

KURDISTAN GAS PROJECT

A ten-year look back and look ahead

Impact Assessment Report 2018



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EXECUTIVE SUMMARY

In 2007, Dana Gas and Crescent Petroleum entered into agreement with the Kurdistan Regional Government (KRG), which provided title and exclusive rights to appraise, develop, produce, market, and sell petroleum, including natural gas domestically and for export, from the Khor Mor and Chemchemical fields in the Kurdistan Region of Iraq (KRI). The agreement marked the start of the Kurdistan Gas Project's contribution as an enabler in the development of the KRI's gas extraction and production.

Within a record 15 months from the start of construction, gas began flowing in October 2008 through newly built pipelines from Khor Mor to power plants in Chemchemical and Erbil. In the ensuing decade, the Project has delivered reliable, affordable energy at scale to the KRI, making a considerable impact on the region's economy, society, and environment.

In 2009, Pearl Petroleum (the Consortium/Pearl/PPCL) was formed as a consortium with Dana Gas and Crescent Petroleum as shareholders with OMV, MOL, and RWE joining the Consortium subsequently with a ten per cent share each. Crescent Petroleum and Dana Gas operate the fields as joint operators on behalf of Pearl.

To commemorate the ten-year anniversary of production in the Kurdistan Gas Project, Crescent Petroleum, Dana Gas and Pearl Petroleum asked PwC to lead an in-depth study to assess the socioeconomic benefits enabled by the Project. PwC studied the impact of the Project in its first decade of operations and projected forward the future impacts based on the anticipated development of the Project over the next decade.

This report presents PwC's key findings and highlights the considerable returns the Project has delivered and will continue to deliver to the KRI.



THE THREE KEY AREAS OF CONTRIBUTION

PwC assessed the Project's contribution to the KRI in three key areas: economy, society, and the environment; locally and globally, taking both a historic and forward-looking view.

The study reviewed the Project's contribution from 2008 to 2017 and estimated its future contribution to the region, given the extensive investment the Consortium is planning in the development of the fields.

How the Kurdistan Gas Project contributes to the KRI







A DECADE OF PARTNERSHIP, SERVICE, AND PROGRESS

Capital investment in the gas project infrastructure and day-to-day operations sustain significant economic activity in the KRI. However, the Project's most significant economic contribution, by far, is through the energy provided to power the KRI's electricity grid.

The electricity generated with gas not only fulfills the basic needs of the KRI's 5.9 million inhabitants, but it also powers activity in all sectors of the economy, including in agriculture, in industry, and in commerce.

By 2017, gas supplies accounted for about 80 per cent of the energy used for electricity generation in the KRI. PwC estimated that, in 2017, this contributed between USD 10.7 billion and USD 18.3 billion to the KRI's GDP by delivering reliable and affordable electricity to the region. This implies that economic growth over the past ten years would have been considerably lower without gas production from the Project.

In the course of its operations, the Project generated 2,200 permanent jobs in 2017 and 20,000 temporary jobs during the construction phase, underscoring the direct economic impact it has had, particularly on local communities.

By supplying natural gas for generating the KRI's electricity, the use of the alternative, more carbon-emitting diesel is avoided. This means that less greenhouse gases are released into the atmosphere as the greenhouse gas footprint of natural gas is considerably lower than what the footprint would be if diesel were used instead.



THE FIRST TEN YEARS

Total investment

USD 1.3bn



Enabled GDP impact

GDP contribution

USD 10.7bn –
USD 18.3bn



Employment impact

Temporary during construction phase

20,000 jobs

Permanent during operational phase

2,200 jobs (2017)



Savings generated due to fuel substitution

Fuel cost savings to KRG

USD 21.3bn

Greenhouse gas emissions savings

29m tCO₂e



Localisation

Local staff employment

Over 80%

Local procurement

USD 0.3bn

Source: PwC analysis (2018)

A FUTURE OF CONTINUED INVESTMENT AND PROGRESS

Looking to the next decade, PwC assessed the Kurdistan Gas Project's socioeconomic impact based on planned USD 4.3 billion in additional expenditure on the project. The scenario envisions more than trebling production at Khor Mor from the current 400 MMscfd to 1,400 MMscfd, delivering an additional 750 MMscfd for domestic consumption in the KRI and 250 MMscfd of gas to supply the rest of Iraq.

The expansion would also include the production of 285 kbpd of crude oil from Khor Mor and additional condensates and liquefied petroleum gas (LPG).

PwC estimated the expanded operations would contribute between USD 28.6 billion and USD 41.6 billion to the KRI economy by 2027 and result in the creation of 7,500 permanent jobs by supporting economic activity in the KRI.

Nearly 90 per cent of those jobs would be for local staff within five years and the proportion would progress to an aspired 100 per cent in the years thereafter.

The Project would also save an estimated USD 33.2 billion over the next ten years by replacing diesel with gas, resulting in greenhouse gas emission savings of 77 million tonnes of carbon dioxide equivalent (tCO₂e).



THE NEXT TEN YEARS

Total investment

USD 4.3bn



Enabled GDP impact

GDP contribution

USD 28.6bn –
USD 41.6bn



Employment impact

Temporary during construction phase

84,000 jobs

Permanent during operational phase

7,500 jobs (2027)



Savings generated due to fuel substitution

Fuel cost savings to KRG

USD 33.2bn

Greenhouse gas emissions savings

77m tCO₂e



Localisation

Local staff employment

90% within next 5 years
100% eventually

Local procurement

USD 1.2bn



ABOUT THIS REPORT



ABOUT THIS REPORT

The year 2018 marks the ten-year anniversary of the Companies' production in the KRI.

As the Companies look back at a decade of progress, professional services firm PwC assessed the contribution of the Kurdistan Gas Project to the region based on the capital investment, direct operations, the activities of suppliers, and the impact that consumption of the product, natural gas, has had on the KRI.

PwC also assessed the impact of the Project's Corporate Social Responsibility (CSR) initiatives in the region to determine future activities and assess their impact on society.

Ultimately, PwC assessed the contribution in three key areas in the KRI: economy, society, and the environment, both locally and globally. This assessment takes both a historic and forward-looking view; it reviews the Project's contribution during its first ten years of operation, from 2008 to 2017, and estimates its future contribution to the region, given the extensive investment projected under future plans.

In addition to expressing the impacts of activities in quantitative and monetary terms, PwC also assessed them in the context of the United Nations' Sustainable Development Goals (SDG), analysing how the project contributes towards meeting the SDG priorities of the KRI.

Taken together, these measures present a holistic view of how the Kurdistan Gas Project has contributed to the region and how it will contribute to the future development of the KRI.



Future expansion scenario

Gas

In addition to current gas production from existing facilities and debottlenecking

1,000 MMscfd
from Khor Mor



750 MMscfd for domestic consumption



250 MMscfd for interregional transfer

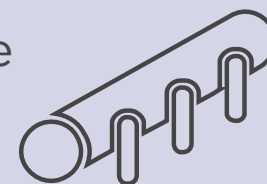
Crude oil

285 kbpd
from Khor Mor



LPG/Condensate

Produced in line with gas plant design



Overarching view of study

Pearl Petroleum activities



Investment



Operations



Supply chain



Product



CSR



Contribution to the KRI economy



Impact on KRI society



Stewardship of the environment



Assessed historically over the period 2008–2017

and anticipated future impacts from 2018–2027

ABOUT THE KURDISTAN REGION OF IRAQ (KRI)

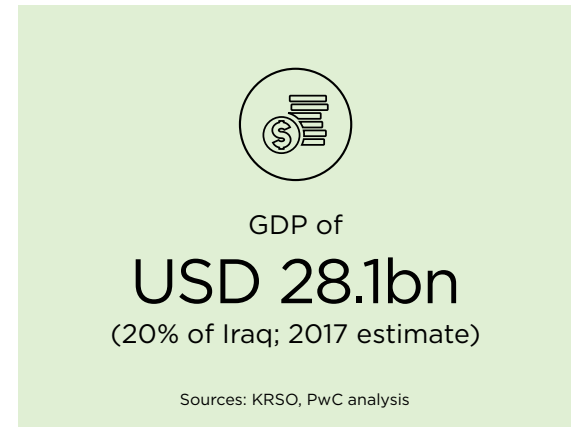
The KRI is a federal region in northern Iraq comprised of three governorates, Dohuk, Erbil, and Sulaymaniyah, with a combined population of about 5.9 million.

The KRI economy is heavily dependent on services and public administration. Its manufacturing sector is nascent and only a small share of GDP comes from agriculture.

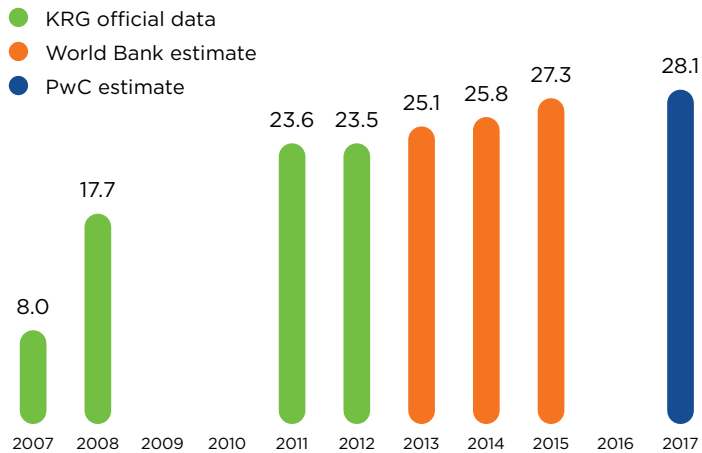
The region has been relatively immune to the insecurity and conflict witnessed elsewhere in Iraq, especially following the 2003 Iraq war and the security challenges brought on in recent years.

As a result, the Kurdistan Regional Government (KRG) has been able to promote a burgeoning private sector and attract foreign direct investment in both its oil and non-oil sectors.

This, in turn, has led to a steady increase in GDP over the past ten years amid comparatively moderate levels of unemployment for most of the period.

