

# Circular Economy City for Recycling Project Proposal Summary

## The Far East Projects & Development Company (FEC)

General Manager, Eng. Mohammed Al-Khatib

Project Manager and Consultant, Eng. Khadr Al-Dakheel

Strategy Consultant, Dr. Reem N. Bsaiso

Business Development Consultant, Azeddine Al-Kharrat

Studies Development Consultant, Suleiman Al-Assaf

Financial Consultant, Emad Al-Samadi

Studies Coordinator, Eng. Malek Al-Jawabrah

Administrative assistant, Fatima A. Saleem

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## 1 Executive Summary

Based on the The Far East Projects & Development Co. (FEC) extensive experience in the fields of plastic waste collection, sorting, and recycling, including the crushing, granulating, and remanufacturing processes of various products, e.g. PVC, agricultural pipes for irrigation, and bottle-to-bottle PET technology, FEC has come to the following conclusions through its practical experience:

## 2 Introduction

The chemical composition of polyethylene terephthalate (PET) allows for the application of specialized recycling techniques to reduce the negative impact on the environment if not treated properly. The plastic manufacturing process itself is a highly environmentally friendly process.

Plastics are made from raw materials such as natural gas or oil, so plastic waste, which is made up of high-molecular-weight organic polymers, contains elements such as carbon, hydrogen, oxygen, nitrogen, sulfur and chlorine. Eliminating every single ton of plastic waste in landfills emits approximately three tons of carbon dioxide equivalent (CO<sub>2e</sub>) from greenhouse gases, which directly contribute to climate change.

For example, clear plastic bottles used for drinking water are usually made of PET, a plastic material derived from crude oil, where producing one kilogram of it requires the consumption of about 1.9 kilograms of crude oil, which means that producing one ton of this plastic requires approximately 1.9 tons of crude oil.

Unfortunately, huge amounts of waste, including plastic, are disposed of in landfills in most developing countries, where plastic needs more than a thousand years to decompose, especially when it is compressed between layers of waste and exposed to rainwater, leading to the leaching of highly toxic dissolves that seep into the soil and reach rivers and groundwater, causing ecosystem pollution and harming life, health and the environment.

The amount of plastic in the oceans is expected to double over the next 15 years, and plastic pollution causes marine organisms to suffocate or trap them, often causing them to die slowly and painfully, and contributing to the degradation of coral reefs. Eventually, plastic toxins are transmitted through the food chain from fish to humans, causing many diseases.

**We recycle plastic to reduce risks to human, animal and natural health, and maximize environmental, economic and social benefits.**

## 3 The Role of FEC and its Steps in Recycling

### 3.1 Equipment

The Far East has invested in a full range of specialized equipment, which included the following:

- Dedicated equipment for crushing, washing and granulating plastics.
- Metal, wood, and plastic containers for the collection of plastics from institutions.
- Dedicated compactors and transportation trucks for the collection of waste and plastics.
- Presses and shredders to handle recyclables.



### 3.2 Infrastructure

- Investing in a dedicated yard for the collection, sorting, and primary processing of recyclables.
- Signing lease contracts with Deir Ala and Karak landfills.

### 3.3 Sorting of Recyclables from Institutions

Through the **Green Earth Bank's Recycling Initiative**, the company has established dedicated areas within industrial, commercial and tourist facilities to sort recyclables, and special containers have been distributed at the company's expense to sort and recover plastics from waste.

Some of our most prominent clients in this field are:

- United Nations Development Programme in Jordan (UNDP Jordan)
- Makkah Mall
- Bristol Hotel
- Teeba Company
- and others

### 3.4 Human Resources

Over the past five years, the company has established and built qualified and trained teams of national talent men and women from various governorates of the Kingdom, ensuring the highest levels of efficiency and sustainability in the implementation of operations and achieving the company's objectives.

