



# Global Compact Network Pakistan

## NET ZERO RESEARCH CHALLENGE 2023

Case Studies on four leading business enterprises from Pakistan to inspire Net Zero Transition

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**PAK-ARAB REFINERY LIMITED (PARCO)**





## Project Brief

July 2023 was the hottest month in recorded modern history! As noted by the Secretary General of the United Nations, climate change has attained crisis proportions as a global existential threat. UN member states that had, in 2015 Paris Agreement, committed to combat global warming by reducing the planet's temperature to 1.5 degrees Celsius, the Net Zero target for 2050, must ensure achieving this commitment! Globally, 2050 is the target year by which we should extract the same amount of Greenhouse Gases (GHG) as we emit in our processes, thus neutralizing their impact to zero. Pakistan is the eighth most vulnerable country to Climate Change. The floods of 2022 are taken as the first indicators of this climate catastrophe.

The Global Compact Network Pakistan has been instrumental in supporting the private sector as a whole, and its members in particular, to incorporate sustainability in their strategic visions. As we move forward in this decade of action (2020 - 2030), awareness among stakeholders has forced business organizations to revamp their operations and create transition plans to reduce their carbon footprint. If, by 2025, businesses do not align their strategies with sustainability practices they will become irrelevant because climate change is now an existential crisis.

In Pakistan, business organizations have not been able to make commitments to the Net Zero target year despite having sustainability-focused policies in place. Only 26 business organizations have committed under the Net Zero Pakistan initiative by the Pakistan Environmental Trust. Of these, 25 organizations are from the Textile and Apparel sector. This is mainly due to the prerequisites of carbon footprints in their supply chains set by the textile and apparel products buyers in Europe and North America. Given the urgency of the situation, the agenda for a global requirement to lower the carbon footprint is pushed forward, and similar actions will be expected by stakeholders in almost every business sector. In its mandate to advocate for Climate Action, GCNP initiated the Net Zero Research Challenge 2023 as an academia-business research project to develop Case Studies on companies in Pakistan on their Net Zero Journey. The core objective of this project was to develop four Case Studies to be used as learning tools in universities for business students to understand the global transition. These case studies are also intended to, be used as guidelines for SMEs to develop their sustainability policies. GCNP partnered with four prominent large-scale organizations; Artistic Milliners (Private) Limited, Roshan Packages Limited, Pak Arab Refinery Limited, and AGI Denim (Private) Limited.

One main objective of the project was to promote experiential learning. This was achieved by engaging Research Teams from Institute of Business Administration (IBA) or NED University. Each corporate partner was deputed a Research Team to conduct in-depth desk reviews, and field visits, and to engage with the leadership to not only incorporate the initiatives already taken by these companies but also to construct a strategic roadmap for companies as a proposal for 2030 and beyond. The Research Teams, led by a faculty member, built their research on how regional business entities have adopted sustainable practices, particularly how operational transitions have helped organizations to reduce their carbon footprint either directly from their operations (Scope 1), or indirectly (Scope 2). The priority area was to structure solutions that could bring optimum efficiency regarding carbon emissions. Furthermore, integrating through the value chain and tracking carbon emissions (Scope 3) was considered and incorporated as a significant policy-backed action for companies.

The Net Zero Research Challenge was launched on 09 June 2023 with a Briefing Session for Corporate and Academic partners. In two months, Research Teams under the guidance of a Project Consultant were able to draft Case Studies on their respective companies. The Case Studies highlight key initiatives taken by companies regarding Sustainable Development Goals, Sustainability, and Carbon Emission projects, particularly the proposed roadmap to achieve Net Zero by 2050. In this Publication, four Case Studies will contextualize important solutions for reducing carbon emissions starting from the plantation of trees and mangroves, awareness raising of stakeholders, transport and operational efficiency, to carbon capture and storage. It also emphasized how interventions and collective reforms can create a substantial difference and contribute to setting up Carbon Credit and Carbon offsetting projects in Pakistan. The Concluding Event was held in Karachi on 17 August 2023 at Movenpick Hotel in which all four Research Teams presented their respective Case Studies.

**Khalid Junejo**  
**Executive Director**

**GLOBAL COMPACT NETWORK PAKISTAN'S  
ENLIGHTENED CORPORATE PARTNERS:**





## Pak Arab Refinery Limited

Established in 1974 and headquartered in Karachi, PAK-ARAB REFINERY Ltd. (PARCO) constitutes a collaborative partnership between the Government of Pakistan, holding a majority share of 60%, and the Emirate of Abu Dhabi, with a 40% stake. Renowned for its stature as the second-largest refinery in Pakistan, PARCO commands a formidable refining capacity of 120,000 Barrels Per Day, thereby assuming a preeminent role in the domains of Crude Oil Refining, Transportation, and Marketing of petroleum products. The strategic dimension of its fuel supply endeavors is reinforced through synergistic ventures with TOTAL (France) and OMV (Austria). Beyond its primary operational scope, PARCO's significance is underscored by its subsidiaries including TOTAL PARCO PAKISTAN LTD (TPPL), PAK – ARAB PIPELINE COMPANY LIMITED (PAPCO), PARCO COASTAL REFINERY LIMITED (PCRL), and Pearl Gas. This intricate network, coupled with an extensive 2000-kilometer pipeline infrastructure, substantiates PARCO's centrality within Pakistan's energy landscape, engendering notable contributions to both economic expansion and energy security.

