AECOM

Middle East

# Property & Construction Handbook

2024

Delivering a better world

# Foreword

## Amidst the challenges faced by the global economy in 2023, the Middle East and North Africa (MENA) region, specifically the Gulf Cooperation Council (GCC), has continued to remain optimistic as diversification plans continue to thrive.

While the recovery remains positive, sustained geopolitical uncertainty, soaring inflation, high interest rates, tightening monetary policy, ongoing conflicts, oil price volatility and disruptions to supply chains all continue to pose significant threats to the construction industry in 2024.

This edition of AECOM's Middle East Property & Construction Handbook assesses trends and new opportunities that presented themselves during 2023. The handbook also reviews the impacts and threats experienced over the last 12 months on local, regional and international markets.

At AECOM, our goal has always been to develop and adapt our knowledge in line with the ever-changing trends and construction growth opportunities, as well as to provide agile, innovative and industry-leading solutions to our clients.

Within our detailed round-up, we discuss the global and MENA regions' current economic and construction performance and present the upcoming challenges and expected future opportunities.

We have carefully selected articles, written by AECOM specialists, that focus on prevailing themes within the property and construction market. These articles aim to provoke thought in relation to the growing opportunities within the Middle East. Our first article, 'Navigating location cost pressures on KSA giga projects', delves into the key factors associated with project location on capital expenditure. In our second article, 'Balancing the cost of infrastructure - masterplan cost estimation', we look at the masterplanning cost estimation process and its key considerations and in 'Luxury residential market analysis and outlook', we explore the cost of building luxury residential towers and the current trends in the market.

Furthermore we explore 'Sustainable Legacies', our ESG strategy and how we work in partnership with our clients to leave a positive, lasting impact for communities and our planet. In addition to this, we also provide a round-up of the outcomes from the recent UN Climate Change Conference, (COP28) which was held in the UAE during 2023.

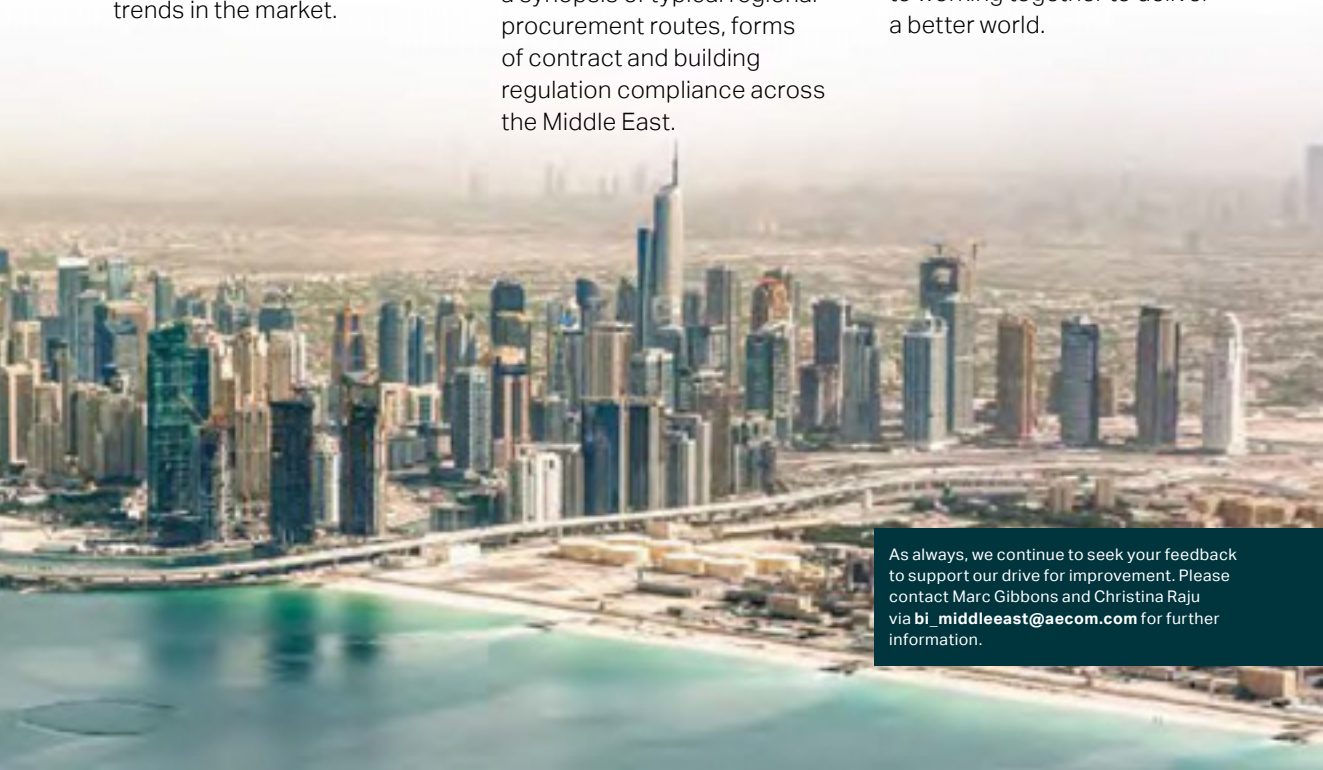
Finally, we delve into the recent chapter of AECOM's digital transformation journey by showcasing how our focus on innovative and transformative solutions are being used to improve outcomes for our clients and communities.