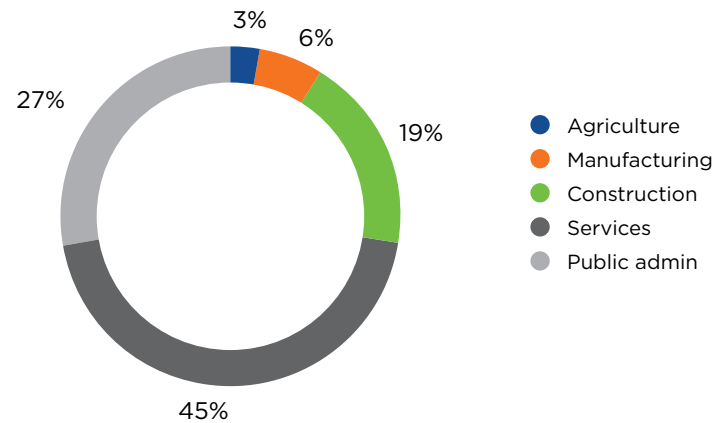


Evolution of GDP over time - Nominal non-oil GDP (USD, bn)

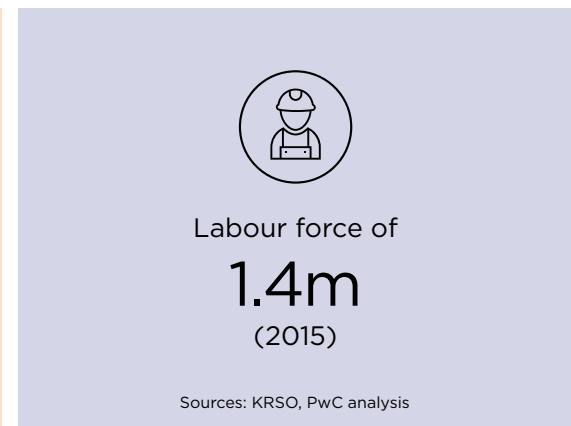
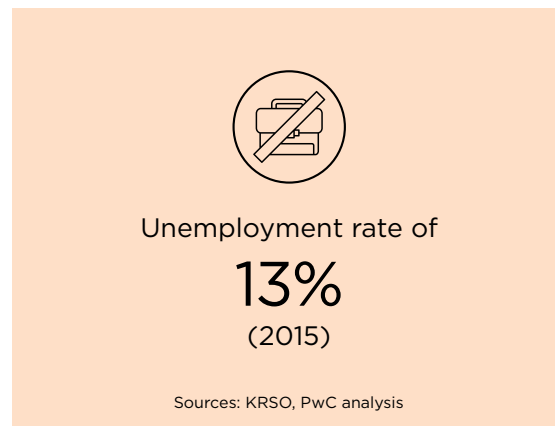
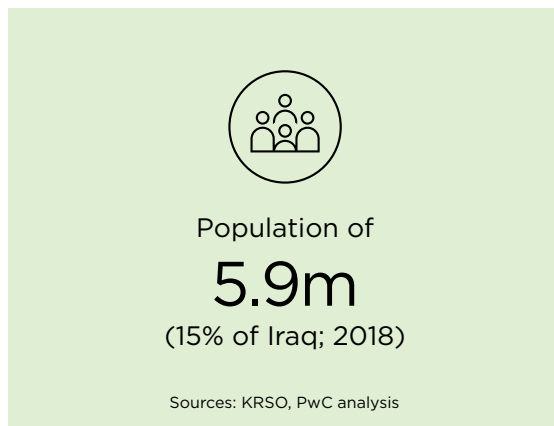


Sources: KRSO, World Bank, PwC analysis

Distribution of GDP by sector



Sources: KRSO, PwC analysis



However, the fall in oil prices experienced in 2014 coupled with the influx of Syrian refugees and Iraqi internally displaced people (IDPs) into the KRI amid the heightened national security challenges presented major economic and social challenges for the region.

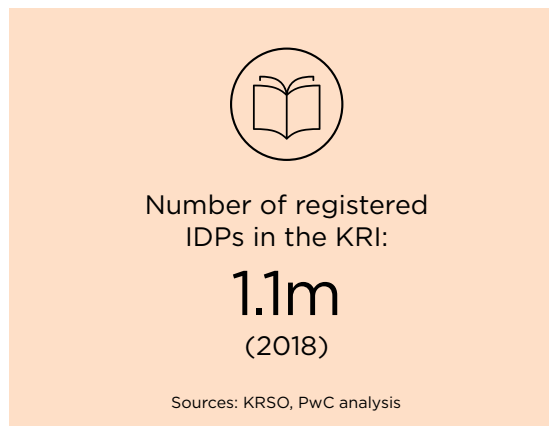
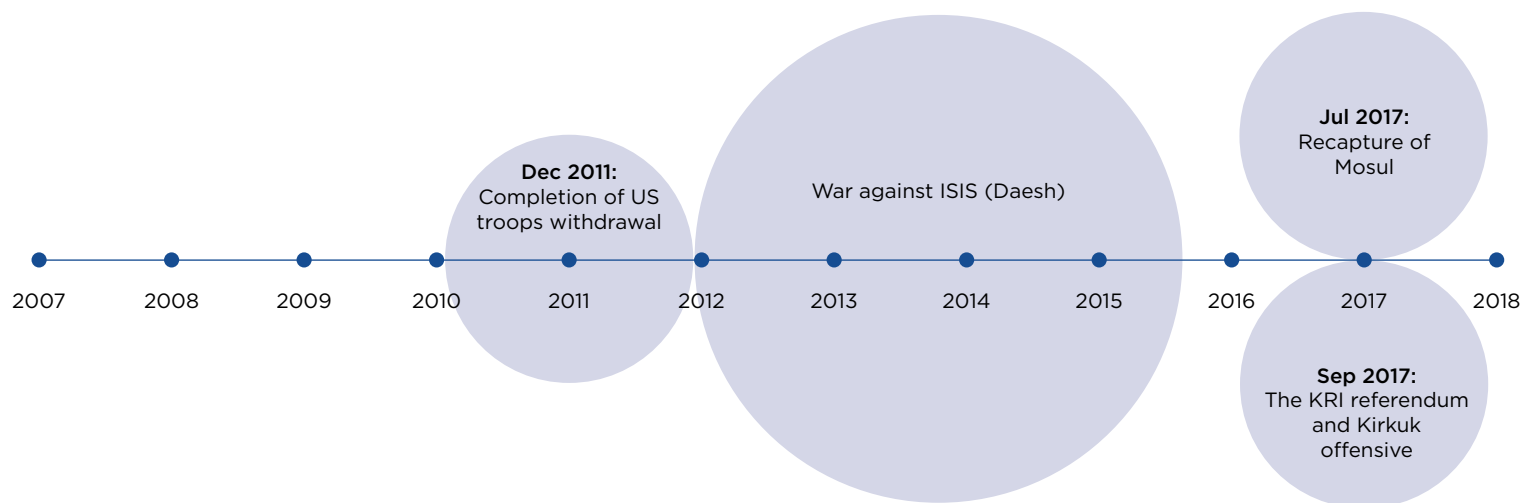
The conditions emphasised the need to accelerate the private sector-led economic diversification process.

The KRI Vision 2020 plan sets out a blueprint for structural reforms and a path to achieving sustainable economic growth in the region. The KRG is committed to rebalancing the economy away from the public sector to drive fiscal consolidation and to stimulate private sector activities in non-oil sectors.

This will be realised by enabling a vibrant business environment as well by unleashing entrepreneurship, particularly among young people, and encouraging improvements in productivity, quality, innovation, and access to regional and global markets.

At the same time, policies that enable small and medium-sized enterprises (SMEs) to grow and encourage larger companies to become more internationally competitive are viewed as critical to building a stronger, more diversified private sector.

Timeline of recent events in the KRI



ABOUT THE KURDISTAN REGION OF IRAQ (KRI)

The KRG recognises that its oil and gas industry is integral to realising its strategic economic development priorities by enabling low-cost, secure, and affordable sources of energy.

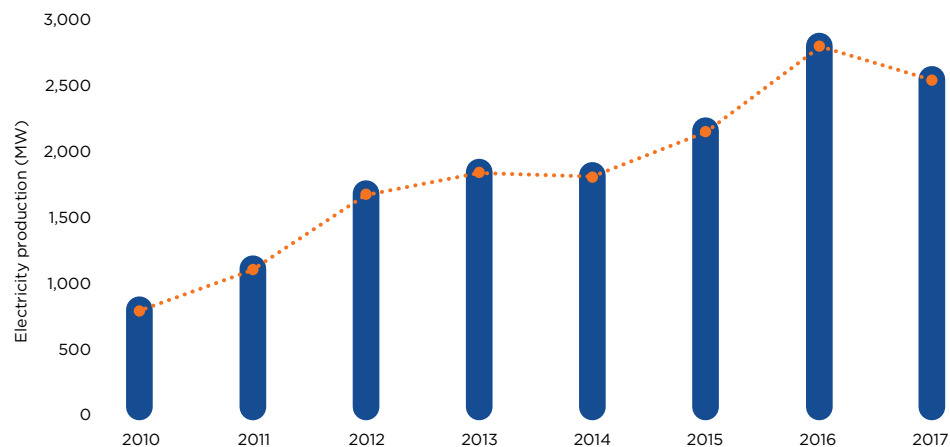
Electricity supply is the central driving force of the economy, supporting all activities within the economy and community development.

Up until 2007, the KRI faced an acute electricity crisis and an absence of locally generated power. Many businesses and residents typically had access to electricity for only two hours a day.

The investment in the Kurdistan Gas Project transformed this picture, allowing for improved and reliable supply of electricity of eight to 14 hours or more per day.

Going forward, the KRG has recognised the need to undertake critical infrastructure investments to ensure adequate power availability, reliability, reduction of losses, and trade of surplus electricity with neighbouring regions of Iraq and elsewhere in the region.

