emissions rose to a record level of 32.5 gigatons in 2017, due to higher energy demand and the slowing of energy-efficiency improvements.⁷ The carbon footprint of the GCC is amongst the largest in the world, with five of the GCC countries ranking in the top 10 (out of 142 countries) in 2015 when measured on a per capita basis.⁸

Total waste in the region is expected to increase from 94 million tons in 2015 to 120 million tons by 2020,⁹ and this rise will have material consequences. Municipalities are not equipped to handle this level of waste generation through the existing landfill strategies. Recycling rates range from 10 percent in Saudi Arabia¹⁰ to close to 30 percent in Abu Dhabi in 2016,¹¹ much lower than the EU average of 46 percent in 2016.¹²

Exhibit 2: GCC countries have some of the most intensive usage of electricity for households and gas for transportation

	Kuwait	Saudi Arabia	UAE	
 Electricity consumption, 2016	MWh per household per year	40.0	24.0	18.0
	Global rank	1st	3rd	4th
 Gasoline consumption, 2016	Liter per person per day	2.8	2.5	2.3
	Global rank	3rd	4th	6th

Source: Enerdata; World Bank; Strategy& analysis

Sustaining resources through a circular economy model

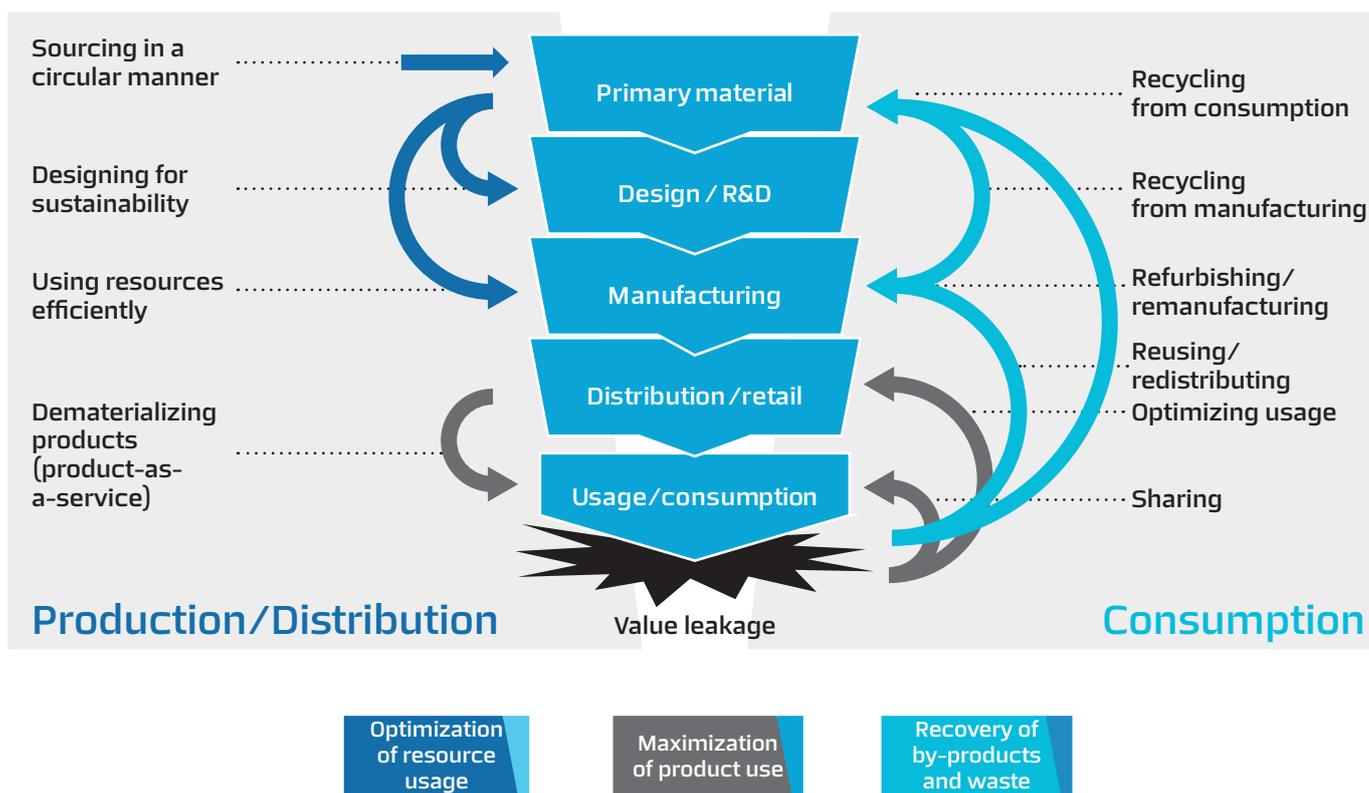
In contrast to the linear model, the circular economy has emerged as a more sustainable alternative, and has attracted interest and support from governments over the last two decades.

Since the 1900s, economists have proposed economic models that aim to conserve finite materials and limit waste by changing how the economy sources, produces, consumes, and reuses materials. These models are inspired by the biological cycles found in nature,¹³ which create a closed-loop material cycle, or circularity, hence the term “circular economy.”

The Ideation Center has formulated a holistic framework for the circular economy that is governed by three principles: the optimization of usage of finite resources, the maximization of product use, and the recovery of by-products and waste.

The circular economy concept involves various stakeholders — manufacturers, distributors, consumers, and governments. It can be applied across all industries, such as food and beverage, healthcare, hospitality, construction, and many other sectors. Making the transition to a circular economy means changing the way we source, design, manufacture, distribute, use, and discard materials (see Exhibit 3).

Exhibit 3: A circular economy creates a closed-loop cycle encompassing resource usage, product life, and waste recovery



Source: Strategy&

Optimization of the usage of finite resources

Optimizing the usage of finite resources requires changes at the production stage. It involves:

- **Sourcing in a circular manner:** This means replacing finite materials with renewable and bio-based materials (material of living or once-living, or agricultural, origin).
- **Designing for sustainability:** Producers must choose the right raw materials and designs for products to facilitate their disassembly, reuse, repair, and/or upcycling (reusing in such a way as to create a product of higher quality or value than the original). For instance, in Denmark, Odense Municipality's new residential buildings are designed to use fewer chemicals, and in addition to use alternative materials such as paper wool for insulation, LED lights, and solar heating.¹⁴
- **Using resources efficiently:** This requires minimizing the use of finite resources and waste generated during the production process.

Maximization of product use

Maximizing product use requires changes at both the production and distribution stages, as follows:

- **Dematerializing products (product-as-a-service):** This means converting physical products into a package of services. Instead of selling products through a one-time transaction, manufacturers or distributors agree a contract with customers to provide the product, maintain it, and eventually replace or recover it. For instance, Philips' "pay per lux" product-as-a-service offering allows businesses to pay a regular fee for light as a service instead of buying bulbs outright. Philips retains ownership of the lighting materials and handles design, installation, maintenance, and upgrades. Once the materials are no longer in use or the contract ends, Philips is able to recover them, recycle them, or use them for another purpose.¹⁵
- **Sharing:** The practice of sharing durable assets such as cars, rooms, and appliances limits the need to

buy new or own physical products. It also expands the usable life of products.