As with previous years, we include, as a point of reference, a synopsis of typical regional procurement routes, forms of contract and building regulation compliance across the Middle East.

The reference data section provides averaged international and regional cost data within the built environment. This data acts as an indicative high-level guide and comparison of building asset costs and should be used circumspectly.

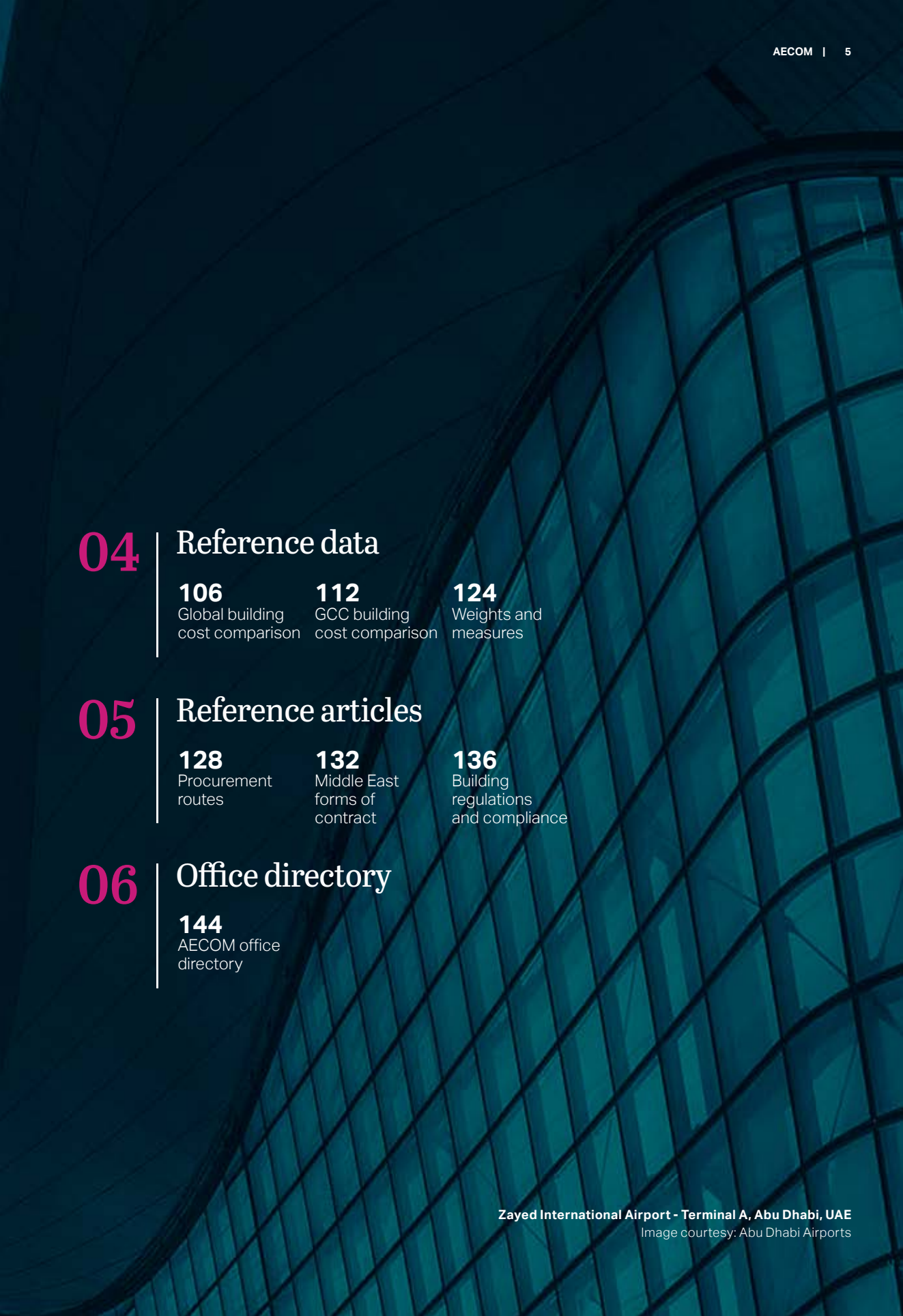
Like the nature of any project, its interpretation is dependent upon several project specific factors and assumptions. For specific current and benchmarked cost data, please reach out to AECOM's Program Cost Consulting team to assist you in obtaining relevant and specific costs for projects.