Electricity production in the KRI



Sources: PPCL, PwC analysis



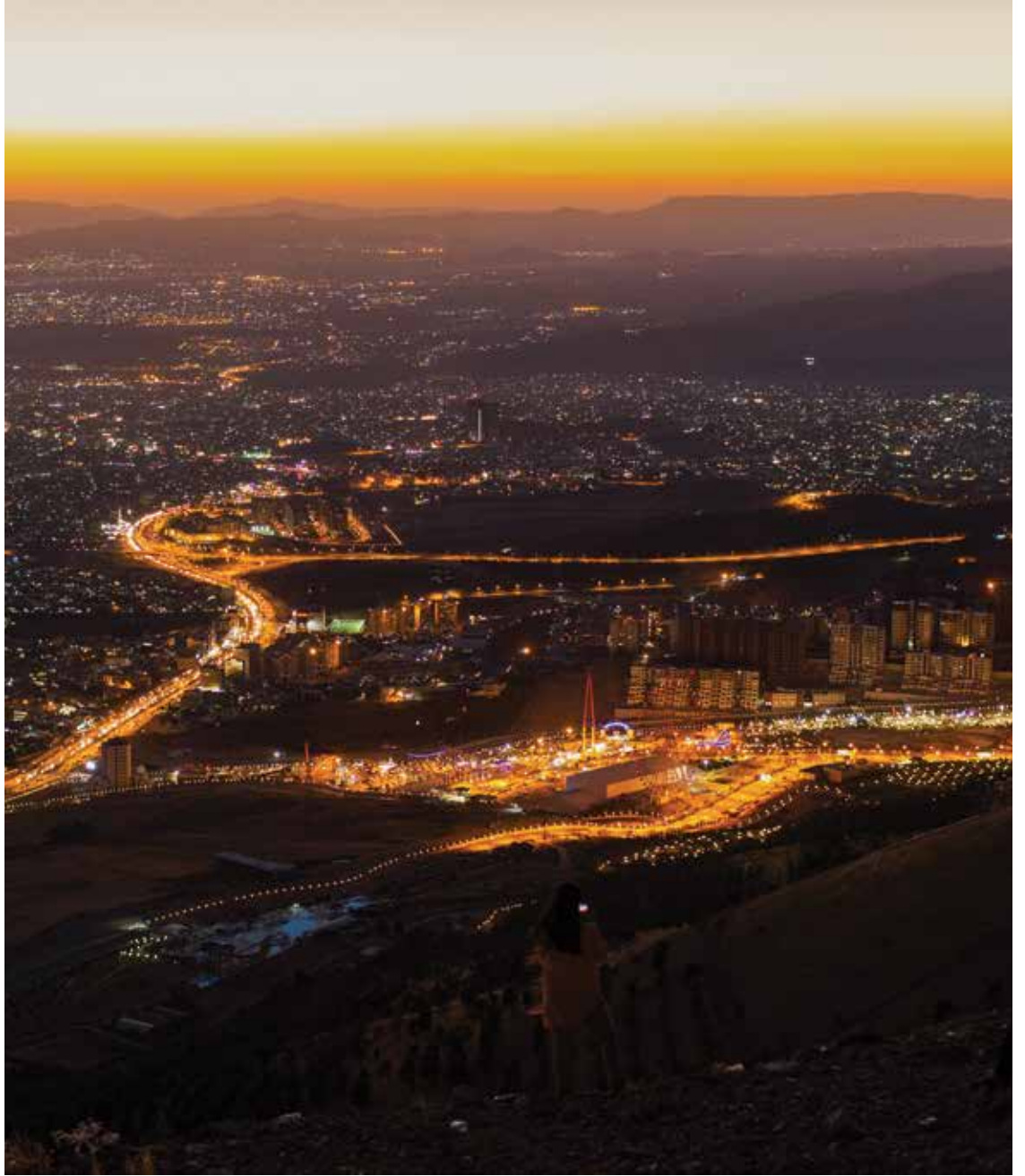
Oil production of
192 kbpd
(2017)

Sources: MNR, PwC analysis



Oil exports of
188 kbpd
(2017)

Sources: MNR, PwC analysis



THE PROJECT'S PRESENCE IN THE KRI

In April 2007, Dana Gas and Crescent Petroleum entered into an agreement with the KRG, which provided title and exclusive rights to appraise, develop, produce, market, and sell petroleum, including natural gas domestically and for export, from the Khor Mor and Chemchemical fields in the KRI.

The aim was to develop the natural gas potential of the region and deliver clean-burning natural gas for more efficient and low-cost power compared to alternatives.

In a record 15 months from the start of construction, an Early Production Facility and gas pipelines were completed and operating, transporting gas from the Khor Mor natural gas field to turbines in power plants in Erbil and Chemchemical.



Current gas capacity of
400 MMscfd

Source: PPCL



Future gas capacity of
1400 MMscfd

Source: PPCL



Future oil capacity of
285 kbpd

Source: PPCL

The first stage of the Khor Mor field development was completed in 15 months, a record time for a project of its scope. The first gas deliveries to Erbil commenced in October 2008, with the help of an Early Production Facility.

A second stage, involving the installation of a liquefied petroleum gas (LPG) plant, was completed in 2011 and further investment has continued since then.

The production rights were transferred in 2009 to the newly formed Pearl Petroleum Company Limited, a joint venture between Dana Gas and Crescent Petroleum, which subsequently formed the Pearl Petroleum Consortium together with major European petroleum companies, the Austrian Mineral Oil Administration (OMV) and the Hungarian Oil and Gas Public Limited Company (MOL), and later, the German RWE.

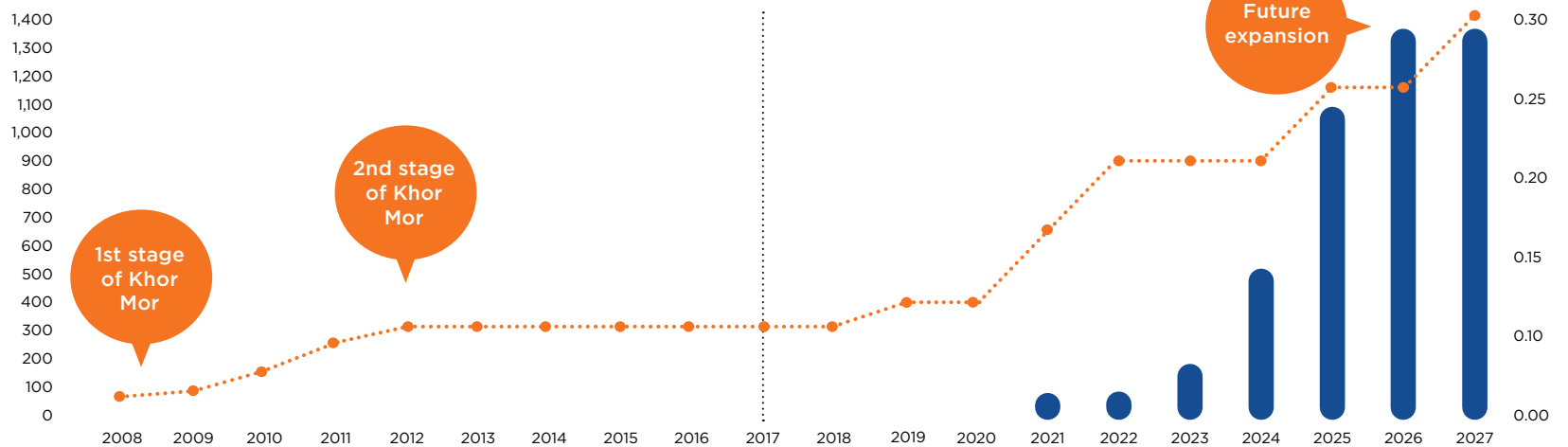
OMV is Austria's largest listed industrial company while MOL is Hungary's largest listed company.

Continual investment is planned in the decade ahead, with a projected capex and opex of USD 4.3 billion planned between 2018 and 2027.

Pearl Petroleum's gas production capacity

Gas production capacity (MMscf/day)

- Gas volume
- Oil production



Source: PPCL



Past capital investment of
USD 0.9bn

Source: PPCL



Future capital investment of
USD 3.3bn

Source: PPCL





THE PROJECT'S CONTRIBUTION TO THE KRI



THE PROJECT'S CONTRIBUTION TO THE KRI

Operations support the KRI in economic, social, and environmental terms

The Project's contribution to the KRI is exhibited in three key ways: by enabling continued growth in the KRI's domestic economy, by driving human capital and community development, and by instilling a more responsible approach towards managing the environment.

In this manner, the companies' operations contribute to local development priorities as well as to the global development agenda structured around the SDGs. This section sets out the contribution across these three areas in quantitative and qualitative terms.



Contribution to the KRI economy

- Providing natural gas to major power stations
- Stimulating economic growth
- Supporting entrepreneurship and business growth
- Creating financial savings to the electricity grid as a result of gas-for-diesel substitution



Impact on the KRI society

- Creating jobs, particularly for locals in the KRI
- Improving social well-being through better local social infrastructure and higher value added jobs
- Giving back to the community through a wide range of social initiatives



Stewardship of the environment

- Improving use of resources to promote long-term prosperity
- Avoiding greenhouse gas emissions as a result of substituting high-carbon diesel for relatively low-carbon gas
- Reducing the use of water and the generation of hazardous and non-hazardous waste



The Project contributes to the economy through investment, operations, and energy for domestic consumption

The Project contributes to the domestic economy of the KRI in multiple ways, which relate to every stage of the value chain: from the investment it makes in local energy infrastructure to the operations, supply chain, and, most importantly, the energy delivered to empower the local economy.

PwC assessed each of these contributions separately to determine the Project's economic footprint in the KRI.

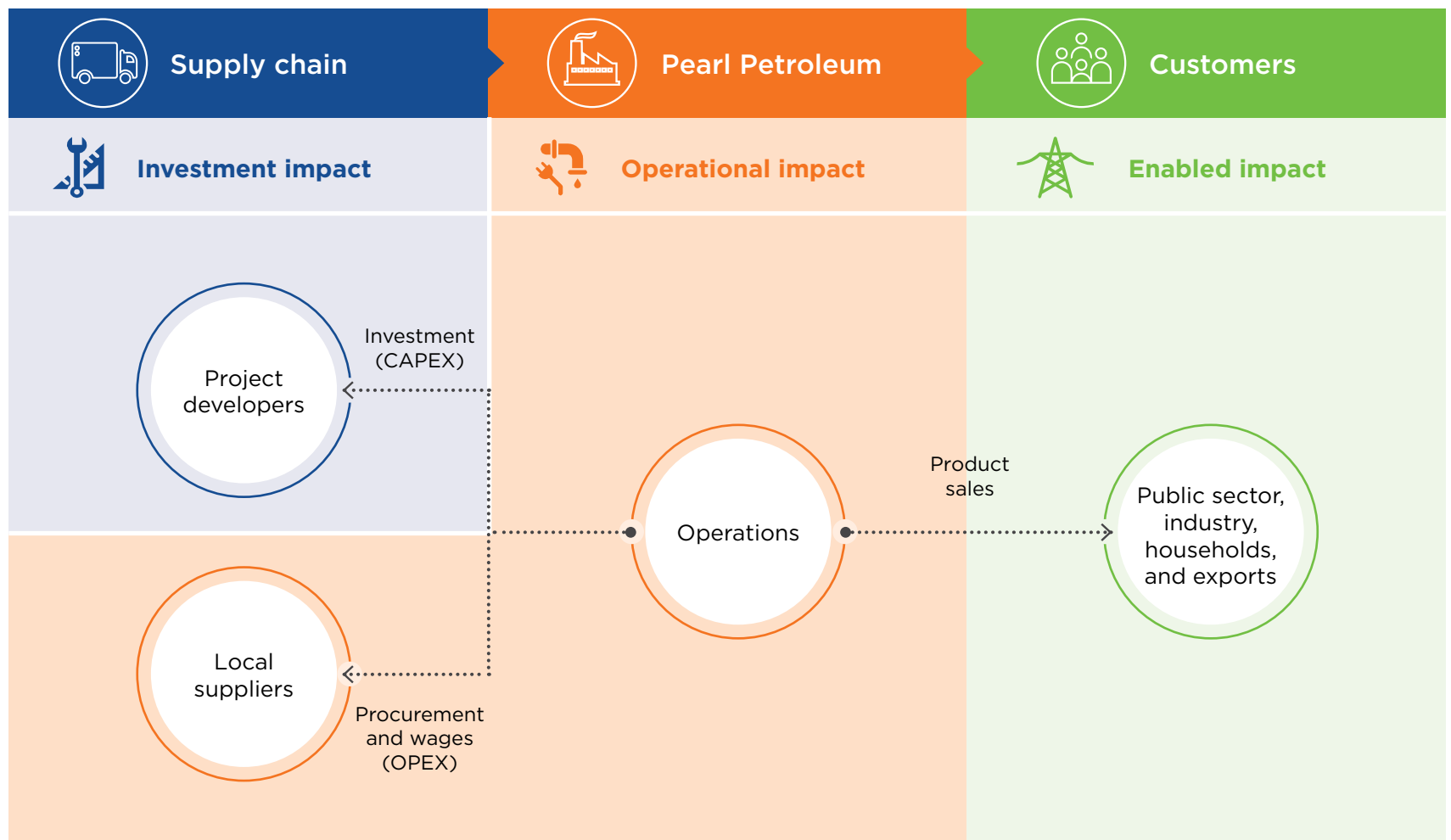
The following pages address each area of economic impact separately:

Investment impact: The Consortium stimulates the KRI economy with its investments in new infrastructure, sustaining an immediate, short-term boost to employment and economic activity. The impact of its local capital expenditures and associated construction activities are assessed through economic multipliers.