- **Optimizing usage:** Using products in a manner that preserves their original properties and ensures durability.
- **Reusing/redistributing:** Reusing or redistributing secondhand and previously owned products prolongs their life span. Hewlett-Packard (HP), for example, undertakes repairs or upgrades and resells used products and components to give them a longer life.¹⁶

Recovery of by-products and waste

Finally, closing the loop prevents value leakage. It applies to the production and consumption stages:

- **Refurbishing/remanufacturing:** Products and their components become more valuable and are reusable if they can go through refurbishment or remanufacturing. This avoids "downcycling" them into lower-value products.
- **Recycling from manufacturing:** Waste and by-products can be recovered from the manufacturing process, and then reintroduced into the production cycle. Such practice incorporates circularity into an earlier stage of the production process. For example, heat produced by furnaces can be used to generate electricity or heating for households. BASF, the largest chemical producer in the world, recovers unrecyclable waste generated during production, and incorporates it in the production of green concrete. By doing so, it reduces the amount of energy used and CO₂ emitted, while also diverting waste from landfill areas.¹⁷ Dell uses plastic sourced from the technology that was recovered from its recycling efforts.¹⁸
- **Recycling from consumption:** Discarded materials can be retrieved after consumption, and then reused for new products. IKEA makes some items entirely from recycled wood and/or plastic bottles.¹⁹

The circular opportunity in the GCC

GCC countries are moving toward a path of sustainability. They have set a number of targets, for example, in renewable energy generation and recycling. However, they still lack a holistic approach for increasing circularity in line with the three principles of the circular economy in key areas such as biomass, energy, and water. By embracing a circular economy, GCC countries can bolster GDP growth through mitigating wasteful consumption and extracting value from waste. Broader environmental and social benefits will also ensue.

The best approach is to focus on urban areas. GCC cities contain 85 percent of the region's population today, a proportion set to reach 90 percent by 2050.²⁰ Moreover, Strategy& expects that increased investment in urban infrastructure and new mega-city developments will grow the construction market to \$350 to \$400 billion by 2023, up 60 percent to 100 percent from its current value. These large sums are a compelling opportunity for GCC governments to implement the circular economy concept, providing impetus to the use of circular strategies, and ensuring maximum impact from increased spending on construction.

The design of a circular city should optimize finite material usage, maximize product life, and recover waste. This report identifies opportunities for the circular economy in three key components of a city: its built environment, its mobility systems, and its households.

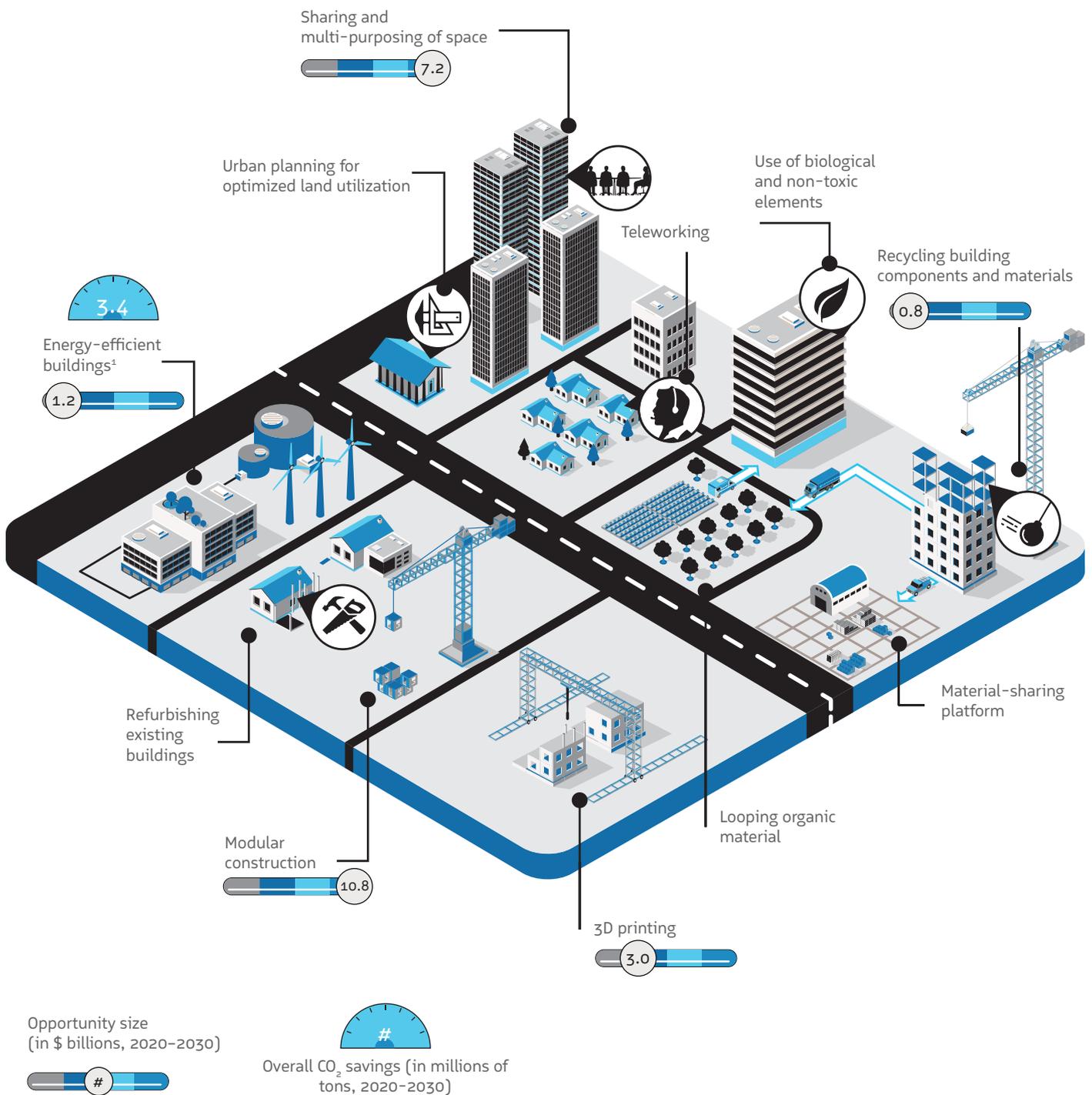
Across each component, opportunities were prioritized based on their impact and relevance to the GCC.

A flexible and durable built environment

The Ideation Center's in-depth analysis suggests that if the region's city planning, modes of construction, and real estate management were to embrace the concept of the circular economy, the built environment would generate cumulative benefits of more than \$23 billion for the GCC between 2020 and 2030. This figure corresponds to up to 2 percent of the region's construction GDP for that period. At present, however, the GCC construction sector overwhelmingly uses conventional construction methods that lead to wasteful practices. The sector produces 35 to 40 percent of the waste in GCC cities (according to official statistics and Strategy& interviews with experts),²¹ compared to 25 to 30 percent in the EU.²²

Instead, GCC governments should design and retrofit cities to incorporate circular economy principles. A circular built environment optimizes land utilization, and integrates durable, flexible, and modular spaces. It is designed to facilitate closed loops of water, nutrients, materials, and energy, and is constructed through sourcing bio-based and recycled materials. Incorporating circular opportunities in the built environment during the construction and throughout the asset life of buildings allows for optimal usage of construction materials, reduced utilization of finite resources, and substantial reductions in waste. These benefits create value for the economy by saving time and money (**see Exhibit 4**).

Exhibit 4: Prioritized opportunities in the built environment would generate benefits of roughly US\$23 billion between 2020 and 2030 in the GCC



¹ Opportunity for energy-efficient buildings quantifies only the savings associated with wider adoption of district cooling.