SDG No.	SDG NAME	SDG ACTION
1	NO POVERTY 	Support for Technical Training Centers to empower individuals.
2	ZERO HUNGER 	Skills Development Program fostering self-reliance and livelihoods.
3	GOOD HEALTH AND WELL BEING 	Upgrading hospitals along the pipeline route for better healthcare access.
4	QUALITY EDUCATION 	Enhancing schools to provide improved education opportunities.
5	GENDER EQUALITY 	Empowering women through sewing and display centers in rural areas.
6	CLEAN WATER AND SANITATION 	Reusing effluent-treated water for horticulture, promoting sustainability.
7	AFFORDABLE AND CLEAN ENERGY 	Transitioning remote stations to solar energy for cleaner power.
8	DECENT WORK AND ECONOMIC 	Establishing a digital roadmap, ensuring work-related health and safety.
9	INDUSTRY INNOVATION AND INFRASTRUCTURE 	Dualizing pipelines (MOGAS project) for enhanced efficiency.
10	REDUCED INEQUALITY 	Promoting diversity and inclusivity within the organization.
11	SUSTAINABLE CITIES AND COMMUNITIES 	Developing sustainable infrastructure in Qasba Gujrat.
12	RESPONSIBLE CONSUMPTION AND PRODUCTION 	Advancing circular economy initiatives for sustainable practices.
13	CLIMATE ACTION 	Implementing a Flare Gas Recovery System to reduce emissions.
14	LIFE BELOW WATER 	Launching the Blue Ocean Project for marine conservation.
15	LIFE ON LAND 	Protecting wildlife in Kithar National Park for biodiversity preservation.
16	PEACE JUSTICE AND STRONG INSTITUTION 	Strengthening compliance-related policies for institutional integrity.
17	PARTNERSHIPS FOR THE GOALS 	Collaborating with UN Global Compact to achieve sustainable goals.

PARCO's Sustainability-focused vision and strategy drive its Environmental, Social, and Governance (ESG) domains, contributing to addressing all 17 Sustainable Development Goals set up by the UN for 2030. PARCO has developed enterprise as well as administrative functions' level scorecards to track the effectiveness of the short-to-long-term goals, initiatives, and targets in each ESG domain. These scorecards are an obligatory part of our regular budgeting and planning process, wherein progress is reviewed and strategies are developed accordingly.

The organization conspicuously demonstrates its commitment to sustainable practices through its proactive prioritization and substantial investment in sustainable initiatives.

PARCO has embarked on an ambitious journey towards sustainability, marked by a series of strategic initiatives aimed at minimizing environmental impact while fostering operational efficiency. This journey aligns seamlessly with global efforts to address climate change and underscores PARCO's commitment to responsible corporate citizenship.

1. Expansion and Dualization of Pipeline Network: Has Enhanced safety in transporting MOGAS to upcountry areas and reduced heavy vehicle traffic, leading to decreased road accidents and carbon impact. The Modified pipeline system increases capacity and flexibility for multiple products. New pumping stations have been installed with additional storage tanks, and pipeline upgrades to boost capacity from 3 to 7 MTPA.
2. Renewable Energy: Installation of solar panels in Cathodic Protection stations and remote areas. Solar-Diesel Hybrid Power Solution in Dhal, reducing carbon footprint equivalent to 1,200 mature trees.
3. Drag Reducing Agents (DRA): has Improved energy efficiency using DRA during pipeline pumping. DRA lowers friction, increases fluid flow, and reduces energy consumption while maintaining output. A systematic approach with an Energy Management System (EMS) post-refinery upgrade is being implemented. Energy Performance Indicators (EPIs) are used to monitor and optimize consumption. More Focus on technical advancements for lower energy use while maintaining output and More Emphasis on process optimization and energy efficiency to cut costs and CO2 emissions.