Operational impact: The Project's operations produce added value for the economy through recurring local procurement and employee wages. The latter two impacts are also assessed by using economic multipliers.

Enabled impact: The provision of energy, the primary product, enables activity throughout the wider KRI economy, providing necessary input for other economic sectors such as agriculture, industry, and commerce to thrive while supporting local communities. This is analysed using output elasticities that assess the relationship between energy provision and economic growth.

Economic contribution along the KRI value chain



THE PROJECT'S CONTRIBUTION TO THE KRI

Pearl's capital investment programme provides an important stimulus to the KRI economy

To date, the Pearl has invested more than USD 870m in energy infrastructure throughout the KRI. This is dedicated to investments in gas production plants, pipelines, and supporting infrastructure. In the first ten years, this contributed an estimated USD 224m to the KRI's GDP.

About a third of the capital expenditure is with local project developers and suppliers. Whilst initially the Companies had to rely heavily on international expertise, operations will increasingly rely on the local ecosystem of businesses.

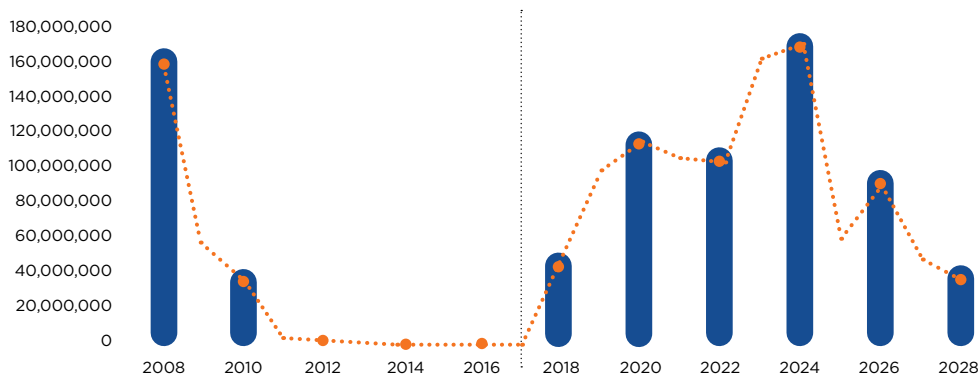
Pearl is now embarking on a new investment programme, adding significantly to gas production and transportation capacity. This includes an expansion of production from Khor Mor as well as Chemchemical.

Over the next decade, the Consortium will invest considerably further in the Project, bringing total capital investment in the KRI to approximately USD 4.2bn since inception.

The new investment is estimated to directly contribute a further USD 869m to the region's GDP over the next decade, benefiting local project developers, suppliers, and labour. Over 20 years, the Consortium's investment will contribute USD 1.1bn to the region's GDP.

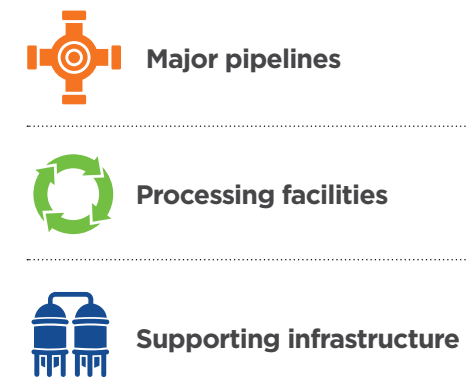
Pearl's capital investment

Local capital expenditure (USD m/year)



Sources: PPCL data, PwC analysis

Capital expenditure is primarily focused on:



Sources: PPCL

Capital investment impact

First ten years



Contribution to the KRI's GDP to date:

USD 224m

Source: PPCL

Next ten years



Future contribution to the KRI's GDP:

USD 869m

Source: PPCL



Total capital investment of

USD 0.9bn

in the first 10 years, with a future capital investment of

USD 3.3bn

Source: PPCL

The Companies' operations sustain a healthy ecosystem of local economic activity

Day-to-day operations sustain significant economic activity in the KRI. This has increased steadily since the start of operations in 2008.

Whilst in 2008, the Kurdistan Gas Project contributed an estimated USD 19m to the KRI's GDP, by 2017 the contribution had increased to an estimated USD 241m.

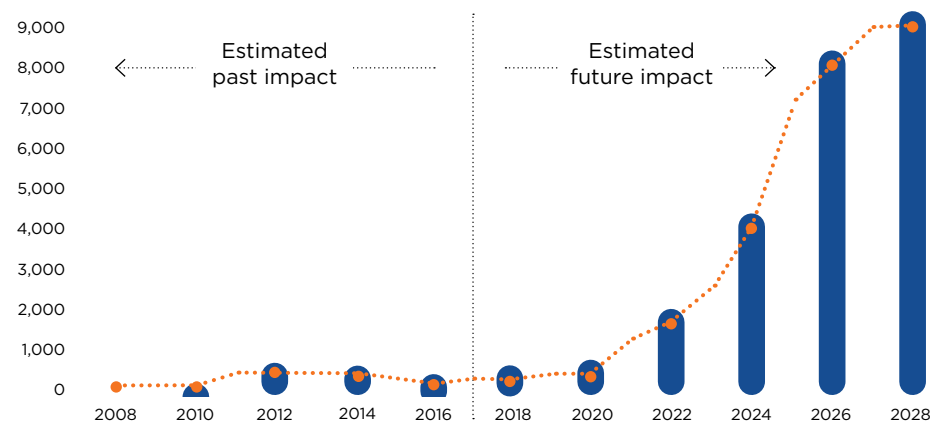
As production capacity expands further, PwC estimates that contribution will rise to approximately USD 9bn by 2027.

This operational impact relates to both the direct gross value added (GVA) and that which is sustained in the wider economy through local procurement and local wage expenditure. Approximately one third of operating costs are spent locally.

PwC estimated that the largest beneficiary sectors of this are the food sector, through catering, manufacturing, and through the materials required for running operations in the KRI.

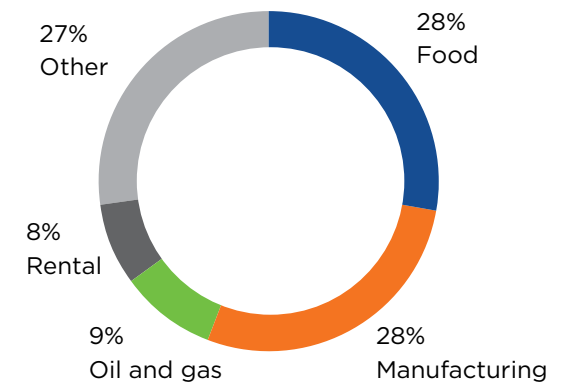
Enabling activity in the wider economy

GVA from operations (USDm/year)



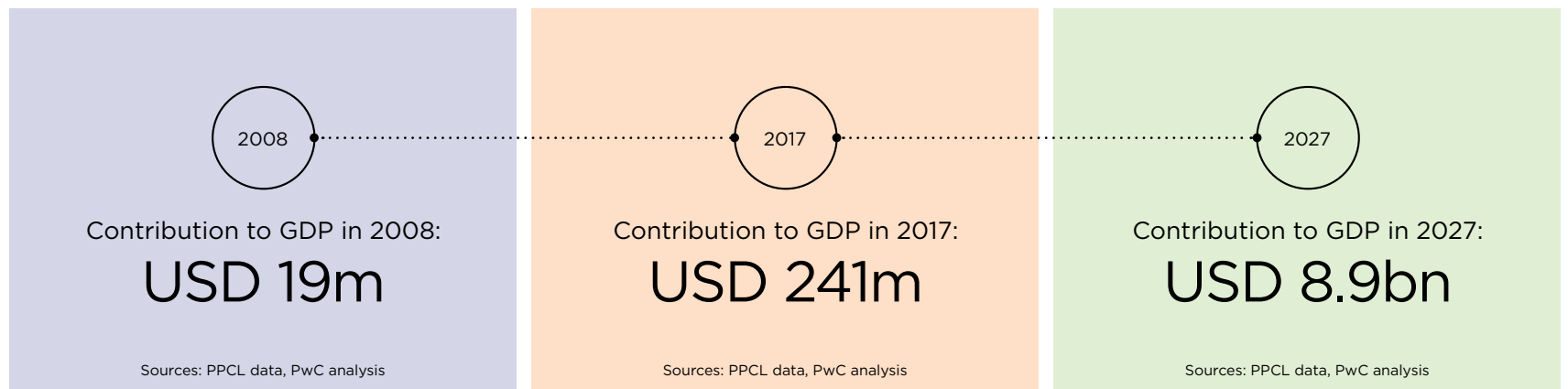
Sources: PPCL data, PwC analysis

Key sectors in the local supply chain



Sources: PPCL data, PwC analysis

Operational impact



Sources: PPCL data, PwC analysis

Sources: PPCL data, PwC analysis

Sources: PPCL data, PwC analysis





THE PROJECT'S CONTRIBUTION TO THE KRI

The provision of reliable and affordable energy sustains a significant share of the KRI economy

The Project's most significant economic contribution, by far, is through the energy provided to power the KRI's electricity grid.

The electricity generated with gas not only provides a basic need for the KRI's 5.9 million inhabitants, but it also powers economic activity in all sectors of the

economy, including agriculture, industry, and commerce.