Source: Strategy&

Moving toward a flexible and durable built environment should involve wider adoption of modular construction, which brings significant savings in cost, material, time, and waste.



The most significant opportunities for GCC countries in the built environment include modular construction, 3D printing, sharing and multi-purposing of space, energy-efficient buildings, and the recycling of building components and materials.

Modular construction

One example of a move toward a flexible and durable built environment would involve wider adoption of modular construction. This development could bring about significant savings in cost, material, time, and waste. During the construction phase alone, the usage of modules can bring savings of up to 15 percent in material costs and close to 75 percent in labor costs²³ for only a slight increase in associated capital and operating expenditure compared to conventional cast-in-situ construction methods. These techniques already exist in the GCC. The challenge is to increase their use across all sectors.

Modular construction and prefabricated buildings involve off-site production and then on-site assembly of building units. This technique increases construction process speed considerably, enhances quality and consistency of output, and reduces material wastage.

3D printing

3D printing technology enables the printing of building components, or structures, in a reduced time frame. It involves only a fraction of the typical associated costs and construction material. With increased adoption, 3D printing in the GCC can save as much as 40 percent in labor costs, and 25 percent in material costs.²⁴

Interest in the technology is growing in the region. Dubai has paved the way, inaugurating the first 3D-printed office in 2016, and launching a dedicated 3D printing strategy in the same year.²⁵

Sharing and multi-purposing of space

Sharing and multi-purposing of spaces is vital to maximize the utilization of real estate. Experience suggests that the sharing and multi-purposing of space

can increase floor space utilization by up to 30 percent, hence reducing the need for new buildings.²⁶

Multi-purposing applies mainly to commercial spaces through co-working (offices shared by workers usually not employed by the same organization), or shared office space (between two or more companies). It also applies to residential spaces being used as an alternative to traditional hospitality spaces.

Energy-efficient buildings

Buildings should aim for utility efficiency by opting for renewable energy as the main source of power, such as by using solar-photovoltaic water heating panels. Their design should ensure energy and water efficiency, and enable the reuse of waste resources such as gray water (water that has been used for washing and so does not contain dangerous contaminants).

District cooling offers great potential to increase energy efficiency in a region where cooling consumes the largest share of urban energy. Electricity savings could range between 25 percent and 80 percent compared to conventional systems.²⁷ GCC governments should aim for increased penetration of district cooling, where possible.

National governments can play a central role in the transition to energy-efficient buildings. They can use a comprehensive regulatory framework that includes energy conservation building codes and green rating systems.

Recycling building components and materials

At the point of end-of-use, disassembly should be favored ahead of demolition. The resulting high-value recycling reduces waste, and captures value that would otherwise be destroyed. This process can save up to 30 percent of material costs.²⁸

Recycling of construction modules (prefabricated building components) also offers an opportunity to reduce consumption of virgin, non-renewable resources, and the energy needed to extract and process them.

A clean and lean mobility system

Considerable savings are available from a circular mobility system, generating economic, social, and environmental value by reducing congestion, traffic accidents, and fuel consumption, along with the costs associated with them. It can also achieve a substantial reduction in CO₂ emissions (see Exhibit 5). Overall, the Ideation Center estimates that adopting the circular model in mobility could generate cumulative benefits in the GCC of \$69 billion from 2020 to 2030, or savings of up to 5 percent compared to the business as usual cost of congestion, accidents, and fuel use. Relevant opportunities can help to achieve a reduction of up to 28 million tons of CO₂ between 2020 and 2030, or the equivalent of 577,000 cars off the road by 2030 — nearly half the number of personal cars currently in use across the United Arab Emirates (UAE).

At present, however, GCC countries are heavily dependent on personal car transport with 80 percent of people in Riyadh, and 63 percent in Dubai, using their personal cars to commute to work (see Appendix).²⁹ As a result, congestion presents a significant challenge. In Dubai, car passengers spend an average of 20 minutes in traffic during their ride to work of 37 minutes; in Riyadh, they spend 16 out of 25 minutes in traffic. Congestion costs are estimated to reach the equivalent of 12 percent of a person's annual salary in Dubai, and up to 7 percent in Riyadh.³⁰ In addition, the rate of traffic accidents is higher in the GCC than in the rest of the world (a 27.4 road traffic death rate per 100,000 population in Saudi Arabia and the UAE, compared to 3.3 in Switzerland and 4.3 in Germany).³¹ In 2016, road traffic accidents claimed over 9,000 lives in Saudi Arabia.³² Circular mobility solutions can increase road safety markedly, not least through reducing the number of cars on the road, and through the emerging safety-enhanced technologies used in electric and autonomous vehicles.

These circular solutions in mobility are developing rapidly. They represent attractive alternatives to car ownership and thus offer some solutions to existing challenges relating to congestion, pollution, and road accidents. A circular mobility system provides interconnected and ubiquitous public transportation solutions. It offers safe, cleaner, and energy-efficient alternatives to the traditional gasoline-based cars, and promotes ride sharing.

The Ideation Center has identified the principal circular opportunities in mobility systems: intermodal transportation systems, vehicle sharing, electric vehicles, and autonomous vehicles.

Intermodal transportation systems

Intermodal transportation systems (ITS) involve the use of more than one mode of transport for a journey. An ITS requires a solid public transportation network, and relies on a digital interface allowing riders to shift between personal, shared, and public transportation in a seamless manner. We believe that ITS can reduce personal transportation use in the region by up to 10 percent by 2030, and generate associated reductions in the volume of congestion, the number of accidents, the use of gasoline, and in CO₂ emissions.

Intermodal commuting is used often to combine the strengths of various transportation options, and reduce dependence on the car. Each GCC state needs such a connected, multi-modal transportation system with sufficient capacity, speed, and comfort.