### 3.5 Marketing & Partnerships

The company has partnerships with a number of recycling plants, including:

- ECONEST
- Al-Nama Company
- Al-Oula Recycling

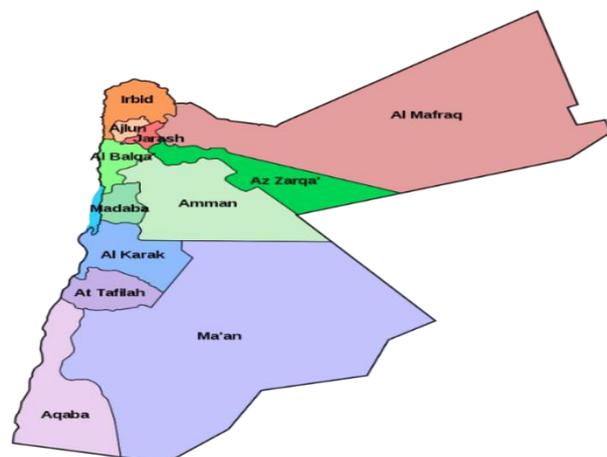
The company also aims to recycle and manufacture several products, such as sewage pipes and irrigation pipes, which are marketed and sold in the target markets as follows:

- Domestic Market: 30%
- European markets: 50%
- Arab markets: 20%

## 4 Overview of Recycling Rates in Jordan

According to population estimates issued by the Department of Statistics, Jordan's population reached about 11,630,323 as of July 11, 2024, placing the Kingdom 11th among Arab countries and 86th globally in terms of population. Non-Jordanians make up **30%** of the population, as a result of recurrent crises and the influx of **refugees** into the country, putting additional pressure on resources and infrastructure, which are already overburdened, with an annual population increase of about **1.9%**. Together, these factors lead to a rise in solid waste volumes and an increasing need for optimal management.

According to the Jordanian Ministry of Environment, the per capita in Jordan produces about **1 kilogram** of waste per day, which is estimated at the total solid waste produced at about 3 million metric tons per year. Despite this



amount, only **about 300,000 tons** are recycled, which represents a maximum of **10%** of the total waste generated. The Ministry of Environment plans to raise this percentage to between **40% and 50% by 2030**. *The following table shows the daily amount of waste for a group of landfills from different governorates according to the statements of the Far East Company .*

City	Mafrq	Aqaba	Ma'an	Russeifa	Zarqa	Madaba	Irbid	Karak	Salt	Deir Alla
Waste Management Site Name	Al-Husayniyat	Aqaba	Ma'an	Russeifa	Zarqa	Madaba	Al-Akaidr	Al-Lajjun	Al-Humra	New Deir Alla
Landfill / Transfer Station	Landfill	Landfill	Landfill	Transfer	Transfer	Landfill	Landfill	Landfill	Landfill	Landfill
2020	250	139	95	268	351	381	1300	236	393	190
2021	224	153	106	294	403	423	1547	278	451	232
2022	247	166	116	334	460	461	1702	330	496	273
2023	271	182	127	363	540	507	2008	387	545	300
2024	307	198	149	400	600	558	2273	443	620	343

The management of solid and municipal waste in Jordan, especially plastic waste, poses a severe environmental and economic challenge with far-reaching impacts. Studies show that the Kingdom produces more than **3 million tons of solid waste annually**, of which about **16% is plastic waste**. In the absence of a well-developed infrastructure to collect and sort this waste, **75%** of waste ends up in landfills, and according to statistics, waste recycling rates do not exceed 10% of the total waste generated.

## 5 Problem Statement

Plastic waste management in Jordan is an urgent challenge with far-reaching implications for the environment and society. The Kingdom faces a number of interrelated issues, most notably poor waste management infrastructure, low recycling rates, and the spread of environmental pollution. The current waste management system is struggling to keep pace with the rapid increase in the amount of plastic waste resulting from population growth, urbanization, and changing consumption patterns.