We hope that you find our review, analysis and construction market evaluations beneficial and of value. We look forward to working together to deliver a better world.



As always, we continue to seek your feedback to support our drive for improvement. Please contact Marc Gibbons and Christina Raju via **bi_middleeast@aecom.com** for further information.

# Contents



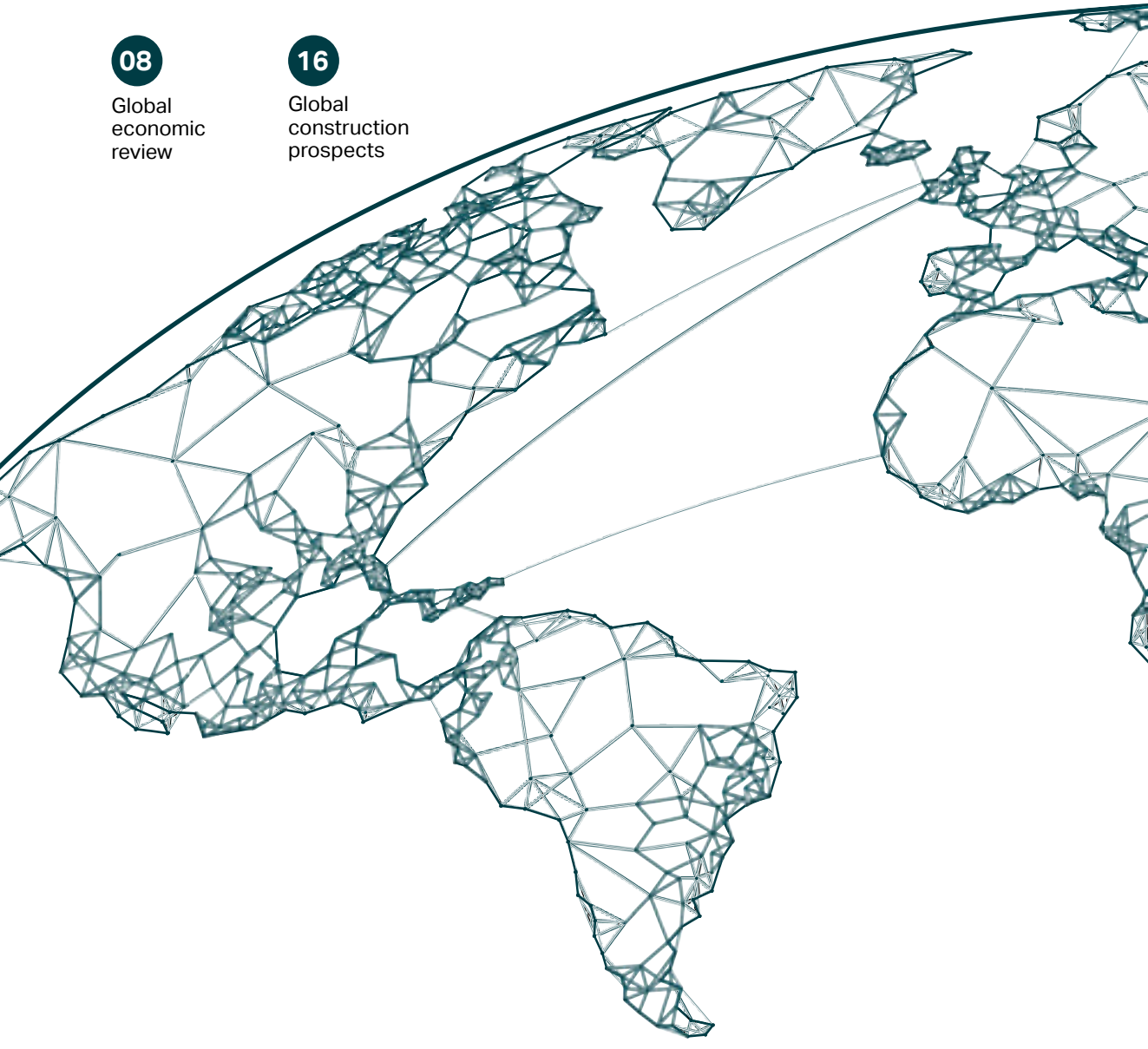


**Zayed International Airport - Terminal A, Abu Dhabi, UAE**
Image courtesy: Abu Dhabi Airports

# 01 Global market review

## IN BRIEF





# Global economic review

**Throughout 2023, the global economy encountered persistent challenges as economies sought to rebound from the effects of the pandemic. Efforts to reinvigorate growth were severely hampered due to the significant tightening of monetary policy across the globe, as many regions and governments attempted to manage and mitigate the effects of high inflation.