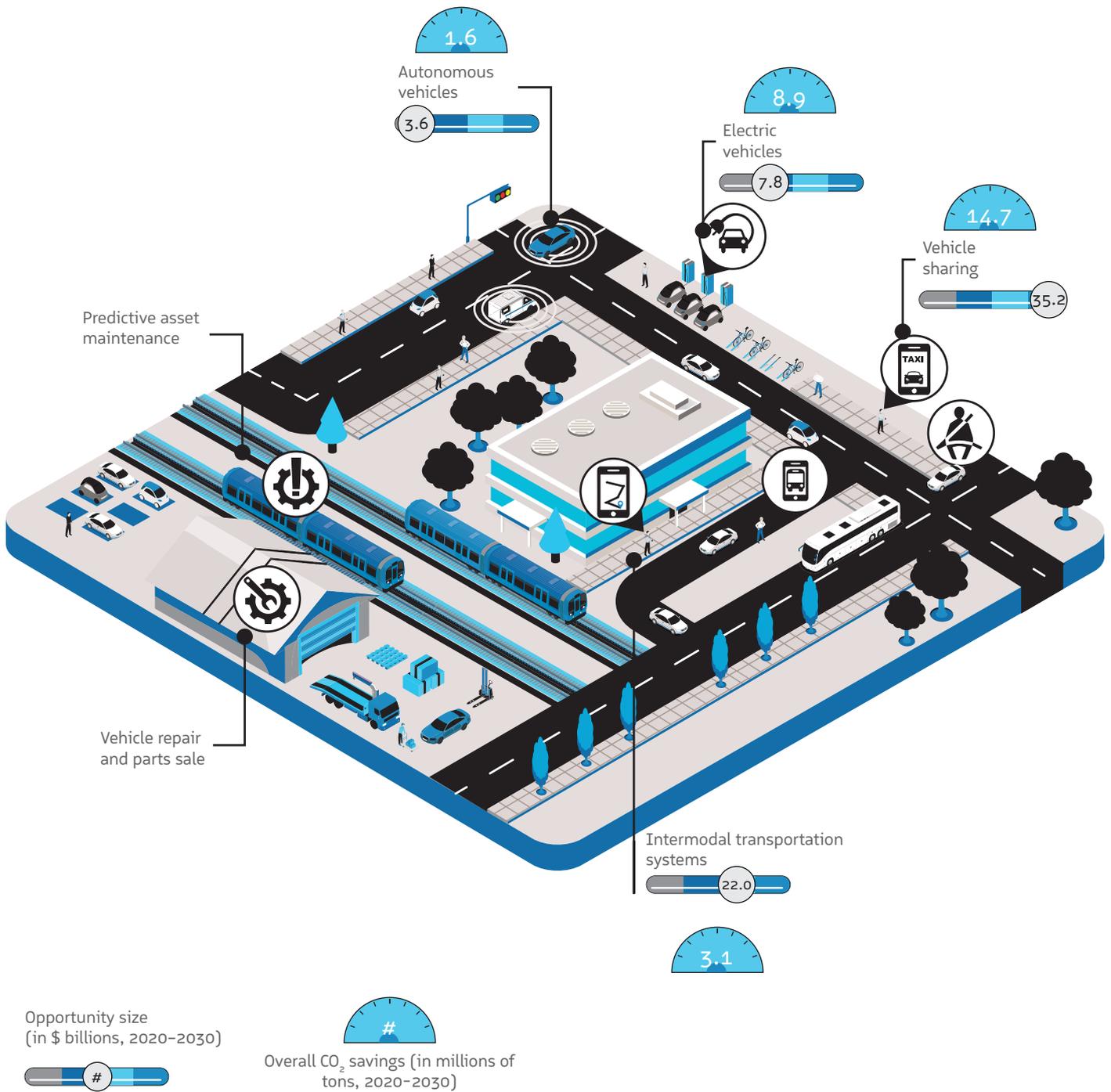
At present, GCC states are investing in ambitious public transport schemes such as the Riyadh Metro; an overhaul of bus systems in Dammam, Jeddah, Makkah, and Madinah; the Abu Dhabi Metro; and the Dubai Metro expansion. When these plans come to fruition, it will be possible to expand the ITS concept in the GCC.

Vehicle sharing

Convenient sharing models give people access to transportation, at any time and from any place, replacing the need for vehicle ownership. Vehicle sharing can take on many forms, from short-term rentals to peer-to-peer car sharing. If the region were to focus on boosting the adoption of ride-sharing services, it could reduce personal car journeys by up to 7 percent, and thereby reduce congestion, pollution, and road accidents.

Digital technology, and the growing popularity of a sharing economy, are supporting the expansion of vehicle sharing in markets around the world. Market research firm Global Market Insights forecasts annual global growth of 34.8 percent between 2016 and 2024.³³

Exhibit 5: Prioritized opportunities in a mobility system would generate benefits of roughly US\$69 billion between 2020 and 2030 in the GCC



Source: Strategy&

Electric vehicles

Electric vehicles (EVs), including battery-powered and plug-in hybrid vehicles, are expected to grow rapidly in the region, as they are worldwide. Electric cars, in particular, consume on average 60 percent less gasoline equivalent than regular cars. Increased adoption will reduce fuel consumption and pollution. Such cars are also safer, due to their lower speed, lack of combustion risk, and the integration of basic automation features that help to prevent accidents.

According to the International Energy Agency, the mass utilization of EVs will start in 2020. They are likely to represent a large share of the global vehicle fleet by 2030, and a dominant share by 2050. European countries are at the forefront, with electric vehicles already reaching a 29 percent market share in Norway in 2016.³⁴ In the GCC region, the UAE federal government is promoting greater electric vehicle use. The Dubai Electricity and Water Authority, and the Roads and Transport Authority, are introducing incentives such as free public parking, toll-fee exemptions, and discounts on registration to encourage adoption.³⁵

Autonomous vehicles

With increased adoption, autonomous vehicles could substantially improve the mobility system. They could reduce congestion by 50 percent by closing space between traveling cars (to an average distance of 1.5 meters compared to the 3 to 4 meters human drivers maintain today), and cut accidents by up to 90 percent.³⁶

Throughout the world, autonomous driving is becoming a reality, with many players seizing the opportunity, from automotive industry incumbents like Audi, BMW, Mercedes-Benz, and Volvo, to technology companies like Apple, Google, and Uber.

Widespread use of autonomous vehicles in the GCC is unlikely in the near future, as mass production is not expected to start until 10 to 15 years from now. However, GCC governments can certainly begin to create the right conditions for their adoption.





An environmentally aware community

The Ideation Center predicts that boosting circularity within households would generate cumulative benefits of \$46 billion between 2020 and 2030, corresponding to savings of up to 3 percent of consumer expenditure on electricity, food, and water. A reduction of up to 117 million tons of CO₂ from 2020 to 2030 can also be achieved through electricity savings — slightly more than the equivalent annual CO₂ emissions of the Czech Republic in 2015.³⁷

Exploiting circular strategies at the household level will generate multiple benefits. It can minimize the usage of finite resources; save costs associated with excessive consumption of electricity, food, and water; extract value from recycled waste; and substantially reduce CO₂ emissions. This can create a circular community, one that is mindful of resource consumption, use, and disposal. It is a community in which consumers optimize consumption of biomass, energy, and water; extend the life cycle of their products; and practice active recycling.

In particular in the GCC, circular approaches can encourage greater use of recycling and more efficient consumption of electricity, food, and water. At present, GCC consumers lack the incentive to consume less energy and to recycle more. There is also insufficient sorting and recycling infrastructure. However, circular economy policies can generate considerable gains and reduce emissions (see Exhibit 6).

The Ideation Center has identified the key opportunities for environmentally aware communities as follows: sourcing low-energy and water-efficient fittings, changing attitudes toward energy consumption, reducing avoidable food waste, and sorting and recycling of materials.

Sourcing low-energy and water-efficient fittings

Fittings that consume little energy, such as LED lights, can bring savings of up to 70 to 90 percent in electricity consumption and associated CO₂ savings.³⁸ Similarly, water-efficient fittings can reduce water consumption by 25 percent for showers and toilets, and by more than 60 percent for faucets.³⁹ As a consequence, given the

region's considerable reliance on desalinated water for residential water use, reduced water consumption will also result in significant energy savings and reduction in CO₂ emissions.

Changing attitudes toward energy consumption

Adopting efficient energy consumption behaviors is essential to reducing associated energy wastage. These include turning off the lights in vacant rooms, adjusting the air-conditioning thermostat, and unplugging appliances that are not in use, coupled with adoption of proven technologies (such as light sensors and home automation).

Recent research in the region has estimated that approximately 15 to 30 percent of residential energy consumption could be saved by good housekeeping or changes in attitude.⁴⁰ With the residential sector consuming 30 to 50 percent⁴¹ of the total electricity generated, increased awareness of sustainable energy consumption can translate into significant electricity savings and fewer CO₂ emissions.