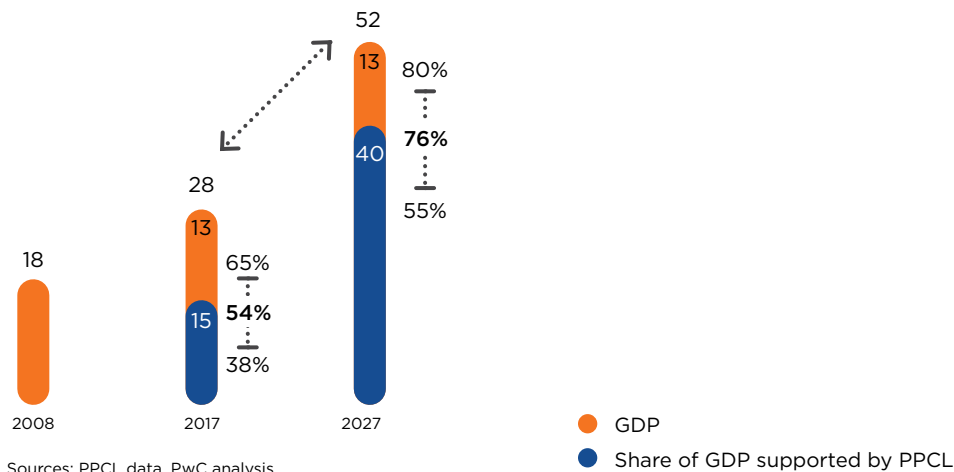
By 2017, gas supplies accounted for about 80 per cent of the energy used for electricity generation in the KRI. PwC estimated that, in 2017, that contributed between USD 10.7bn and USD 18.3bn to the KRI's GDP by delivering reliable and affordable electricity to the region. This implies that economic growth over the past decade would have been considerably lower without gas production from the Project.

With the resulting increase in electricity supply, PwC estimated that the Companies' expanded operations would contribute between USD 28.6bn and USD 41.6bn to the KRI economy by 2027.

While Pearl's investment in expanding production capacity is not the sole factor impacting such growth, it is a necessary input to enable it. In turn, it expects to continue playing a key role in empowering economic development in the KRI.

Enabling activity in the wider economy

Nominal non-oil GDP (USD bn)



Sources: PPCL data, PwC analysis

Enabled impact

2017 - USD 10.7bn to USD 18.3bn

Lower bound	38% USD 28.1bn = USD 10.7bn
Upper bound	65% USD 28.1bn = USD 18.3bn

2027 - USD 28.6bn to USD 41.6bn

Lower bound	55% USD 52.0bn = USD 28.6bn
Upper bound	80% USD 52.0bn = USD 41.6bn



Enabling reliable, low-cost power

The use of natural gas to generate the KRI's electricity demand replaces the use of more expensive and more carbon-emitting diesel fuel.

Gas generates significant cost savings for the KRI electricity grid. PwC estimated that the fuel cost savings associated with running the grid on gas instead of diesel amounted to USD 19.2bn between 2008 and 2017 alone.

Going forward, based on current diesel prices, the increased use of gas to meet growing electricity demand will generate additional estimated savings of USD 33.2bn up to 2027. Such fuel cost savings will have direct consequences for the customer, delivering improved services and reliability and further enhancing the affordability of electricity in the KRI.

Over the 20 years between 2007 and 2027, the anticipated cost savings from substituting gas for diesel will amount to USD 52.4bn.



First ten years



Gross fuel cost savings from using gas instead of diesel up to 2017:

USD 19.2bn

Sources: PPCL data, PwC analysis

Next ten years



Gross fuel cost savings from using gas instead of diesel in the following decade:

USD 33.2bn

Sources: PPCL data, PwC analysis



THE PROJECT'S CONTRIBUTION TO THE KRI

Stimulating exports

Whilst the Project's current development plan is focused solely on domestic consumption, further investment in production capacity offers the opportunity of exporting energy to other parts of Iraq and abroad.

Should the Consortium agree with the KRG to invest further in expanding oil and gas production capacity, the Project could make a major contribution to KRI exports going forward.

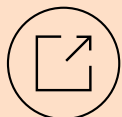
PwC estimated that the expansion of this production capacity could lead to export revenues from crude oil production of USD 7bn annually by 2027.

Increasing the KRI's exports by such an amount will provide an important stimulus to the regions image as a global oil and gas player, increase foreign reserves and provide further stimulus to the domestic economy through the knock-on effects of export demand.

Contributing to government revenues

The Consortium has reached full agreement with the KRG on future revenues generated.

Going forward, the KRG will receive 78 per cent of revenues, after the recovery of costs and entitlements by Pearl. This will represent a major contribution to public finances in the KRI, with the potential to relieve pressures on other sectors of the local economy and households.



Potential oil exports of
USD 7bn
per annum by 2027

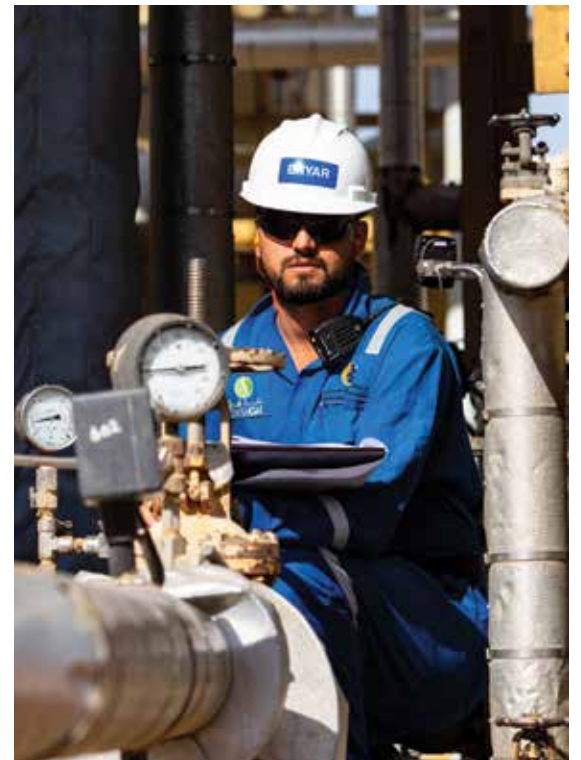
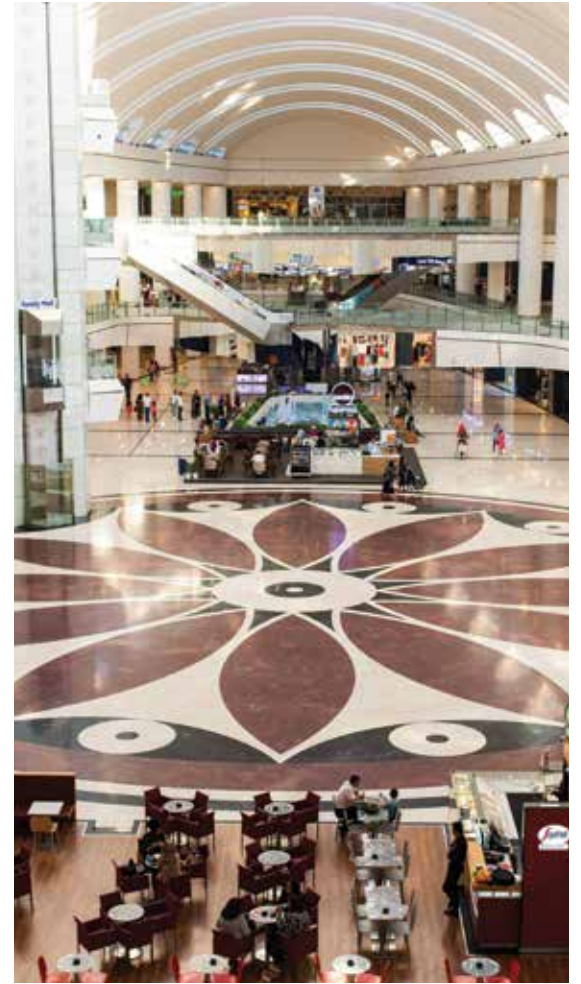
Sources: PPCL data, PwC analysis



Pearl contributes
78%
of revenue to the KRG after
recovery of costs and entitlements

Sources: PPCL data, PwC analysis





A photograph of industrial workers in blue uniforms and white hard hats working on a complex machinery. The scene is brightly lit, and the workers are focused on their tasks. A semi-transparent blue box is overlaid on the left side of the image, containing the text 'THE PROJECT'S IMPACT ON KRI SOCIETY'.

THE PROJECT'S IMPACT ON KRI SOCIETY



THE PROJECT'S IMPACT ON KRI SOCIETY

The Project is creating thousands of jobs in the KRI, encouraging local employment

Through the capital and operational expenditure, the Companies have directly employed hundreds of professionals in the KRI and indirectly contributed to employment through its supply chain activities and spending by employees.

This significantly benefits society by improving job security and income equality. It also encourages consumer spending, further benefiting other businesses.

The capital investment to date is estimated to have had an employment effect of 20,000 jobs. Of this, it is estimated 10,000 jobs of direct employment were created by 2017.

This figure is matched by further contributions to employment through supply chain activities (6,000 jobs) and the spending by employees of the Consortium and its suppliers (4,000 jobs).

In the next ten years, the direct employment, supply chain, and employee expenditure impacts are set to increase at least fourfold, with the creation of around 84,000 jobs.

Jobs created (000s)

First 10 years



Next 10 years



- From direct employment
- From supply chain activities
- From spending of employees

Sources: PPCL data, PwC analysis

Capital investment impact



Contribution to employment to date:*

20,000 jobs



Future contribution to employment:*

84,000 jobs

*job-years of direct, indirect, and induced employment
Sources: PPCL data, PwC analysis



The Companies' operational impact has been increasing significantly every year. Between 2008 and 2017, the Consortium increased the number of jobs from 340 to 2,200—increasing employment contribution from operational activities sixfold.

In 2008, the Companies directly hired 85 people. By 2017, this grew to 400 employees and, by 2027, it is expected to grow to 835 direct hires. The supply chain and household impact is also expected to grow substantially, reaching approximately 2,300 and 4,300 jobs respectively by 2027.



Jobs created

2008



2017

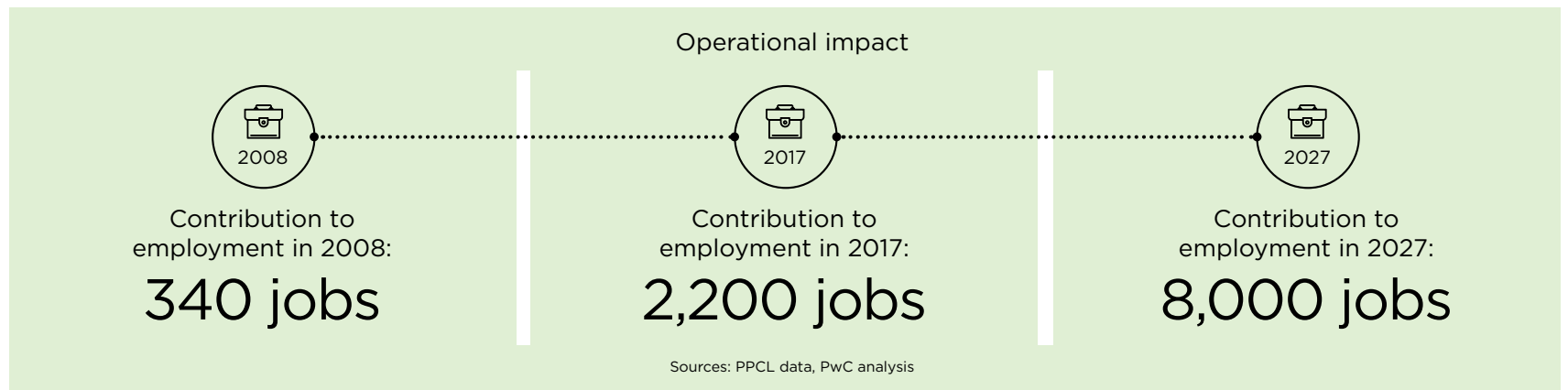


2027



- From direct employment
- From supply chain activities
- From spending of employees

Sources: PPCL data, PwC analysis



THE PROJECT'S IMPACT ON KRI SOCIETY

The Companies have prioritised local employment and development of human capital

The Companies aim to promote local employment as much as possible. The Project has helped equip a large number of local people with new skills while encouraging local suppliers to support the facility's construction and the facility its daily activities. Currently, 80 per cent of employees are KRI nationals.