**

The ongoing conflict in Ukraine and rising tensions in the Middle East also created challenges for global leaders. As a result, it is expected that global growth will continue to slow with many of the same challenges persisting well into 2024.

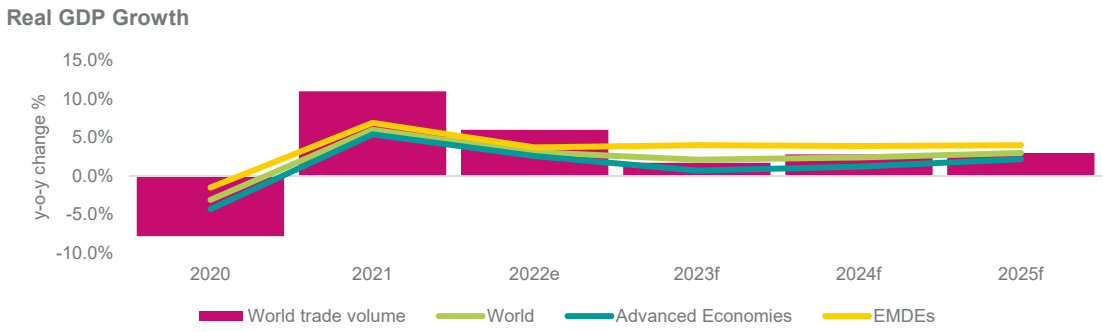
With many advanced economies across the globe showing some levels of stress within their domestic financial markets, the outlook for 2024 remains cautious with fears that persistent inflation, coupled with rising geopolitical tensions in many regions, could result in a further erosion of global economic growth prospects. There is real concern that many emerging economies will become more vulnerable to the impact of higher borrowing costs and the ongoing burden of managing debt.