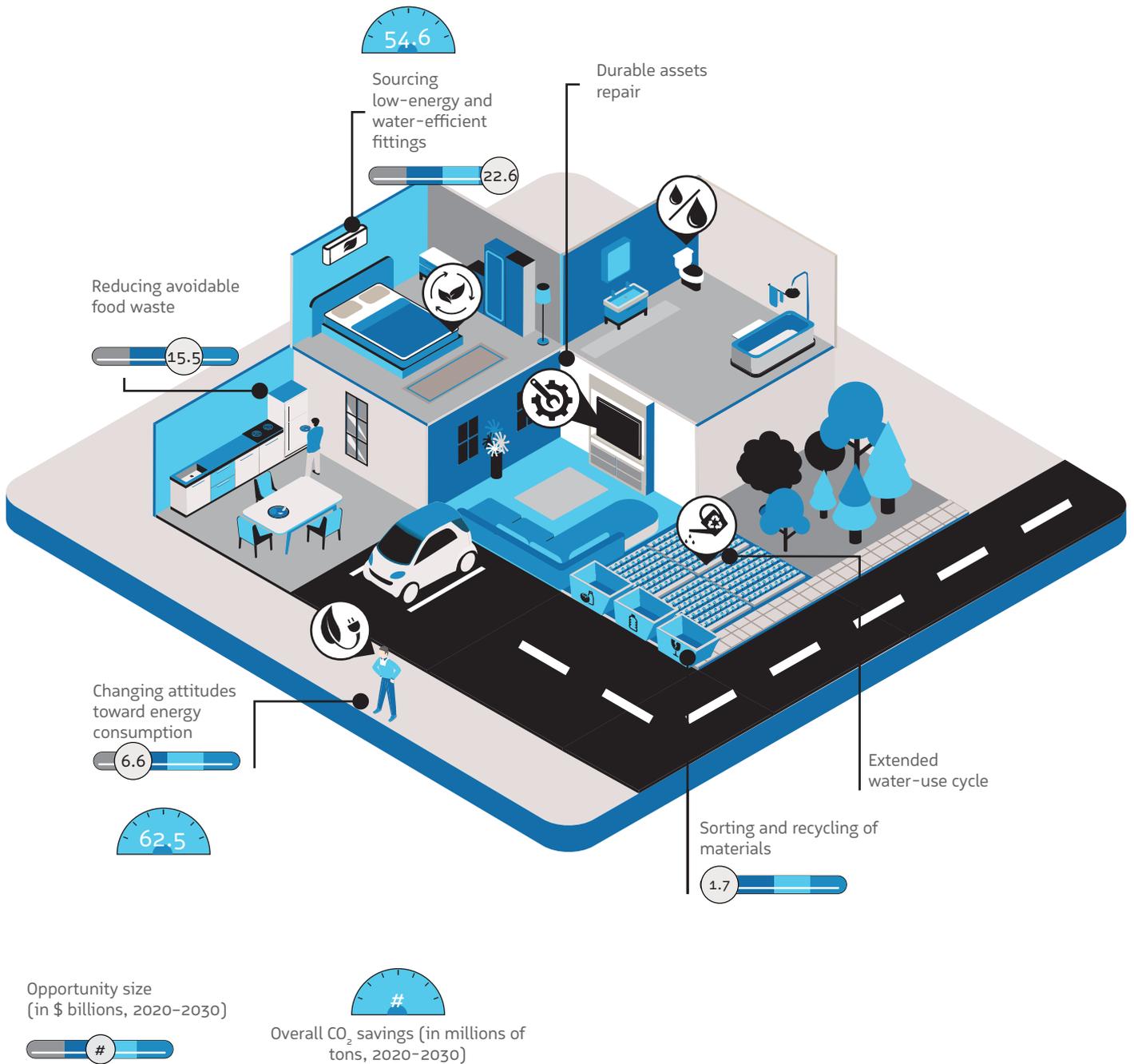
Reducing avoidable food waste

Preventing the generation of organic waste represents another significant opportunity. According to the "Food Not Trash" website, AED 15 billion (\$4.1 billion) of food is discarded every year in the UAE. GCC countries can reduce avoidable food waste by compelling retailers to take a number of initiatives, such as right-size packaging and smart packaging for increasing shelf life. Encouraging awareness among consumers is also vital.

Sorting and recycling of materials

Bringing recycling rates in the GCC in line with European recycling rates can result in major economic benefits, due to the extracted value of waste and the reduced costs associated with waste management and landfilling. The region discards large amounts of plastic, aluminum, and paper, which end up in landfills or dumpsites. Bee'ah, a UAE environmental management company, estimates that the UAE discards three billion plastic water bottles, 11 billion plastic bags, and 290 million aluminum cans annually.⁴² Recycling and reusing these items would generate jobs and value in the economy.

Exhibit 6: Prioritized opportunities in households and communities would generate benefits of roughly US\$46 billion between 2020 and 2030 in the GCC



Source: Strategy&

Circular economy benefits to the GCC (2020-2030)



Flexible and durable built environment



Clean and lean mobility system



Environmentally aware community

Cumulative savings

US\$ 23 billion

US\$ 69 billion

US\$ 46 billion

Tons of CO₂ emissions reduction

28 million

117 million

Building a circular economy

To set in motion the transition to a circular economy and reap the desired benefits, GCC governments should integrate their efforts in a comprehensive national framework that will ensure all relevant stakeholders contribute toward a holistic solution (see Exhibit 7).