Moreover, the Companies are committed to continuously localising the supply chain, with currently one third of procurement done through local suppliers.

The Companies also actively pursue the cultivation of an empowered workplace by hiring more young people and women. Between 2016 and 2017 the Consortium boosted hiring of women by almost ten per cent. In 2017, almost one quarter of employees were under the age of 30.

The Companies are committed to developing human capital by consistently training employees in the required skills and competencies in the oil and gas industry.

The Companies also offer broader soft and technical skill training programmes, such as in business and report writing, the use of Excel, and the essentials of project management. In total, over 17,000 hours of training were conducted in 2017.

The Human Resources Department strives to run regular health and safety awareness sessions and training for employees as well. These initiatives aim to increase employees' productivity and happiness.



Over
80%
of staff are local

Source: PPCL data



~**1/3**
of procurement is
with local suppliers

Source: PPCL data



Over
17,000
training hours were conducted
in 2017

Source: PPCL data



Female employees have
increased by
10%

Source: PPCL data



25%
of employees are less
than 30 years old

Source: PPCL data

Local procurement

USD 300bn
First 10 years

USD 1.2bn
Next 10 years





COMMUNITY ACTION PROGRAMME



COMMUNITY ACTION PROGRAMME

The Community Action Programme (CAP) contributes employee time and financial resources to local villages, businesses, and schools in supporting the standard of living, health, well-being, security, and stability and the development of human capital in the KRI.

Following engagement with local communities and a review of the success of previous initiatives, the Companies have designed a comprehensive CAP strategy for the coming years in the KRI. A five-year CAP plan for 2018-2022 outlines priorities, including addressing the urgent needs of communities surrounding operational areas and implementing larger-scale projects.

Specifically, the Companies are looking to invest in projects that cover the core areas below.

Work to date has covered three areas of impact: villages, public services, and communities.

- Residents of Qadir Karam are the primary beneficiaries of village initiatives. Each year, the Companies supply USD 1.1 million worth of complimentary electricity to around 1,225 residents (up to 75 per cent of the population of the sub-district).

- The Companies have also provided electric generators, along with the fuel required to power them, to over 260 people in eight remote villages in Qadir Karam.
- To provide clean and accessible water to isolated villages, the Companies have constructed water wells and rainwater harvesting ponds, serving potable water to over 20,000 villagers in Chemchemal.
- Additionally, the Companies have contracted water tankers in Qadir Karam to deliver potable water to over 1,900 people residing in 21 villages.



1

Impacting villages

Offering:

- **Uninterrupted electricity**
- **Clean water**



Despite improvements in electricity supply through the Companies' work, some remote villages continue to face power cuts. Moreover, due to a lack of water processing infrastructure, some communities lack access to clean water.

- The Companies have enabled injury care by supporting the construction of a full-fledged X-ray examination room at the Altun Kupri Health Centre, after it was damaged.

- The Companies have helped improve maternity care by helping the Hoshang Azad Martyr Hospital for Maternity to facilitate quality and sufficient blood banking. They have also expanded facilities by erecting seven prefabricated cabins around the building, which host an outpatient clinic and various other support departments.

- At Qadir Karam, the Companies have equipped a shrine and mosque with water tanks, water coolers, air conditioners, ceiling fans, and other equipment.



2

Impacting public services

By enhancing:

- **Healthcare**
- **Places of worship**



Following the events of the past ten years in the region, the population in the KRI has grown dramatically. This has increased pressure on public services, such as healthcare facilities and sites of worship.



- Lack of social health insurance in the KRI prevents those living below the poverty line from seeking medical care. In order to help, the Companies run a Charity Help programme, where they award deserving individuals from USD 200 to USD 1,000 to cover their medical expenses.
- The Companies sponsored 1,000 orphans below 18 years of age, providing them with support every month to help cover their school transportation fees and other living expenses.



3

Impacting people

By promoting:

- **Equal opportunities**
- **Education**
- **Sports**
- **Employment**



In the KRI, poverty continues to be a key issue. The Companies aim to tackle poverty and improve quality of life through improving access to education, employment, and recreational activities.





A DECADE OF CAP PROJECTS AND THEIR IMPACT

The table below summarises the activity, impact, social benefits of each CAP project undertaken over the past decade. While some have been completed, many continue into the future as a central part of the CSR programme.

Activity	Beneficiaries	Relevant impact areas
Providing electricity supply to Qadir Karam and surrounding villages.	10,000 people	Standard of living, Security and stability
Drilling water wells in drought area in Qadir Karam, Shores, and Chemchemical.	10,000 people	Standard of living, Health and well-being, Security and stability
Replacing Chemchemical water tanks.	10,000 people	Standard of living, Health and well-being, Security and stability
Providing Shwan sub-district with water treatment system.	200 people	Standard of living, Health and well-being
Mobile health team.	5,000 people	Health and well-being
Construction of X-ray room in Alton Kupri Hospital.	10,000 people	Health and well-being
Handover of a Health Centre Caravan to Grdasoor Quashtapa.	500 people	Health and well-being
Construction of a 4-classroom school in Qarachewar-Qadir Karam.	Students in the village	Human capital
Donating educational materials to Chemchemical and Qadir Karam schools.	600 students	Human capital
Donating 19 water coolers to Altun Kupri schools.	1,000 students	Standard of living, Human capital
Granting 7 scholarships for Master degrees in the American University in Suleymania.	7 MBA students	Standard of living, Security and Stability
Donating a 250 KV generator to Qadir Karam town and Sangaw.	Qadir Karam and Sangaw	Standard of living, Security and Stability
Construction of 4 soccer fields in Qadir Karam, Shores, Chemchemical, and Rezan.	Youth in the areas	Health and well-being, Community cohesion, Human capital

Activity	Beneficiaries	Relevant impact areas
Supporting Qadir Karam community with kerosene.	100 families	Standard of living, Community cohesion, Security and stability
Supporting community in Qandel district.	95 families	Standard of living, Community cohesion, Health and well-being
Providing a generator set to the district of Sangaw.	Sangaw district	Standard of living, Community cohesion, Security and stability, Health and well-being
Supporting maternity hospital in Chemchemical.	Chemchemical district	Standard of living, Community cohesion
Donating AC units.	Qadir Karam district	Standard of living, Health and well-being
Hiring vehicles and providing transportation to schools.	Students in the villages	Standard of living, Health and well-being
Supporting Qadir Karam and Chemchemical societies.	Chemchemical and Qadir Karam districts	Community cohesion, Security and stability, Health and well-being
Supporting a writer.	Book writer	Community cohesion, Standard of living
Supporting orphans along with Barzani Charity Foundation.	1,000 orphans	Community cohesion, Security and stability, Standard of living
Financial support to a hospital in the KRI.	KRI	Community cohesion, Health and well-being
Providing of free electricity to 5 villages in Qadir Karam town.	Houses, government buildings, and shops in these villages (276 in total)	Standard of living, Health and well-being, Security and stability



STEWARDSHIP OF THE ENVIRONMENT



STEWARDSHIP OF THE ENVIRONMENT

The Companies actively manage the direct impact of their operations

Alongside their commitment to reducing carbon dioxide (CO₂) emissions as they deliver clean burning gas, the Companies embrace the duty to protect the environment by minimising CO₂ emissions, waste production, and water usage.

CO₂ Emissions

The CO₂ emissions covering both scope 1 and scope 2 have been separately calculated.

Scope 1 looks at direct greenhouse gas (GHG) emissions from sources that are controlled by us. Scope 2 looks at indirect electricity generation GHG emissions, which are emitted in the generation of electricity consumed by the company.

In 2017, ongoing operations produced around 120,000 tCO₂ of scope 1 emissions. This constitutes a 53 per cent drop from the operations' 2013 scope 1 emissions and a ten per cent drop compared to the 2016 figure. For scope 2, operations produced around 800 tCO₂ in 2017, which is an eight per cent drop from emissions in 2013 and a seven per cent drop from emissions in 2016.



10%

decrease in scope 1 GHG emissions

7%

decrease in scope 2 GHG emissions

Sources: PPCL data, PwC analysis

Waste

The Companies carefully track the hazardous and non-hazardous waste produced, as well as how it is disposed of (i.e. incineration, landfill, recycling, composting, or any special treatment).

Hazardous waste is potentially dangerous or harmful to human health and/or the environment. Non-hazardous waste results from the production of goods and products.

In 2017, operations produced around 90 tonnes of hazardous waste, which is a 71 per cent decrease compared to the previous year. For non-hazardous waste, operations produced around 1,500 tonnes, which is a 11 per cent decrease compared to 2016.

The Companies have also saved 174 trees in 2017 by partnering with Shred-It and placing an emphasis on recycling paper. The Companies are also cautious of hydrocarbon spills to the environment, successfully avoiding any spills between 2015 and 2017.

Water

In 2017, operations consumed almost 100 m³ of water across all operational sites and camps. The Companies have continuously worked towards decreasing water consumption.

Additionally, the waste water generated between 2016 and 2017 decreased by eight per cent, to around 3,000 m³.



71%

decrease in hazardous waste

11%

decrease in non-hazardous waste

Sources: PPCL data, PwC analysis



174

trees saved in 2017 by partnering with Shred-It

Sources: PPCL data, PwC analysis



Zero

hydrocarbon spills to the environment between 2015-2017

Sources: PPCL data, PwC analysis

The Companies has significantly contributed to reducing greenhouse gas emissions

By supplying natural gas for generating the KRI's electricity, the use of the alternative, more carbon-emitting diesel, is avoided. This means that lower CO₂ emissions are released into the atmosphere, as the GHG footprint of natural gas is considerably lower than what the footprint would be if diesel were used instead.