606.81 Tons of CO2e (Scope 2)  
saved through Renewables and Smart  
Pipeline Operations



44,968 kWh  
generated through Renewables (Solar)



1,856,268 kWh  
saved through Smart Pipeline  
Operations

4. Environmentally friendly technologies: Diesel Hydro Desulphurization Unit (DHDS) produces low-sulfur HSD, reducing hazardous emissions. The PENEX Unit reduces gasoline Benzene and aromatics for a greener environment. The Pressure Swing Absorption (PSA) Unit recovers and purifies hydrogen, enhancing cleaner diesel production.
5. Reducing Flaring and Venting: The advanced plant minimizes routine flaring, with controlled venting during specific operations. A Flare Gas Recovery Project is underway to reduce Scope 1 GHG emissions.
6. Recycling Wastewater from Refinery: The Effluent Treatment Plant (ETP) treats refinery wastewater. The ETP protects the environment, improves air quality, recovers resources, and reduces waste disposal costs.



Zero  
Major Oil Spill

## **Road to 2050**

In its vision to be among the leading Energy enterprises in the region, PARCO is firm on its strategic goal to reduce its carbon footprint and initiate projects to commit towards a Net Zero target year. As compared to Shell's Net Zero Target of 2050, Reliance 2035, ARAMCO 2050, and Qatar Petroleum's 2030, PARCO is looking ahead with structural transformation to achieve Net Zero by 2050. PARCO plans to upgrade its infrastructure to produce Euro-5 fuels and reduce Fuel Oil (FO) production as per the government's directive to improve fuel specifications. Energy conservation and the use of renewable resources to generate power remains the top priority for PARCO as well. PARCO has been engaged with various feasibility studies for renewable and clean energy sources, combining various resources and cost estimation, to find a sustainable solution for meeting the organization's power requirements.

In the context of its endeavor to attain a state of Net Zero emissions, PARCO can undertake several pivotal measures to guide its trajectory forward. In the shorter run, PARCO may establish a Climate Action Committee, collaborating with its workforce to enhance awareness regarding carbon emissions and devising strategies to curtail Scope 2 carbon emissions.

PARCO is poised to achieve net zero emissions through a comprehensive approach encompassing five key categories:

- Energy Conservation
- Renewable Energy
- Bio Fuels
- Carbon Capture and Storage
- Waste recycling



As PARCO diligently engages in the realms of Energy Conservation and Renewable Energy, it may concurrently direct its attention toward exploring viable alternatives to ensure sustained regional competitiveness in the energy sector. Two major domains to start the Net Zero journey are to focus on Circular Economy and Carbon Capture and Storage.

### **The Circular Economy of Carbon**

The circular economy of carbon represents a transformative approach to managing carbon emissions and resources within our ecosystem. Unlike the traditional linear model of "take, make, dispose," the circular carbon economy seeks to close the carbon loop by minimizing waste and maximizing the reuse, recycling, and regeneration of carbon-based materials. The Petrochemical View of the Circular Economy encapsulates a strategic shift within the petrochemical industry towards a more sustainable and resource-efficient paradigm. This can open a new world of possibilities for PARCO's future biofuel and expansion goals. There has been significant research done on utilizing captured carbon and the results from the implementation are very promising. Two of the most promising uses of captured carbon are Carbon Mineralization and Carbon Neutral Fuel.



#### ***CO<sub>2</sub> to Fuel***

The transformation of carbon dioxide (CO<sub>2</sub>) into viable fuels is realized through a diverse array of chemical and biological conversion methodologies. The transformation begins when CO<sub>2</sub> is broken down into oxygen and CO, the latter of which can be combined with hydrogen to make a variety of hydrocarbon fuels. Adding four hydrogen atoms, for example, creates methanol. One shining example of this comes from Carbon Engineering in Canada. They have perfected the process of converting captured carbon into low-carbon fuels. Their hydrogen is produced by splitting water into hydrogen and oxygen. The CO<sub>2</sub> and hydrogen are reacted to produce hydrocarbons which can directly, or with refining, be converted into drop-in compatible gasoline, diesel, and jet fuel.



#### ***CO<sub>2</sub> Mineralization***

Mineral Carbonation involves reacting minerals that contain Magnesium and Calcium. The captured CO<sub>2</sub> is used to produce SSS-based construction blocks that are bound by CO<sub>2</sub> as solid, stable carbonates, and that are equivalent in performance to precast non-reinforced concrete products on the market such as bricks or pavers. There are other diverse applications of CO<sub>2</sub> mineralization being experimented with in the industry as well such as refractory materials, glassmaking, and fire-retardant materials.