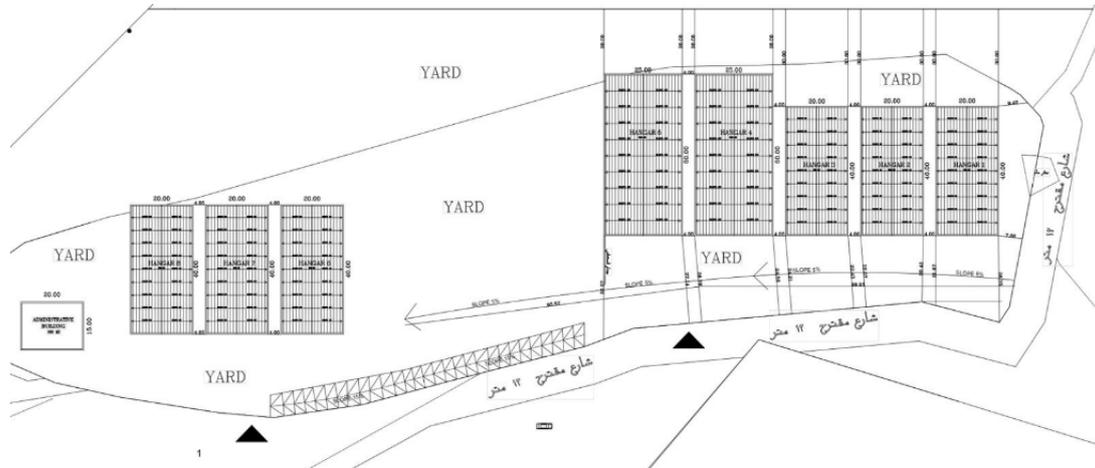
Moreover, recycling rates in Jordan remain alarmingly low, with a large proportion of plastic waste being disposed of in improper ways. This contributes to an increase in reliance on virgin raw materials, while exacerbating environmental pollution, particularly in water bodies and natural habitats. Plastic waste poses a serious threat to ecosystems, marine life, and human health, due to its toxic release and persistence in the environment for hundreds of years.

One of the main reasons for the low recycling rates in Jordan is the lack of recycling plants capable of covering all governorates, which leads to the concentration of activity in limited areas only, increased transportation and collection costs, and lack of access to many communities and industrial and commercial sectors. The lack of investment in this sector and the lack of sufficient incentives to develop it limits the ability of companies to scale up their operations and achieve sustainability.

As a result, a large proportion of plastic waste remains unutilized, and continues to accumulate in landfills or environmental pollution, increasing pressure on the ecosystem and negatively impacting public health. Hence, there is an urgent need to develop an integrated national recycling network, which includes the establishment of new factories, the expansion of the capacity of existing factories, and the provision of incentives for investment in this vital sector, to ensure effective and sustainable management of plastic waste across the Kingdom.

## 6 Solution: Circular Economy City – An Effective Strategy to Solve the Plastic Problem and Support the Circular Economy

The Circular Economy City for Recycling is an innovative and sustainable model for solving the problem of environmental pollution, especially in relation to plastic waste. Through a variety of production lines and cutting-edge technologies, the city contributes to reducing the volume of waste and converting it into products of high economic value, which enhances the local economy and contributes to the preservation of the environment. It also represents a practical solution to the environmental challenges faced by Jordan, especially in terms of recycling plastics and tires, and providing local and international quality products under the slogan "Made in Jordan".



### 6.1 City Components

The Circular Economy Recycling City consists of several hangars and contains several recycling lines and production lines. **The city mainly includes:**

- **Plastic Crushing Lines:** To reduce the size of plastic and make it easier to process.
- **Pressing lines:** to facilitate the handling of goods.
- **Plastic washing lines:** for preparation for recycling.
- **Plastic granulation lines:** Production of plastic granules of various types ready to be used as raw materials.
- **Tire treatment lines:** Jordan is in short supply of damaged tire treatment solutions.
- **Agricultural Pipe Production Line:** A final product exported to international and local markets under the name "Made in Jordan".
- **Sewage Pipes and Pipes (PVC) Production Line:** A final product exported to international and local markets under the name "Made in Jordan".
- **Plastic Bottles Manufacturing Line – Bottle to Bottle:** A final product exported to international and local markets under the name "Made in Jordan".
- **Converting copper and aluminum into alloys.**

### 6.2 City Products:

- Ready-to-use raw materials for industrial and/or export purposes.
- Ready-to-use finished products.

### 6.3 Material Sources (Inputs)

- "GreenEarth Recycling Bank " Initiative
- Landfill Contractors

- Informal Waste Collectors (Scavengers)
- Material Sorting Stations

#### 6.4 Targeted Plastics

The recycling lines were selected based on the proportions of plastics in the market, as the Circular Economy City lines will wash, granulate and convert the following types into raw materials:

- Polyethylene (PE), which includes:
  - High-density polyethylene (HDPE)
  - Low-density polyethylene (LDPE)
  - Linear Low Density Polyethylene (LLDPE)
- Polypropylene (PP)
- Polyethylene terephthalate (PET)
- PVC

PP and PE make up about 60% of the market.

