



Recently, Saudi Arabia has seen significant growth in various fields, including population, agricultural and industrial growth, posing challenges regarding management of different types of waste. Waste management, recycling, reuse, energy recovery and circular economy are key factors to maintain the Kingdom's natural resources; in addition to creating jobs, reducing greenhouse gas emissions and transforming them into power.

The government has launched several projects and initiatives to boost waste disposal activities, to improve recycling, reuse and energy recovery processes, and to operationalize the concept of circular economy, including:

1. Setting up a Saudi company for waste recycling.
2. Integrated waste management at Al Jubail industrial city.
3. Setting up a factory to produce organic fertilizer using food leftover with a capacity of 6000 tons annually.
4. "Save the Grace" initiative.
5. Comprehensive strategy for waste management in Riyadh

## [Recycling Prospects in Saudi Arabia](#)

The concept of waste recycling has been getting increasing attention in Saudi Arabia in recent years. The country produces around 15 million tons of municipal solid waste each year with an average daily rate of 1.4 kg per person. This rate is projected to double (30 million tons per year) by 2033 with current annual population growth rate of 3.4%.

The major ingredients of Saudi Arabian municipal solid waste are food waste (40-51%), paper (12-28%), cardboard (7%), plastics (5-17%), glass (3-5%), wood (2-8%), textile (2-6%), metals (2-8%) etc. depending on the urban activities and population density of studied region.



### **Prevalent Scenario**

In Saudi Arabia, [recycling](#) is in early stages, and recycling of metals and cardboard is the main recycling practice, which covers 10-15% of the total waste and usually carried out by informal sector. The waste pickers or waste scavengers take the recyclables from the waste bins and containers throughout the cities. The waste recycling rate often becomes high (upto 30% of total waste) in some areas of same cities.

The recycling is further carried out at some landfill sites, which covers upto 40% of total waste by the involvement of formal and informal sectors. The recycled products are glass bottles, aluminum cans, steel cans, [plastic bottles](#), paper, cardboard, waste tire, etc. depending on the area, available facilities and involved parties.

### **Recycling Potential in KSA**

It is estimated that 45 thousand TJ of energy can be saved by recycling only glass and metals from municipal solid waste. This estimation is based

on the energy conservation concept, which means xyz amount of energy would be used to produce the same amount of [recyclable material](#).

Similarly, a study on waste recycling benefits revealed that only by recycling glass, metals, aluminium and cardboard in Makkah city, climate will be saved from 5.6 thousand tons emission of methane with 140.1 thousand Mt.CO<sub>2</sub> eq. of global warming potential (GWP). Furthermore, a net revenue of SAR 113 million will be added to the national economy every year only from [Makkah](#) city by only [recycling glass](#), metals, aluminium and cardboard.

### **Future Outlook**

The current [waste management activities of KSA](#) thus require a sustainable and integrated approach with implementation of waste segregation at source, waste recycling, and valuable material recovery. As a starting point, aluminium and [polyethylene terephthalate \(PET\) bottle recycling](#) in large urban cities like [Jeddah](#), Dammam, Riyadh, Makkah and Medina will provide a long-term viable option for the country, as they will reduce the need for expensive raw materials and fossil fuels.

Moreover, if the recyclable materials such as paper, cardboard, glass, [metals](#) and aluminium are recycled and stopped to going into landfills, it will not only reduce the operational and environmental overburden of waste on land resources, but also generate huge economic revenue.

### [Princess Nourah University implements three environmental awareness campaigns relative to the sustainable development objectives](#)

In view of the role of Princess Nourah bint Abdulrahman University in achieving environmental sustainability, and its belief in the importance of active students' participation in various international forums and events related to the environment. The Department of Biology and the Community Service Unit at the College of Science have recently organized three environmental community awareness campaigns with slogans linked to the thirteenth objectives of private sustainable development in the climate, and the fifteenth of life on the land. In the presence of the

head of the Biology Department, Dr. Laila Al-Shuraim, the college's vice-rector, as well as several faculty members, administrative staff and the students.

As coordination and cooperation has been made with the General Department of Parks and Community Service in the Secretariat of the City of Riyadh to obtain various types of different annual flowering seedlings, cacti, perennial outdoor plants, and small trees to be cultivated by approximately (90) students among the fourth level students in the Biology Department within two weeks at a rate of one hour per day, under the supervision of Dr. Arwa Abdul Karim Al-Hukail.

This comes in line with the Kingdom's strategies towards the environment and the restoration of vegetation in Riyadh to reduce the damages related to drought and its negative effects, as an influential environmental mission and social responsibility to activate the role of students in society inside and outside the college and university. In addition to contributing to raising awareness and environmental sense with a number of Applied Ecology issues.