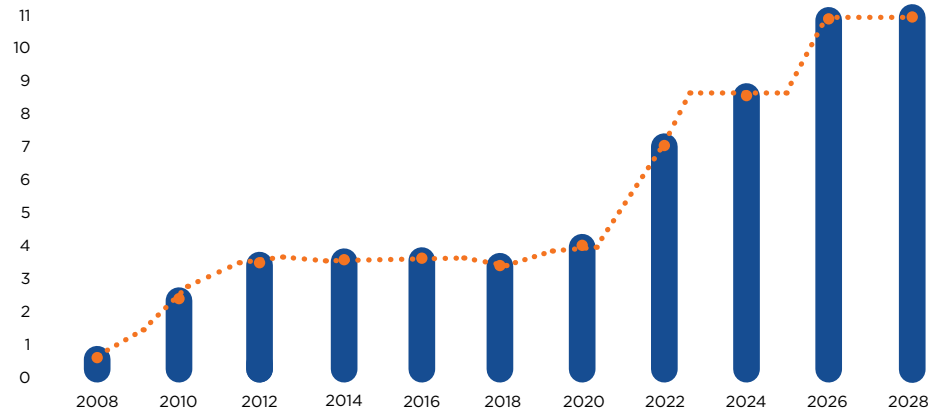
The avoided emissions result in lower social cost of carbon (SCC). The SCC is a measure of the economic harm from the impact of

CO₂ emissions, expressed by assigning a monetary value to the total damages from emitting one metric tonne of carbon dioxide into the atmosphere.

PwC has calculated the gross SCC savings from using low-carbon gas instead of high-carbon diesel up to 2017 and has predicted future savings as well.

Avoided GHG emissions by year

Avoided GHG emissions (million tCO₂e)



Sources: PPCL data, PwC analysis

First ten years

2008

Avoided GHG emissions:
29m tCO₂e

Next ten years

2027

Avoided GHG emissions:
77m tCO₂e



Gross social cost savings from using low-carbon gas instead of high-carbon diesel in the first ten years:

USD 2.6bn

Gross social cost savings from using low-carbon gas instead of high-carbon diesel in the next ten years:

USD 9.7bn

Sources: PPCL data, PwC analysis

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APPENDIX 1

LIST OF ACRONYMS

Bbls	Barrels
Capex	Capital expenditure
CO₂	Carbon dioxide
CSR	Corporate Social Responsibility
GDP	Gross Domestic Product
GHG	Greenhouse gas
GVA	Gross value added
IDPs	Internally Displaced Persons
IPCC	Intergovernmental Panel on Climate Change
kbpd	Thousand Barrels Per Day
KRI	Kurdistan Region of Iraq
KRG	Kurdistan Regional Government
KRSO	Kurdistan Regional Statistics Office
LPG	Liquefied petroleum gas
MDG	Millenium Development Goals
MMscfd	Million standard cubic feet per day
MNR	Ministry of Natural Resources
MOL	Hungarian Oil and Gas Public Limited Company
OMV	Austrian Mineral Oil Administration
Opex	Operational expenditure
PPCL	Pearl Petroleum Company Limited
SCC	Social cost of carbon
SDGs	Sustainable Development Goals

SUMMARY OF MODELLED IMPACTS

Operational impact	2008	2017	2027
GDP	USD 19m	USD 241m	USD 8.9bn
Employment	340 (of which 85 direct)	2,200 (of which 400 direct)	7,500 (of which 835 direct)

Construction impact	2008-2017	2018-2027	Total
GDP	USD 224m	USD 869m	USD 1.1bn
Employment	20,000	84,000	104,000

Enabled impact	2008-2017	2018-2027
Value (USD bn)	USD 10.7bn to USD 18.3bn	USD 28.6bn to USD 41.6bn
% of GDP	38% - 65%	55% - 80%

Fuel cost savings	2008-2017	2018-2027
Diesel savings	186m bbls	487m bbls
Diesel cost savings	USD 19.2bn	USD 33.2bn

Carbon savings	2008-2017	2018-2027
Carbon savings	29.3m tCO ₂ e	76.8m tCO ₂ e
Carbon cost savings	USD 2.6bn	USD 9.7bn

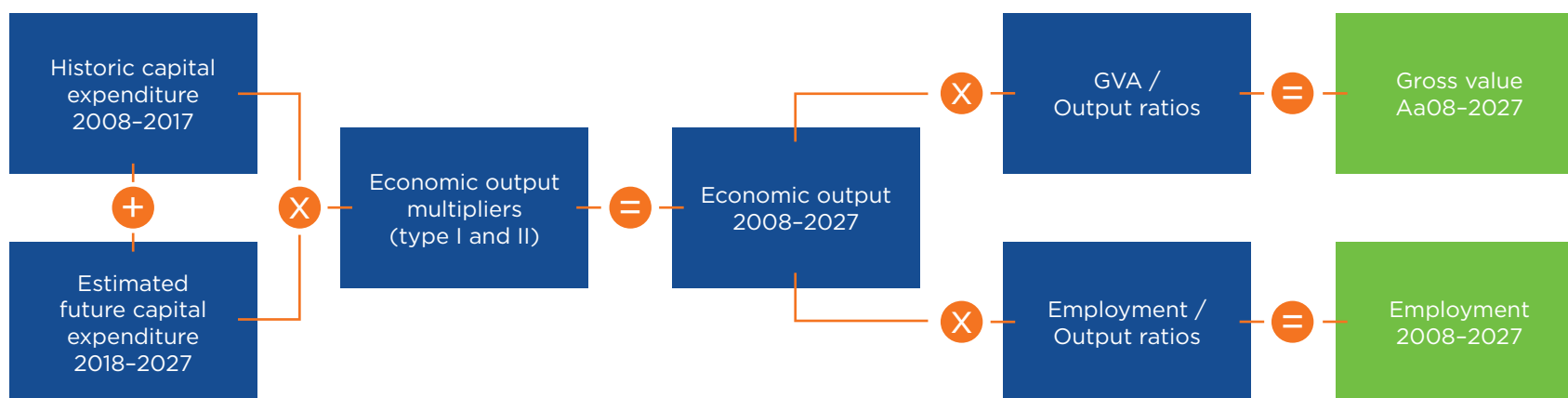
METHODOLOGY - CONSTRUCTION IMPACT

Summary of approach

- The impact of the investment in the KRI is estimated using multipliers. The overall historic and future capital expenditure is first adjusted for the portion spent locally. Subsequently, PwC mapped capital expenditure items against their relevant economic sectors.

- PwC initially estimated the impact of capital expenditure on gross output using type I and type II output multipliers. Economic output is subsequently converted into Gross Value Added (GVA) and employment using GVA/Economic output and Employment/Economic output ratios, respectively.

Simplified calculation steps



Key assumptions

- In the absence of KRI-specific input-output tables, PwC derived multipliers from the Azerbaijan input-output table.
- The multipliers and the GVA and employment ratios are assumed to remain constant over time.
- Approximately 30 per cent of future capital expenditure is assumed to be spent locally in the KRI.

Key data sources used

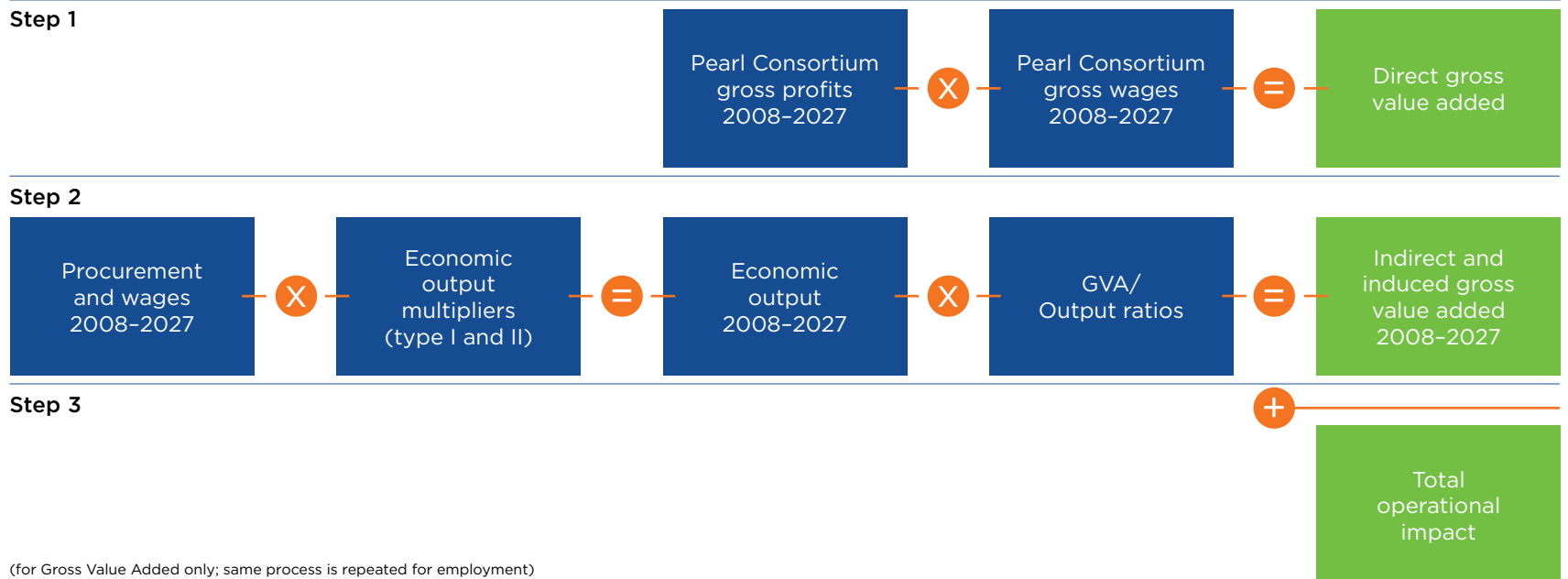
Input-output table	State Statistics Committee (2011)
Employment data	State Statistics Committee (2011)
Capital expenditure data	PPCL

METHODOLOGY - OPERATIONAL IMPACT

Summary of approach

- The impact of operations is estimated by adding the direct operational, indirect supply chain, and induced household expenditure impact. Direct operational impact is estimated by adding gross profits and gross wages from financial forecasts.
- The indirect and induced impacts are estimated using procurement and wage data. PwC adjusted this for expenditure with local suppliers and staff and mapped it against the relevant economic sectors. Subsequently, PwC applied type I and type II output multipliers and converted them into GVA and employment.

Simplified calculation steps



Key assumptions

- In the absence of KRI-specific input-output tables, PwC derived multipliers from the Azerbaijan input-output table.
- The multipliers and the GVA and employment ratios are assumed to remain constant over time.
- Approximately 30 per cent of future procurement is assumed to be spent locally in the KRI.