### 7 Project Requirements

- Land and location suitable for the establishment of the project
- Construction & Infrastructure
- Specialized Equipment & Machinery
- Transportation and trucks for collecting and transporting materials
- Raw materials needed for production
- Training of manpower and technical personnel
- Production Lines

### 8 Circular Economy City Mechanism

#### 8.1 Raw Materials (Production Input)

Raw materials are purchased from:

- Landfill Contractors
- Informal waste collectors
- Waste sorting companies

Providing raw materials through:

- The GreenEarth Recycling Bank Initiative.
- Government and national initiatives related to waste sorting and recycling.

#### 8.2 Recycling

- Materials are recycled and converted into raw materials that can be reused in manufacturing.

#### 8.3 Manufacturing

- Manufacturing some types of plastic products within the circular economy city, such as: PVC pipes.

#### 8.4 Marketing:

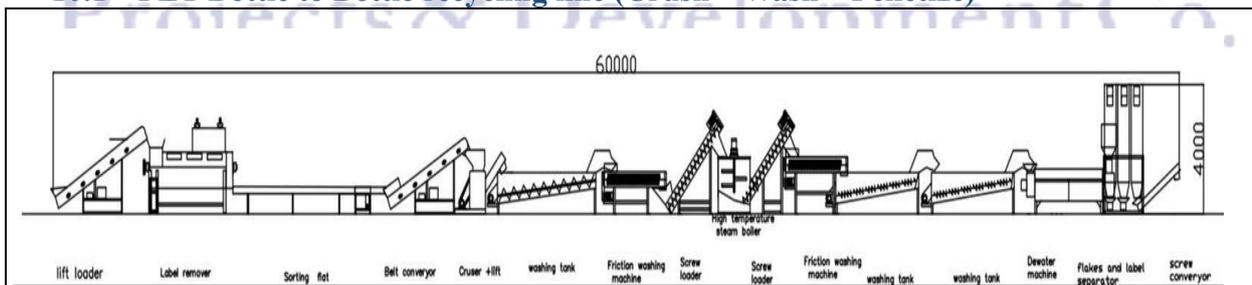
- Circular economy city products are sold in the domestic market or exported overseas.

## 9 Effects of the Circular Economy City:

- **Environmental Impact:**
  - **Minimizing the plastic problem:** Preventing plastic waste from reaching landfills and instead recycled in a circular economy city.
  - **Natural resource protection:** Reduce the need to extract new raw materials through the use of recycled materials.
- **Economic Impact:**
  - **Cost reduction:** By using recycled materials as a substitute for raw materials, production costs in various industries can be reduced, which contributes to enhancing the competitiveness of Jordanian products.
  - **Supporting the circular economy:** By converting waste into new products, the need for new raw materials can be reduced and costs associated with production can be reduced. This helps to improve productivity and reduce waste.
  - **Promoting investments:** The establishment of a circular economy city encourages the attraction of local and international investments in the recycling sector and sustainable industries, thereby boosting the national economy and creating an innovative business environment.
- **Social Impact:**
  - **Job Creation:** The city provides many job opportunities in different fields such as collection, sorting, waste recycling, and manufacturing of finished products. This contributes to improving the standard of living for the local population.
  - **Raising environmental awareness:** Through educational and awareness projects related to recycling, the city contributes to increasing environmental awareness among the community, which promotes a culture of sustainability and environmental preservation.

## 10 Circular Economy City recycling lines (Sample)

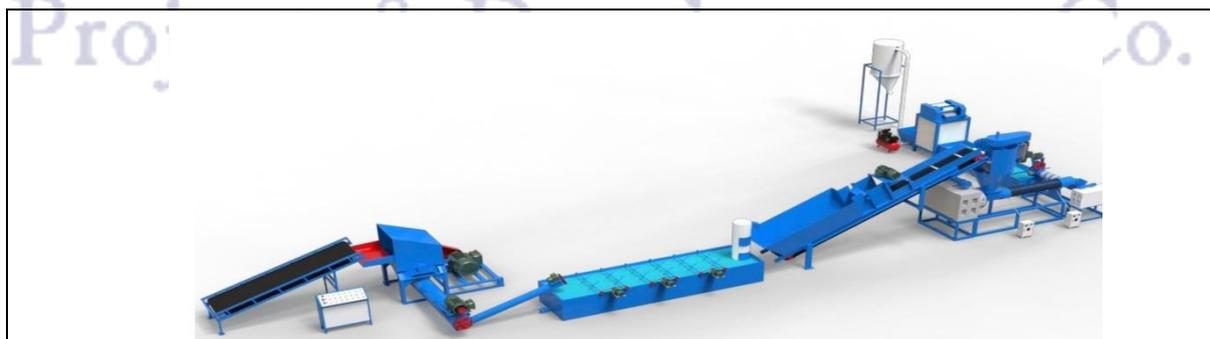
### 10.1 PET Bottle to Bottle recycling line (Crush – Wash – Pelletize)