On the other hand, and to achieve the quality of educational outputs, in line with the achievement of the Kingdom's Vision 2030, the initiative has been taken to host (14) third-graders (American Diploma) students from Riyadh Najd Private Schools to attend the various campaigns and events and participate in applied activities such as afforestation. In order to increase the green areas inside the college and educate them about home gardening methods in addition to a scientific tour to learn about the laboratories of the Department of Biology and the herbal plants in the college.

The awareness campaigns varied to include the introduction of the World Day to Combat Desertification and Drought under the slogan (Vision is affiliation to achieve development), the introduction of the International Day for Biological Diversity, whose campaign was called (Our Vision 2030 Saves Our Environment). As well as the introduction of the International

Day for Preserving the Ozone Layer and shedding light on the resulting global climate change and global warming under the slogan (Vision 2030 protects the environment).

The event was accompanied by three corners of environmental issues for the three campaigns to cover them from various aspects and link their issues to each other and to clarify the risk of continuing to pollute the environment with different pollutants. Several visual presentations, which have been designed and prepared by students, were presented. In addition to reviewing some international efforts and the Kingdom's efforts specifically the directives included in the Vision 2030 for environmental protection.

This came within the framework of promoting the principle of rationalization, reducing consumption and waste in natural resources, preserving biological diversity. As well as protecting it through nature reserves, sustainable development for it, preserving it, and directing renewable (clean and safe) energy such as solar energy, wind energy, etc. as a safe and clean alternative that protects and preserves the environment and contributes to reducing the breadth of the Ozone (O<sub>3</sub>) layer hole.

The campaigns also presented recommendations and proposed solutions to contribute to limiting the exacerbation of these problems and controlling them and explaining some positive applied mechanisms to protect the environment. These recommendations emphasized the importance of solidarity and effective participation in eliminating pollution by limiting the use of all kinds of plastics, and the need to move to the use of safe alternatives as biodegradable plastics alternatives. As well as the possibility of using some insect repellent plants, especially in house rooms, as an alternative to the use of chemical pesticides. In addition to urging the rationalization of electricity and water consumption and preventing logging, and encouraging the participation of students in planning and implementing organized campaigns, including some positive activities and events, and developing a high

sense of responsibility towards public property and cleanliness of the environment within university and college facilities.

## [Saudi Jubail Industrial City operates the largest integrated irrigation system](#)



Head of Irrigation Operation and Maintenance Department at the Royal Commission in Jubail, Engineer Safar Al-Natifat, confirmed that the Commission has given special attention to afforestation and increasing green areas in order to improve the environmental and aesthetic style and achieve balance in all aspects of environmental life in Jubail Industrial City, which contributed to creating an attractive competitive environment and providing a high quality of life. For residents, visitors and investors in the city.

And he indicated that the application of the concept of sustainability lies in the use of triple-treated irrigation water for the purposes of horticulture and afforestation, in addition to the establishment of a huge irrigation network and the use of the latest applications and technologies in the field of irrigation water management, through an integrated irrigation system that is operated and managed through an automated central control system, which is the largest of its kind on the world. The world level, where it includes nearly 8,000 automatic control devices distributed over the irrigation network, in addition to carrying out many

operations and processing huge data that exceed 800,000 signals daily to and from the central control system.

Al-Natifat pointed out that the system contributed to improving and continuity of the operational process of the irrigation system, and providing the water needs of plants and trees from irrigation water continuously over 24 hours a day, which made Jubail Industrial City become one of the largest Arab and international cities in the field of afforestation and green spaces per capita. .

On the other hand, the King Fahd Industrial Port in Jubail achieved during last July of 2021 an increase in the total handling goods exported and imported by more than 5 million tons, of various refined petroleum and petrochemical products, an increase of 3.45 percent, compared to the same period in The previous year through 155 ships of different tonnages and sizes.

The most important exports that originated from King Fahd Industrial Port in Jubail included materials such as diesel, industrial fertilizer (urea), in addition to methanol, naphthalene, acacia and kerosene.

The King Fahd Industrial Port in Jubail is the largest specialized industrial port in the world for the export of petrochemical products, oil derivatives and solid materials (iron ore, urea (industrial fertilizers, sulfur, petroleum coal) with 34 berths and an area of 6.8 square kilometers, with 5 stations. The port is 70 million tons.

The port is one of the Kingdom's ports, whose management is supervised by the General Authority of Ports. It is one of the Kingdom's gates, through which it overlooks an important part of the world, which is the eastern side.

These were the details of the news Saudi Jubail Industrial City operates the largest integrated irrigation system in... for this day. We hope that we have succeeded by giving you the full details and information. To follow all our news, you can subscribe to the alerts system or to one of our different systems to provide you with all that is new.

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## [Jubail gets 'smart' waste containers](#)



In several areas of the Jubail Industrial City, the hygiene department at the Royal Commission for Jubail (RCJ) has installed smart waste containers which send electronic signals when they are full and need servicing.

The use of this technology came within RCJ's keenness to use the latest technologies which provide greater efficiency and quality at the lowest possible cost.