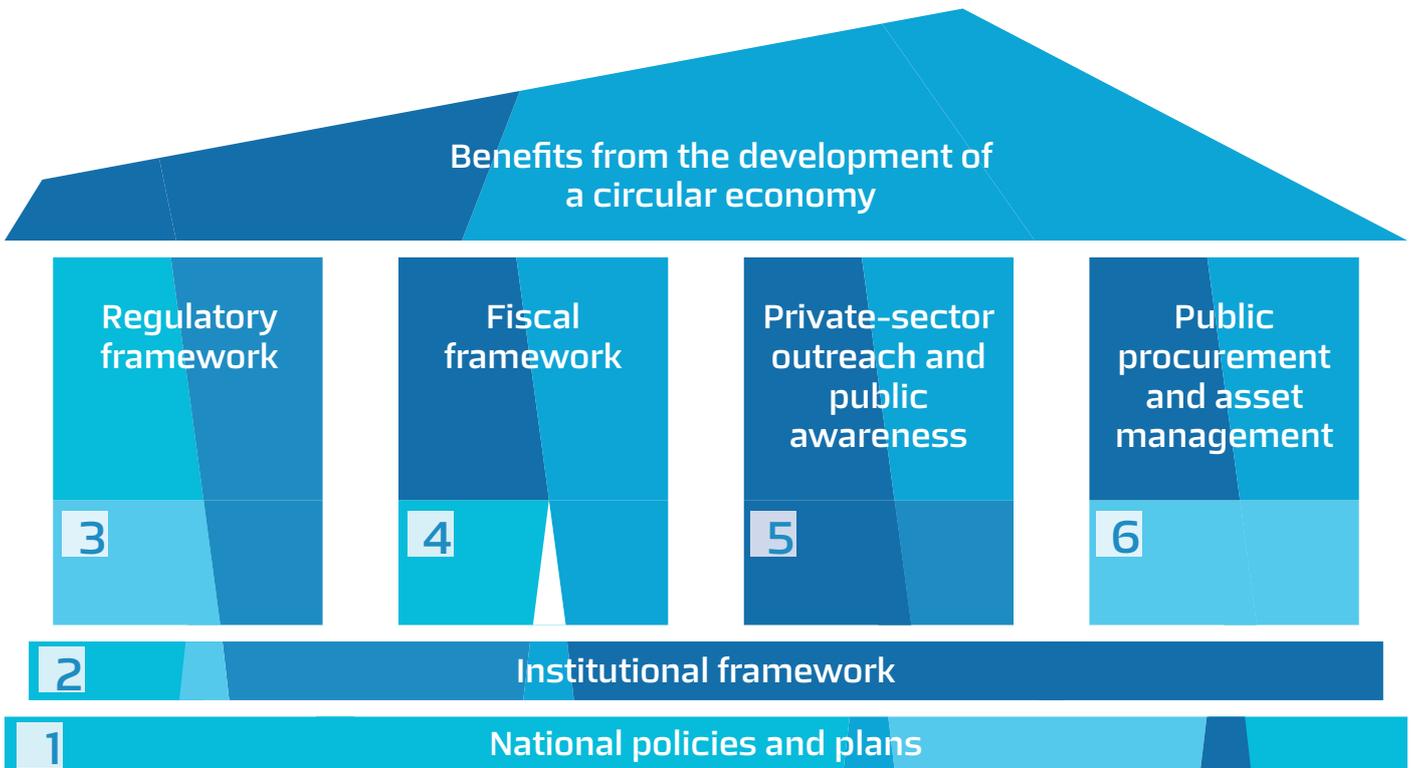
1. National policies and plans

A dedicated and comprehensive circular economy strategy is the first step in the transition toward a circular economy. As part of their strategy, policymakers should define priority initiatives to spearhead the

transition, while continuously monitoring their implementation and impact against set targets. At the national level, this includes achieving resource efficiency and increasing the use of renewable energy. At the city level, this involves proper waste management and increased recycling.

China, France, the Netherlands, and Scotland, among other countries, have adopted a comprehensive circular economy strategy. They have thereby affirmed their government's commitment to achieving circularity at the national level.

Exhibit 7: A comprehensive national framework aims to develop a holistic circular solution



Source: Strategy&

2. Institutional framework

A coordinated implementation at both the national and local levels is essential to the successful introduction of a circular economy strategy. Environment ministries have a key role to play in supporting the ministries of economy, industry, and transportation in defining priorities and targets. Local governments, specifically municipal authorities, are critical for the implementation of waste management, municipal procurement, and asset management strategies.

To ensure proper coordination and alignment between various entities, GCC countries should create a separate body dedicated to the circular economy. Such an operating model exists in the Netherlands, where the Social and Economic Council (SER) advises the government and parliament on key social and economic policies, including circular economy practices. In 2016, the SER assessed whether there was a need to move to a circular economy, and identified barriers to this transition. The result was a decision to focus on making reusable materials more commonplace in the Dutch economy through the development of the National Raw Materials Agreement. The SER is financed by the industrial sector and is wholly independent from the government, representing the interests of industrial groups and trade unions.

3. Regulatory framework

Regulations are required to enhance the productivity of materials, and minimize any current practices that encourage value leakage. This framework should provide the right incentives for manufacturers, distributors, consumers, and governments to adopt circular economy principles. When setting regulations, GCC governments should cover the three governing principles of the circular economy.

Examples of regulations include California's Rigid Plastic Packaging Container Program, which stipulates that recycled resins should make up at least 25 percent of relevant products.⁴³ The Oregon recycling law of 1991, which set requirements for the recycling of glass and rigid plastic containers and for the government procurement of recycled products, proved effective at increasing such activity.⁴⁴

4. Fiscal framework

Governments should introduce taxes or fiscal incentives to support the transition to a circular economy. Taxes or levies on non-circular practices can help to curb such wasteful behaviors. For example, to reduce the use of certain raw resources, Denmark introduced a Raw Materials Tax which is levied on resources that are commercially extracted or imported. The Raw Materials Tax was introduced in close conjunction with the Waste Tax. In combination, these taxes encouraged manufacturers to adopt recycled materials as a primary source.⁴⁵

In Taipei, citizens have to pay for official-issue blue bags in order for garbage trucks to pick up their unsorted trash. Alternatively, they can sort their recyclable trash (including organic materials) in any bag and dispose of it for free. Violators of these regulations are fined up to \$200.⁴⁶

At the same time, tax cuts and other incentives can remove barriers to circularity. For example, China eliminated VAT on goods produced from recycled materials. New York introduced tax credits in favor of remanufacturing firms 20 years ago.⁴⁷ Remanufacturing has become an important sector in both places.

5. Private-sector outreach and public awareness

GCC governments need to increase public awareness of the circular economy and its benefits. They can do this through launching mass media campaigns and resource websites, introducing ecolabels (a voluntary method of environmental performance certification and labeling), and incorporating relevant principles in school curricula. The European Commission's website, for example, includes comprehensive resources on the EU Ecolabel for consumers and businesses, complete with brochures, links to government websites, news, and tool kits.⁴⁸

In addition, the behavioral science approach holds considerable promise for policymakers in their bid to achieve environmental sustainability. This approach is spreading globally, with the 2017 Nobel Prize in Economics being awarded to Richard Thaler, a pioneer of behavioral economics. A study co-authored by the Ideation Center and WPP, published for the 2018 World Government Summit, highlights how behavioral interventions improve people's responsiveness to policies without restricting their freedom of choice.⁴⁹

Governments can also help businesses to confront the main barriers in the transition to a circular economy. They can provide advisory support, disseminating best practices and fostering networks of stakeholders for collaborative projects. The Green Deal in the Netherlands tackles non-financial barriers in implementing circular economy opportunities by providing advisory support for selected innovative business initiatives.⁵⁰

6. Public procurement and asset management

As the largest procurers of goods and services, GCC governments and cities should lead the transition to a circular economy and change the way they procure goods and services. They should change the way they manage and provide access to their assets. Following this approach, governments can save public funds by taking into account the entire life cycle of procured products.

For example, governments can impose circular specifications on products, such as the reparability and sustainability of materials. Individual government agencies can arrange for suppliers to handle the recovery and disposal of these products and components. Cities can rethink how they allocate civic assets and spaces to ensure their maximum utilization. For example, they can share machinery or workspaces among different local government departments or with neighboring municipalities, or make unused public spaces available to residents.

The Seoul metropolitan government, for example, maintains a website where individuals and organizations can book municipal spaces like sports facilities, lecture halls, and meeting rooms.⁵¹ Such wide-reaching initiatives stimulate demand for circular products and services.



Conclusion

The previously dominant linear model of consumption is ending. GCC countries understand that they must move toward a circular economy. A focus on cities should be the priority, with a particular emphasis on the built environment and transportation, which produce the largest output of waste. For their part, communities must learn to consume energy, food, and water more efficiently.

All stakeholders — governments, consumers, and industries — stand to gain from a circular economy, and must cooperate to find optimum solutions, learning from the successes of other regions and countries. If handled correctly, this transition is set to bring enormous financial and environmental benefits to multiple sectors and the region as a whole.