Label Removal		
Inclined Conveyor Belt	Transport bottles to the label removal machine	3 KW
Label Removal Machine	Remove labels from bottles	19.5 KW
Sorting Conveyor Belt	Sort bottles with incomplete label removal	3 KW
Crushing/Grinding		
Crushing Conveyor Belt	Transport bottles to the crushing machine	3 KW
Bottle Crushing Machine	Crush bottles into small flakes	22 KW

Washing		
Washing Tank	Separate caps from bottles	3 KW
Helical Conveyor Belt	Transport washed PET flakes to the high-heat barrel	4 KW
Hot Washing Tank	Wash PET flakes with hot water and cleaning agents	4 KW
Helical Conveyor Belt	Raise raw materials from the hot washing tank	4 KW
High-Speed Scrubbing Machine	Ensure bottles are clean and remove impurities	7.5 KW
Washing Tank	Separate PET flakes from PE bottle caps	3 KW
Drying		
PET Flake Dryer	Remove water from PET flakes	15 KW
Pelletizing		
Pelletizer	Convert PET flakes into pellets	37 KW
Cooling Tank	Cooling	-
Vertical Fan	Cooling	2.2 KW
Pellet Cutter	-	4 KW
Vibrating Screen	Ensure pellet separation	-
Silo	Storage	2.2 KW
Feed Conveyor Belt	-	0.4 KW
Heating Mixer	-	5.5 KW
Other Machines		
Sharpening Machine	Sharpen blades	5.2 KW
Control Panel	-	-

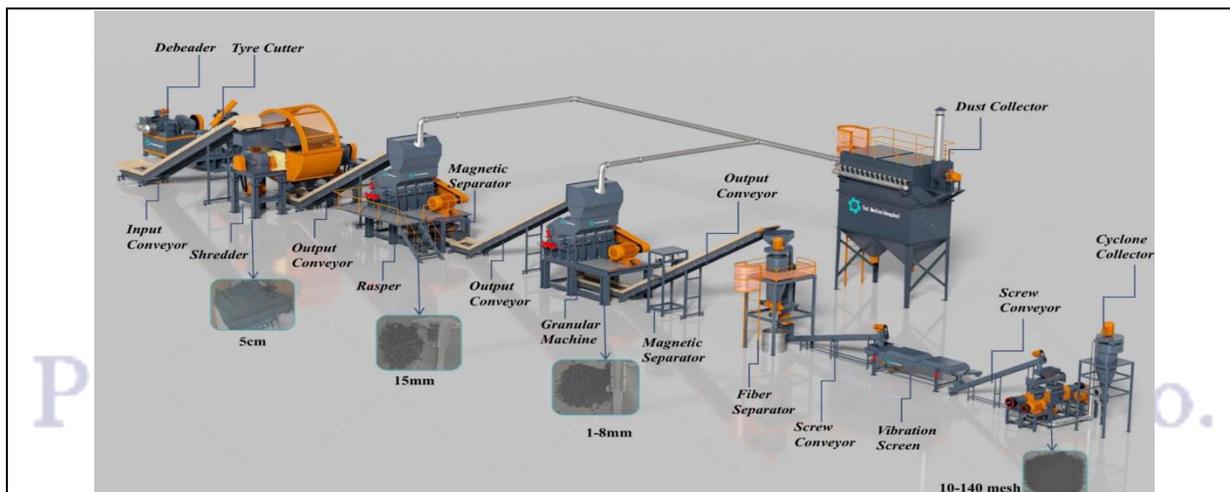
## 10.2 PP/PE recycling line (Crush – Wash – Pelletize)