These 10-cubic-meter enclosed containers are characterized by their ability to compress waste, which reduces transportation needs, discharge times and working hours, and thus reducing operational costs.

The smart containers reduce fuel consumption and reduce carbon emissions resulting from the frequent use of waste transportation trucks to and from landfills.



Mahdi Al-Harshan, director of the RCJ hygiene department, said that the installation of these containers came within the commission's interest to achieve the concept of integrated waste management.

"This project is implemented with a totally closed system to avoid the spread of odors, provide high safety levels, with a device that signals when the container is full and needs to be replaced," he said. "The system serves commercial areas with large amounts of waste and high traffic."

Al-Harshan said that there are plans to expand this project after a technical evaluation if it is determined that this system would be suitable for all areas in the Jubail Industrial City, city center, and other areas.

"RCJ waste management has followed a unique integrated system in terms of waste collection and transfer, and safe environmental disposal," the official said.

He explained that waste collection from residential and commercial facilities in Jubail is carried out on a daily schedule prepared in advance to meet the needs of residents, and promote businesses and developmental projects by relying on the latest modern technical methods in dealing with wastes.

He said that about 7,000-8,000 containers of various sizes are received on a daily basis to be washed, sterilized, maintained, and repainted periodically.

## [Recycling and Waste-to-Energy Prospects in Saudi Arabia](#)

The Kingdom of Saudi Arabia produces around 15 million tons of municipal solid waste (MSW) each year with average daily rate of 1.4 kg per person. With the current growing population (3.4% yearly rate), urbanization (1.5% yearly rate) and economic development (3.5% yearly GDP rate), the generation rate of MSW will become double (30 million tons per year) by 2033. The major ingredients of Saudi Arabian MSW are [food waste](#) (40-51 %), paper (12-28 %), cardboard (7 %), plastics (5-17 %), glass (3-5 %), wood (2-8 %), textile (2-6 %), metals (2-8 %) etc. depending on the population density and urban activities of that area.



In Saudi Arabia, MSW is collected and sent to landfills or dumpsites after partial segregation and recycling. The major portion of collected waste is ends up in landfills untreated. The landfill requirement is very high, about 28 million m<sup>3</sup> per year. The [problems of leachate](#), waste sludge, and methane and odor emissions are occurring in the landfills and its surrounding areas due to mostly non-sanitary or un-engineered landfills. However, in many cities the plans of new [sanitary landfills](#) are in place, or even they are being built by municipalities with capturing facilities of methane and leachate.

### **Recycling Prospects in Saudi Arabia**

The recycling of metals and cardboard is the main waste recycling practice in Saudi Arabia, which covers 10-15% of the total waste. This recycling practice is mostly carried out by informal sector. The waste pickers or waste scavengers take the recyclables from the waste bins and containers throughout the cities. The waste recycling rate often becomes high (upto 30% of total waste) by waste scavengers in some areas of same cities. The recycling is further carried out at some landfill sites, which covers upto 40% of total waste by the involvement of formal and informal sectors.

The recycled products are glass bottles, aluminum cans, steel cans, plastic bottles, paper, cardboard, waste tire, etc. depending on the area, available facilities and involved stakeholders. It is estimated that 45 thousand TJ of energy can be saved by recycling only glass and metals from MSW stream. This estimation is based on the energy conservation concept, which means xyz amount of energy would be used to produce the same amount of recyclable material.

## **Waste-to-Energy Potential in Saudi Arabia**

The possibilities of converting municipal wastes to renewable energy are plentiful. The choice of conversion technology depends on the type and quantity of waste (waste characterization), capital and operational cost, labor skill requirements, end-uses of products, geographical location and infrastructure. Several [waste to energy](#) technologies such as pyrolysis, anaerobic digestion (AD), trans-esterification, fermentation, gasification, incineration, etc. have been developed. Waste-to-energy provides the cost-effective and eco-friendly solutions to both energy demand and MSW disposal problems in Saudi Arabia.

As per conservative estimates, electricity potential of 3 TWh per year can be generated, if all of the KSA food waste is utilized in biogas plants. Similarly, 1 and 1.6 TWh per year electricity can be generated if all the plastics and other mixed waste (i.e. paper, cardboard, wood, textile, leather, etc.) of KSA are processed in the pyrolysis, and refuse derived fuel (RDF) technologies respectively.

## **Conclusion**

[Waste management issues in Saudi Arabia](#) are not only related to water, but also to land, air and the marine resources. The [sustainable integrated solid waste management](#) is still at the infancy level. There have been many studies in identifying the waste related environmental issues in KSA. The current SWM activities of KSA require a sustainable and integrated approach with implementation of waste segregation at source, waste recycling, [WTE](#) and value-added product (VAP) recovery.

By 2032, Saudi government is aiming to generate about half of its energy requirements (about 72 GW) from renewable sources such as solar, nuclear, wind, geothermal and waste-to-energy systems.