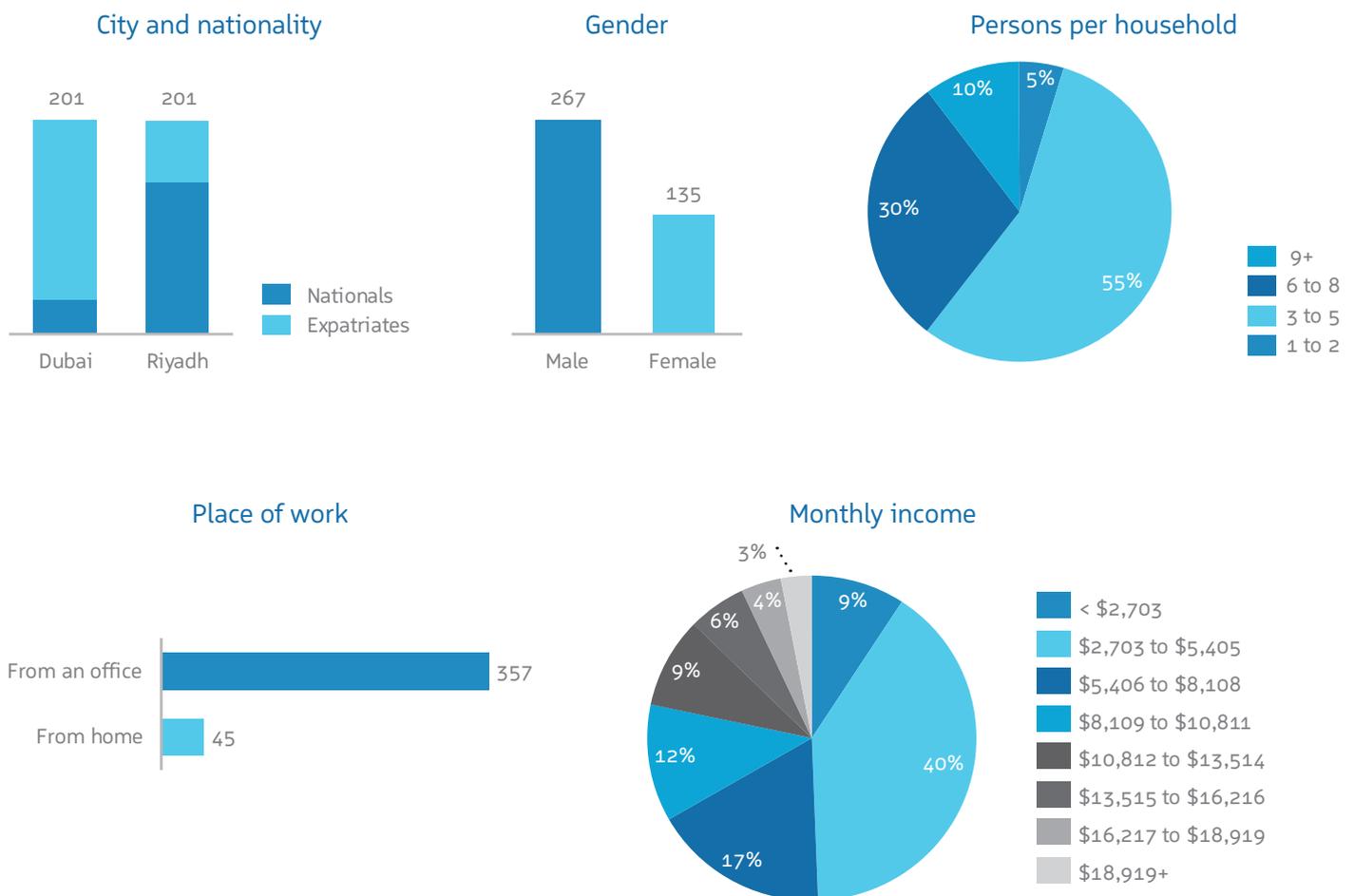
Appendix

2018 Strategy& Middle East circular economy practices in Dubai and Riyadh survey methodology

Strategy& Middle East conducted a circular economy survey among 402 residents, both nationals and expatriates, of Dubai and Riyadh in January 2018. The survey sought to understand how far circular economy concepts have penetrated key GCC cities. The survey analyzed the adoption of circular practices in home and work environments, asking respondents about their use

of circular products and sustainable behaviors in their daily lives. Beyond living and working environments, the respondents were asked to provide details of their daily travel patterns, in terms of mode of transport, number of passengers per car, and time spent in traffic. The survey also asked respondents to rank government intervention measures that are most likely to convince them to switch to more-circular alternatives in their homes and while on the move. Respondents were analyzed by gender, employment status, marital status, age, and income level (see Exhibit 8).

Exhibit 8: The 2018 circular economy survey was answered by 402 respondents residing in Dubai and Riyadh



Source: Strategy&

Endnotes

- 1 The GCC consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.
- 2 Key World Energy Statistics 2017, International Energy Agency (<http://www.iea.org/publications/freepublications/publication/KeyWorld2017.pdf>).
- 3 “Eight metals used in low-carbon energy technologies under risk of shortages,” European Commission (<https://ec.europa.eu/jrc/en/news/eight-metals-used-low-carbon-energy-technologies-under-risk-shortages>).
- 4 Madeleine Lovelle, “Food and Water Security in the Kingdom of Saudi Arabia,” Future Directions International, Jul. 28, 2015 (<http://www.futuredirections.org.au/publication/food-and-water-security-in-the-kingdom-of-saudi-arabia/>); Haweya Ismail, “Kuwait: Food and Water Security,” Future Directions International, Sep. 1, 2015 (<http://www.futuredirections.org.au/publication/kuwait-food-and-water-security/>).
- 5 Andrew Maddocks, Robert Samuel Young, and Paul Reig, “Ranking the World’s Most Water-Stressed Countries in 2040,” World Resources Institute, Aug. 26, 2015 (<http://www.wri.org/blog/2015/08/ranking-world%E2%80%99s-most-water-stressed-countries-2040>).
- 6 Daniel Hoornweg and Perinaz Bhada-Tata, “What a Waste: A Global Review of Solid Waste Management,” Urban Development Series Knowledge Papers, World Bank, Mar. 12, 2012 (https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf).
- 7 Nina Chestney, “Global carbon emissions hit record high in 2017,” Reuters, Mar. 22, 2018 (<https://www.reuters.com/article/us-energy-carbon-iea/global-carbon-emissions-hit-record-high-in-2017-idUSKBN1GYORB>).
- 8 Key World Energy Statistics 2017, International Energy Agency (<http://www.iea.org/publications/freepublications/publication/KeyWorld2017.pdf>).
- 9 “GCC Waste Management Industry to Present Untapped Opportunities,” Frost & Sullivan, Aug. 10, 2016 (<https://ww2.frost.com/news/press-releases/gcc-waste-management-industry-present-untapped-opportunities-notes-frost-sullivan/>).
- 10 Bernd Debusmann Jr, “Saudi Arabia’s PIF launches recycling company,” *Arabian Business*, Oct. 17, 2017 (<http://www.arabianbusiness.com/industries/banking-finance/381370-saudi-arabias-pif-launches-recycling-company>).
- 11 “Waste Statistics 2016,” Abu Dhabi Statistics Center (https://www.scad.ae/Release%20Documents/AgEnv_ENR_Publication_Annual_Annual_2016_v3-En.pdf).
- 12 Recycling rate of municipal waste, Eurostat (<https://tinyurl.com/yajdqjnj>).
- 13 Biological cycles involve organic matter which, once used up, is decomposed and reintroduced into the system in a different form, without causing harm to the environment. Technical cycles refer to inorganic materials that stay in use without losing their properties or value.
- 14 “Denmark: Public procurement as a circular economy enabler,” Ellen MacArthur Foundation (<https://www.ellenmacarthurfoundation.org/case-studies/denmark-public-procurement-as-a-circular-economy-enabler>).
- 15 “Selling light as a service,” Ellen MacArthur Foundation (<https://www.ellenmacarthurfoundation.org/case-studies/selling-light-as-a-service>).
- 16 “HP 2015 Sustainability Report” (<http://www8.hp.com/h20195/v2/GetPDF.aspx/c05154920.pdf>).
- 17 “Green Sense® Concrete technology now also available on the European market,” BASF, Feb. 14, 2014 (<https://www.basf.com/en/company/news-and-media/news-releases/2014/02/p-14-131.html>).
- 18 “Dell and the circular economy,” Dell (<https://www.dell.com/learn/us/en/uscorp1/corp-comm/circular-economy?c=us&l=en&s=corp>).
- 19 Therese Akesson, “Taking steps to create a circular IKEA,” IKEA (<https://highlights.ikea.com/2017/circular-economy/>).
- 20 “World Urbanization Prospects,” United Nations, 2014 Revision (<https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.pdf>).
- 21 “Statistical Yearbook of Abu Dhabi 2017.”
- 22 “Construction and Demolition Waste,” European Commission, last updated on Jun. 17, 2016 (http://ec.europa.eu/environment/waste/construction_demolition.htm).
- 23 Strategy& comparative cost assessment of different construction methods for a low-rise apartment based on input from regional engineering experts.
- 24 “Delivering the circular economy: A toolkit for policymakers,” Ellen MacArthur Foundation, Jun. 2015 (https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_PolicymakerToolkit.pdf).
- 25 “Dubai 3D Printing Strategy,” Last updated on Mar. 07, 2017 (<https://government.ae/en/about-the-uae/strategies-initiatives-and-awards/local-governments-strategies-and-plans/dubai-3d-printing-strategy>).