A key focus of leading nations during the recent COP28, held in Dubai, was a renewed emphasis on the importance to maintain and increase international cooperation on challenges such as climate change, supporting nations most affected by crises and hunger, and also assisting with debt management to countries in need.

According to the World Bank – Global Economic Prospects Report (June 2023), global growth was forecasted to slow sharply from 3.1 per cent in 2022 to 2.1 per cent in 2023, which represents a 1.0 per cent contraction. Global growth in 2024 is forecasted to edge up slightly to a subdued level of 2.4 per cent.

Furthermore, the World Bank reports that Emerging Market and Developing Economies (EMDEs) are forecasted to decline from 4.1 per cent in 2022 to 2.9 per cent in 2023. This represents a 1.2 per cent contraction with overall growth for the period 2020-2024 expected to average at 3.4 per cent.

As reported by the World Bank, there are five key areas identified to assist global leaders and policymakers to manage and mitigate the most pertinent challenges. This includes, mitigating financial contagion, reducing domestic vulnerabilities, restoring financial sustainability, reinvigorating long-term growth and alleviating debt distress and strengthening the global financial safety net.



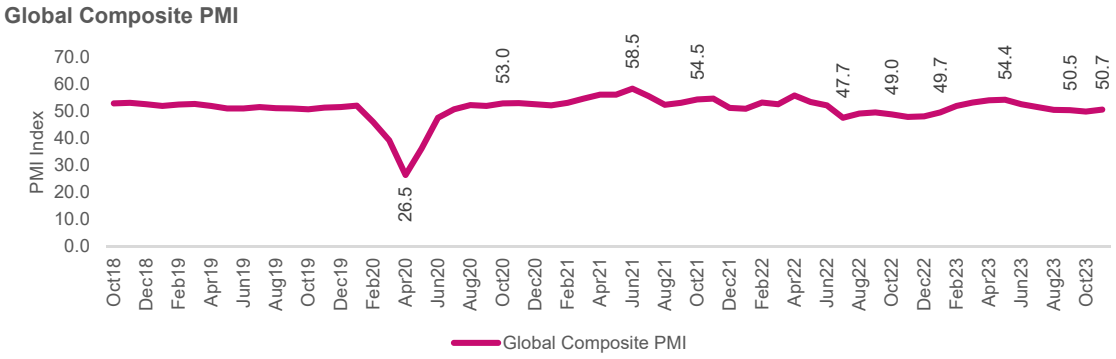