Key data sources used

Input-output table	State Statistics Committee (2011)
Employment data	State Statistics Committee (2011)
Procurement data	PPCL
Gross wages	PPCL
Gross profits	PPCL



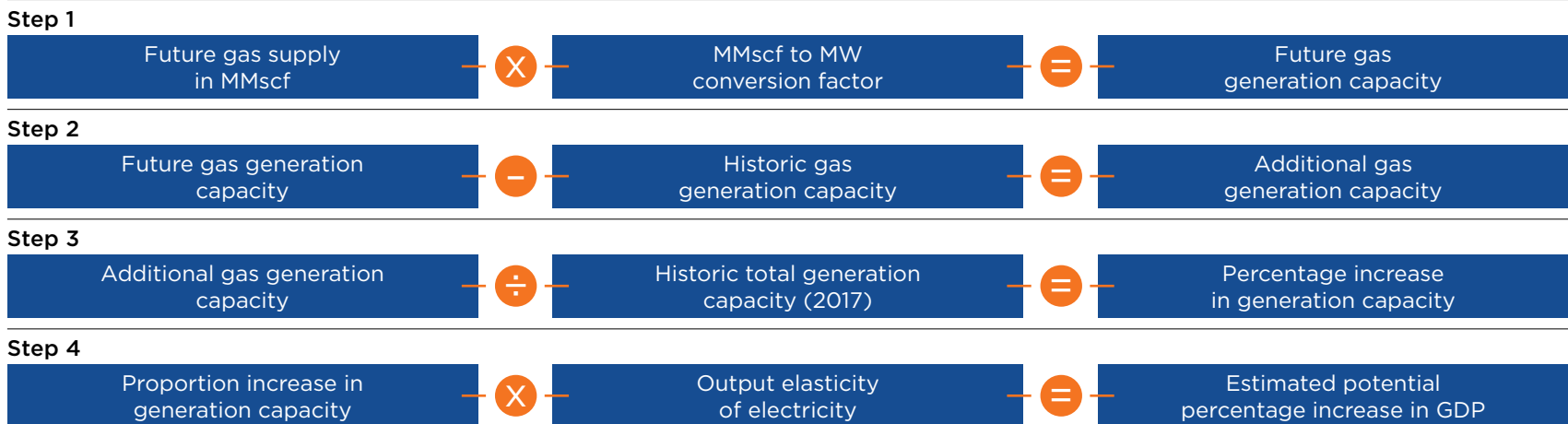


METHODOLOGY - ENABLED IMPACT

Summary of approach

- Energy is a key enabler of economic activity. The increase in the supply of electricity is therefore a key stimulator of economic growth.
- To assess enabled impact, PwC first assessed the addition in baseline electricity generation, which is realised through gas offtake. For the historic period, PwC used 2008 as the baseline. For the forward-looking period, 2017 is the baseline.
- After establishing the increase in electricity generation as the baseline, PwC applied an output elasticity that describes the relationship between a change in electricity supply and GDP. This, in turn, is applied to 2017 GDP to estimate the monetary value of this enabled impact.

Simplified calculation steps



Key assumption

- The output elasticity of electricity is assumed to be 0.77, meaning that for every one per cent increase in electricity supply, GDP grows by 0.77 per cent. This is the average of a number of international benchmarks, of which the lower bound is 0.4 and the upper bound is 1.2.

Key data sources used

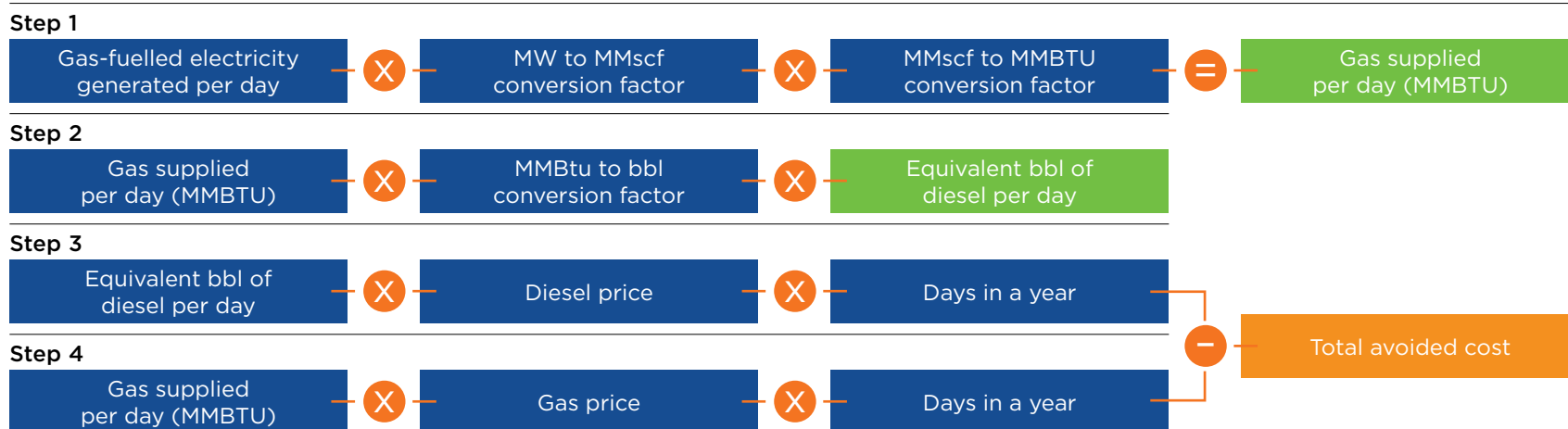
Historic generation capacity	PPCL
Forecasted gas supply/sales	PPCL
Electricity provision GDP elasticity	International benchmarks
KRI non-oil GDP	KRSO, (2016), World Bank (2015)

METHODOLOGY - FUEL COST SAVINGS

Summary of approach

- PwC assessed fuel cost savings by comparing the fuel costs associated with generating historic and estimated future generation by diesel instead of gas.
- The current gas capacity is converted into its equivalent of barrels of diesel. This cost is valued using historic diesel prices for the past and assuming constant diesel prices for the future.
- PwC then netted off the gas cost to estimate the difference in fuel costs between systems. This does not take into account any potential differences in capital and operating costs between the two fuel types.

Simplified calculation steps



Key assumptions

- The valuation is based on a counterfactual where all current and future planned gas-fuelled electricity generation capacity is replaced with diesel.
- The valuation only considers fuel cost savings, not any potential differences in capital and operating costs between the two fuel types.
- The diesel price for 2018–2027 remains constant at current levels.
- The cost of diesel has a 30 per cent uplift for transportation costs.
- There are no generation efficiency improvements in either technology between 2018 and 2027.

Key data sources used

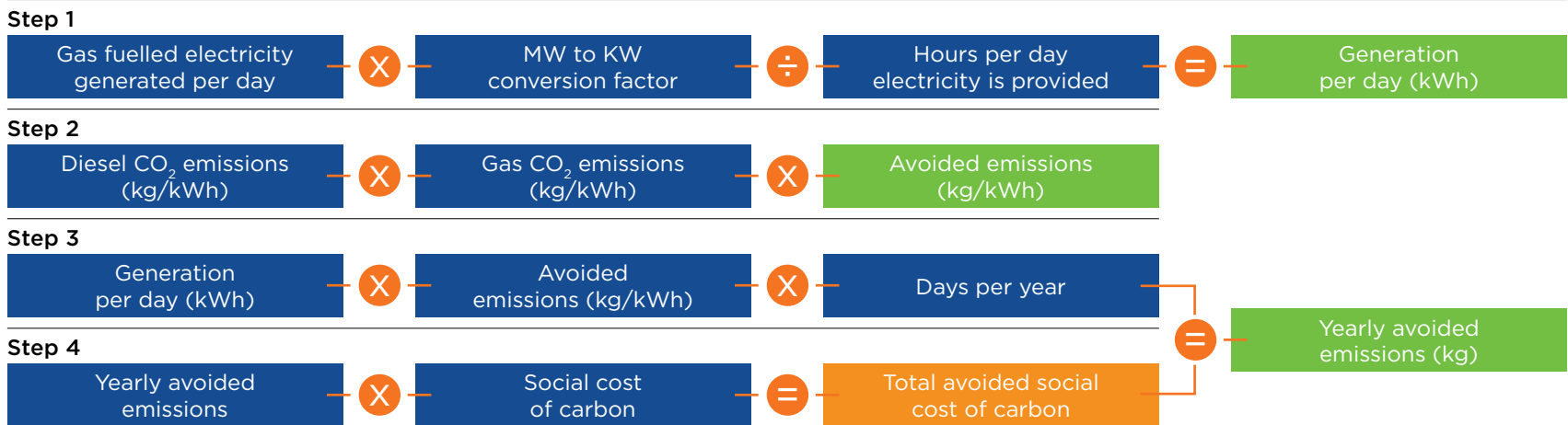
Gas-fuelled electricity generation	PPCL
Historic diesel price data	PPCL, OPEC (2018)
Historic gas price data	PPCL
Energy conversion factors	PPCL

METHODOLOGY - CARBON SAVINGS

Summary of approach

- PwC assessed carbon savings by comparing the greenhouse gas emissions associated with generating historic and estimated future generation by diesel instead of gas.
- The current gas capacity is converted into its equivalent of barrels of diesel. The footprint of an all-diesel system is assessed by applying the relevant emissions factors for both diesel and gas. The difference between these two is considered the carbon savings resultant from running the electricity system on gas.

Simplified calculation steps



Key assumptions

- The valuation is based on a counterfactual where all current and future planned gas-fuelled electricity generation capacity is replaced with diesel.
- The Social cost of carbon is valued at USD 102 per tonne. The Social cost of carbon grows at three per cent per annum between 2018 and 2027. This is based on a meta-analysis of academic and other literature compiled by PwC.
- There are no generation efficiency improvements in either technology between 2018 and 2027.

Key data sources used

Gas-fuelled electricity generation	PPCL
Diesel CO ₂ emission factor	IPCC (2018)
Gas CO ₂ emission factor	IPCC (2018)
Social cost of carbon	PwC valuation coefficient

APPENDIX 8

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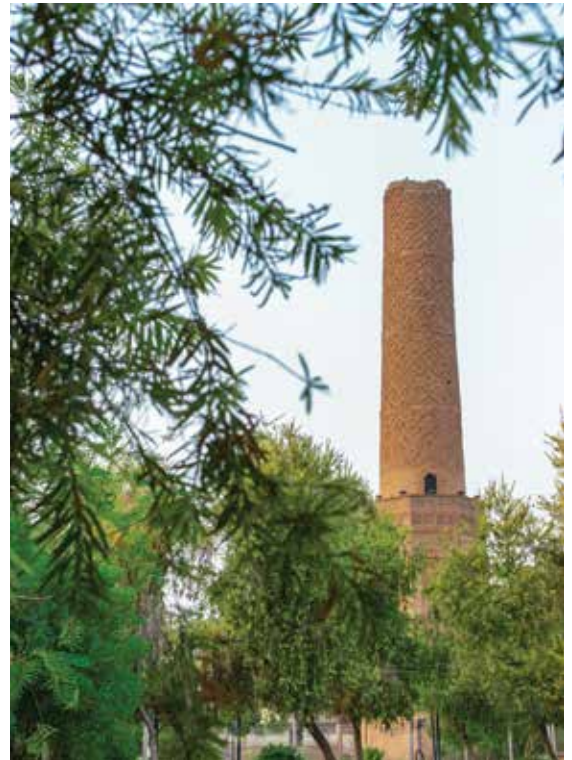
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