- 26 “Delivering the circular economy: A toolkit for policymakers,” Ellen MacArthur Foundation, Jun. 2015 (https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_PolicyMakerToolkit.pdf).
- 27 “Dubai Cooling Study,” Regulatory and Supervisory Bureau (<https://www.rsbdubai.gov.ae/dubai-cooling-study/>).
- 28 “Delivering the circular economy: A toolkit for policymakers,” Ellen MacArthur Foundation, Jun. 2015 (https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_PolicyMakerToolkit.pdf).
- 29 Based on the 2018 Strategy & Middle East survey on circular economy practices in Dubai and Riyadh.
- 30 Ibid.
- 31 “Global status report on road safety 2015,” World Health Organization (http://www.who.int/violence_injury_prevention/road_safety_status/2015/TableA2.pdf?ua=1).
- 32 “Car accidents kill over 9,000 people in 2016,” *Arab News*, Last updated on May 11, 2017 (<http://www.arabnews.com/node/1097886/saudi-arabia>).
- 33 “Car Sharing Market.” Global Market Insights, Apr. 2018 (www.gminsights.com/industry-analysis/carsharing-market).
- 34 “Global EV Outlook 2017,” International Energy Agency (<https://webstore.iea.org/global-ev-outlook-2017>).
- 35 LeAnne Graves, “Dubai announces new electric vehicle incentives,” *The National*, Sep. 24, 2017 (<https://www.thenational.ae/business/energy/dubai-announces-new-electric-vehicle-incentives-1.661286>).
- 36 “Qatar launches first electric car charging station project,” *Gulf Times*, Feb. 27, 2018 (<http://www.gulf-times.com/story/583246/Qatar-launches-first-electric-car-charging-station>).
- 37 “Self-driving cars could dramatically reduce the road toll,” Swinburne University of Technology, Sep. 26, 2017 (<http://www.swinburne.edu.au/news/latest-news/2017/09/self-driving-cars-could-dramatically-reduce-the-road-toll.php>).
- 38 “Key World Energy Statistics 2017,” International Energy Agency (<http://www.iea.org/publications/freepublications/publication/KeyWorld2017.pdf>).
- 39 “Dubai Municipality and Philips Lighting announce launch of Dubai Lamp Initiative,” *GlobeNewswire*, Oct. 5, 2016 (<http://inpublic.globenewswire.com/2016/10/05/Philips+Lighting+Dubai+Municipality+and+Philips+Lighting+announce+launch+of+Dubai+Lamp+Initiative+HUG2046647.html>).
- 40 Building inspection results; previous audits conducted by EMS in Dubai between 2007 and 2012.
- 41 Michael Sachse, “The UAE Is Gearing Up for More Energy Efficiency,” *The UAE State of Energy Report 2015*, United Arab Emirates Ministry of Energy (http://www.dcce.ae/wp-content/uploads/2015/06/SOER_2015_BOOK_draft7_171114_pp_V2_LOW1.pdf#page=30).
- 42 Said Nchet and Marie-Claire Aoun, “The Saudi electricity sector: Pressing issues and challenges,” *Ifri Centre Energie*, Mar. 30, 2015 (https://www.ifri.org/sites/default/files/atoms/files/note_arabie_saoudite_vf.pdf).
- 43 “Pioneering sustainability in the UAE; Bee’ah advises,” *Arabian Business*, Apr. 4, 2015 (<https://www.theneweconomy.com/technology/pioneering-sustainability-in-the-uae-beeah-advises>).
- 44 “Regulations: Title 14, Natural Resource--Division 7, CIWMB; Chapter 4. Resource Conservation Programs; Article 3. Rigid Plastic Packaging Container Program; Section 17942. Regulatory Effect Of Questions And Answers; Effective Dates,” California Government (<https://www.calrecycle.ca.gov/>).
- 45 “Rigid Plastic Containers,” Oregon Government (<https://www.oregon.gov/deq/recycling/Pages/Rigid-Plastic-Containers.aspx>).
- 46 Patrik Söderholm, “Taxing Virgin Natural Resources: Lessons from Aggregates Taxation in Europe,” *Luleå University of Technology*, 2011 (<http://www.sustainablewaste.info/download/18.7df4c4e812d2da6a41680004968/NaturalResourcesTax.pdf>).
- 47 Jessica Bush, “Taiwan Has Found A Brilliant Way To Get People To Recycle More,” *Buzzworthy*, Aug. 30, 2017 (<https://www.buzzworthy.com/taiwan-garbage-disposal/>).
- 48 Ron Giuntini and Kevin Gaudette, “Remanufacturing: The next great opportunity for boosting US productivity,” *Business Horizons*, November–December 2003 (<https://www.cardone.com/docs/environmental-commitment/remman-20next-20great-20opportunity-20for-20productivity.pdf>).
- 49 European Commission website (http://ec.europa.eu/environment/ecolabel/index_en.htm).
- 50 Fadi Adra, Dr. Yahya Anouti, Alice Klat, Philippa Clayre, and Samer Dada, “Triggering change in the GCC through behavioral insights,” *Strategy&*, 2017 (<https://www.strategyand.pwc.com/media/file/Triggering-change-in-the-GCC-through-behavioral-insights.pdf>).
- 51 “Green Deal approach,” *Green Deal Netherlands* (<https://www.greendeals.nl/english>).
- 52 “Reservation for Public Service,” *Seoul Metropolitan Government* (<http://yeyak.seoul.go.kr/main.web>).

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