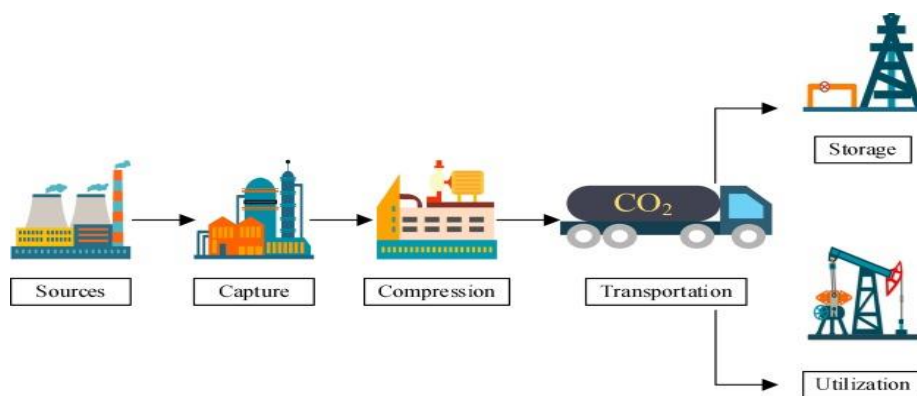


## Carbon Capture and Storage Units

PARCO is strategically poised to embrace Carbon Capture and Storage (CCS), a groundbreaking approach entailing the capture of carbon dioxide (CO<sub>2</sub>) emissions arising from industrial operations such as power generation from fossil fuels. In alignment with PARCO's forward-thinking vision, this captured carbon can be slated for efficient transport, followed by secure subterranean storage in geological formations.

A typical CCS project aims at about 90% efficiency, which means that 90% CO<sub>2</sub> from the power plant may be captured and stored. The implementation of this technology at PARCO's Mid-Country Refinery (MCR) at MehmoodKot would mean that CO<sub>2</sub> emissions may be reduced significantly in less than a decade. This leap will mark a monumental stride toward the realization of net zero emission aspirations. The global landscape mirrors this pursuit, with a notable 26 operational commercial-scale carbon capture projects worldwide, an additional 21 projects in early developmental stages, and 13 poised for advanced development. PARCO may consider a 10-year plan to implement Carbon Capture and Storage at its MCR.

Carbon capture opens doors to new doors for PARCO, such as repurposing captured carbon for sustainable fuel, chemical, or material production (mentioned earlier), thereby expanding market reach and profitability. Collaborations with research institutions and technology providers in the realm of carbon capture can lead to shared knowledge, cost-sharing, and access to funding for research and development, enhancing the company's competitive position. Embracing carbon capture not only enhances a company's image as environmentally conscious but also attracts environmentally-minded investors, customers, and stakeholders, potentially bolstering market share and brand value. Importantly, such initiatives position companies for long-term sustainability by reducing regulatory risks, maintaining their social license to operate, and securing their role in a low-carbon future.



## **Resilience for Net Zero**

The Government of Pakistan intends to set a cumulative ambitious conditional target of an overall 50% reduction of its projected emissions by 2030. To reach the target, Pakistan aims to shift to 60% renewable energy, and 30% electric vehicles by 2030 and ban coal imports as well as expand nature-based solutions. Looking ahead to a sustainable future and aiming to stand toe-to-toe with regional energy leaders, PARCO is acutely conscious of its Carbon Footprint and is consequently resolutely committed to implementing comprehensive measures for carbon reduction and environmental stewardship. PARCO's launch of its sustainability report has reaffirmed its position as the most visionary oil and gas company in Pakistan and has shown the way forward for other national Oil and Gas companies, nonetheless, there is a lot more to explore. In the short term, PARCO is on track to further reduce its carbon emissions by conserving energy and opting for renewable energy options. A climate action committee, as suggested, could work to increase the awareness amongst employees to reduce Scope 2 emissions. In the medium run, PARCO could explore Carbon Capture and Storage policies and study feasibility. This will not only dramatically increase the carbon neutral goals of PARCO but can also open dialogue for further expansion in Carbon Mineralization and Carbon Negative fuels in Pakistan. In the longer run, PARCO's strategic initiative to establish Carbon Capture and Storage Units, as suggested, can significantly diminish its carbon footprint, thereby laying a solid foundation for the advancement of its petrochemical circular economy.



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# GLOBAL COMPACT NETWORK PAKISTAN'S ENLIGHTENED ACADEMIC PARTNERS:



The NED University of Engineering & Technology, was established in March 1977 under an act of the Provincial Assembly of Sindh after upgrading of the former NED Government Engineering College, which was set up in 1921. The NED University is thus one of the oldest institutions in Pakistan for teaching and producing Engineering graduates. Our mission is to make students acquire education and research excellence in engineering and allied disciplines to produce leadership and enabling application of knowledge and skills for the benefit of the society with integrity and wisdom.

The department of Economics and Management Sciences is a part of faculty of Architecture & Management Sciences. The degree programs are designed to develop logical reasoning and analytical skills among students through the provision of advanced knowledge in the field of Economics and Management Sciences. The department aims to establish the thinking ability of the students in such a way that they can carry out innovative research in the field of Economics, along with to prepare the students to meet the market challenges in public and private sector.

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The era of global warming has ended; the era of **global boiling** has arrived.”

***António Guterres***  
*Secretary-General of the United Nations*