Crushing/Grinding		
Conveyor Belt	Transport materials to the plastic crusher	1.5 KW
Plastic Crusher	Crush and grind plastic into smaller sizes	45 KW
Cleaning Machine	Remove impurities	18.5 KW
Washing		
Washing Tank	For washing and removing impurities	-
Vertical Drying Machine	Transport materials from the washing tank and dry	11 KW
Horizontal Drying Machine	For drying	11 KW

Pelletizing		
Metal Removal and Feeding Machine	Remove metal impurities and feed materials to the pelletizing unit	0.75 KW
Plastic Melting Machine	Melt plastic for pelletizing	110 KW
Plastic Pelletizing Machine	Pelletize the plastic	55 KW
Mold	Hydraulic mold for continuous screen changes	3 KW
Water Tank	Stainless steel	-
Cutting		
Blowing Machine	Blow to remove moisture from the pellets	-
Cutting Machine	Cut pellets	-
Silo	Storage	2.2 KW
Control Panels		
Electrical Control Panel	Control for the crushing and washing section	-

### 10.3 Tires recycling line (Grinding)



Steel wire removing		
Tire Steel Removal Machine	Removes the internal steel wire of the tire vertically.	15 kW + 0.75 kW
Tire Cutting Machine	Cuts the tire completely into 4-5 pieces.	5.5 kW
Tire flakes		
Conveyor Belt	Transports materials to the next stage.	3 kW
Dual Shaft Shredder	Shreds used tires less than 1200 mm in length and rubber material into 50 mm blocks.	37 kW * 2 + 2.2 kW
Steel wire removal		
Conveyor Belt	Transports materials to the next team.	3 kW
Shredder	Shreds 50x50 mm rubber blocks into pieces and separates steel wire.	75 kW
0.75 kW	Separates rubber from steel wire.	Magnetic Separator
Pelletizing		
Conveyor Belt	Transports materials to the next pelletizing machine.	2.2 kW
Pelletizing Machine	Crushes separated rubber materials into fine pellets (200 to 40 mesh).	75 kW

Grinding		
Rubber Grinding Machine	Grinds rubber pellets into different sized rubber powder.	30 + 2.2 kW
Collector	Collects rubber pellets into the rubber grinding machine.	11 kW
Dust removal		
Fiber Separator	Separates rubber fibers and pellets.	3 + (1.1 * 3) kW
Conveyor Belt	Sends rubber pellets to the next stage.	3 kW
Exit Screen	Separates materials of different sizes upon exit.	0.75 * 2 kW
Exit Conveyor Belt	Sends materials with the final correct size.	3 kW
Dust Removal Equipment	Handles dust cleaning issues within rooms and uneven distribution of inputs and outputs.	7.5 kW
Additional Parts	Storage container for fiber pellets, dust removal fan, cyclone collector, air lock, water cooling tube.	-
Control Box	Automatic reversal when current exceeds the allowable limit. Emergency stop.	-

#### 10.4 Cardboard Baler



Crushing/Grinding		
Conveyor Belt	Transport materials to the Baler	4 KW
Baler machine	Turn cardboard into 1100 * 800 mm Bales	22 KW

#### 10.5 Plastics crushing machines

Energy Consumption: 30 KW  
Feeding Opening Size: 600 × 640 mm  
Function: Crushing materials into small pieces  
Weight: 1000 kg



## 10.6 Metals Baling machines

Energy Consumption: 7.5 KW  
Feeding Opening Size: 430 x 1110 mm  
Function: Baling metals  
Weight: 2700 kg



## 11 Project Cost

Cost of the Circular Economy City with its entire infrastructure, production lines, transportation machinery and lines: 33,000,000 Jordanian dinars as the first phase, where the total number of stages is 90 million dollars

## 12 Conclusion

The Circular Economy City for Recycling is a pioneering and effective model in addressing the challenges of plastic waste and tires in Jordan, combining technical innovation, environmental sustainability, and economic and social feasibility. Through the adoption of integrated production lines and advanced technologies, the city contributes to the transformation of waste into valuable products, reducing environmental pressures, reducing the depletion of natural resources, and boosting the local economy by creating new jobs and supporting sustainable industries.

**Thank You for Your Interest in Environmental Sustainability.**

**Sincere regards,**

General Manager, Eng. Mohammed Al-Khatib



The Far East Projects & Development Co.

<https://thefareastproject.co.uk/>

<https://www.facebook.com/mohammadalkhatib000/>