Source: World Bank Economic Prospects, June 2023

## Global inflation

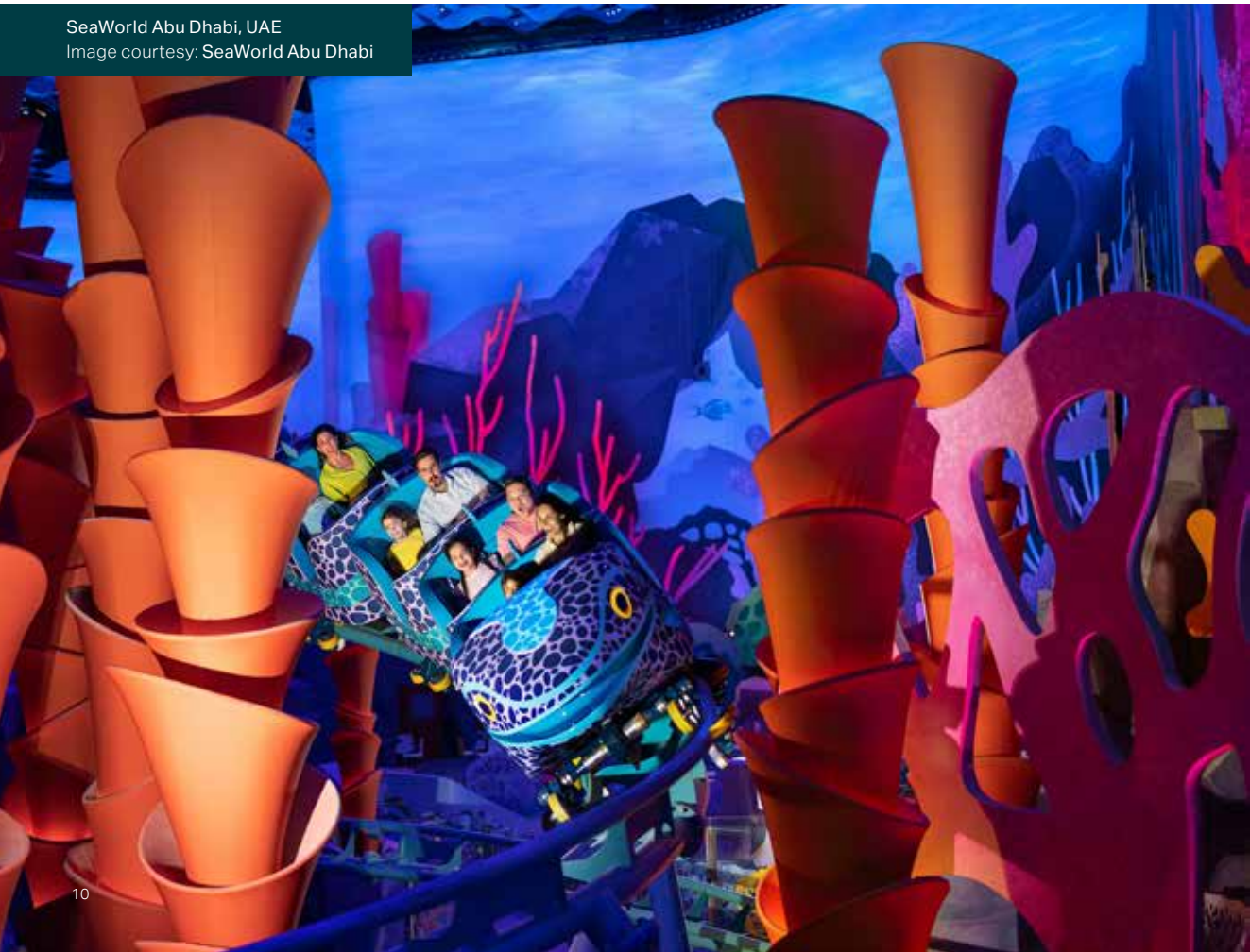
Following the acceleration of global inflation during 2022, it is noted that up to June 2023 inflation remained above the targeted levels within most advanced economies whereby targets are set. According to the World Bank – Global Economic Prospects Report (June 2023), median headline global inflation was 7.2 per cent (y/y) up to April 2023. This was a notable reduction from a level 9.4 per cent (y/y) in July 2022 and was due to reductions in commodity prices, easing of supply chain pressures and moderating energy prices. These trends had been maintained in many economies throughout 2023 until recent developments in the Middle East.

# Purchasing Managers Index (PMI)

The global composite Purchasing Managers Index (PMI) for 2023 rose from below the 50-point mark in January 2023 (49.7) and stood at 54.4 in May 2023, before gradually falling to 50.7 in November 2023.




Source: IHS Markit, JP Morgan



SeaWorld Abu Dhabi, UAE
Image courtesy: SeaWorld Abu Dhabi

# Commodity prices

With rising geopolitical tensions in the Middle East, it is inevitable that such uncertainty impacts global commodity markets, which had up until recent times been mitigating against other global issues such as the ongoing conflict in Ukraine.

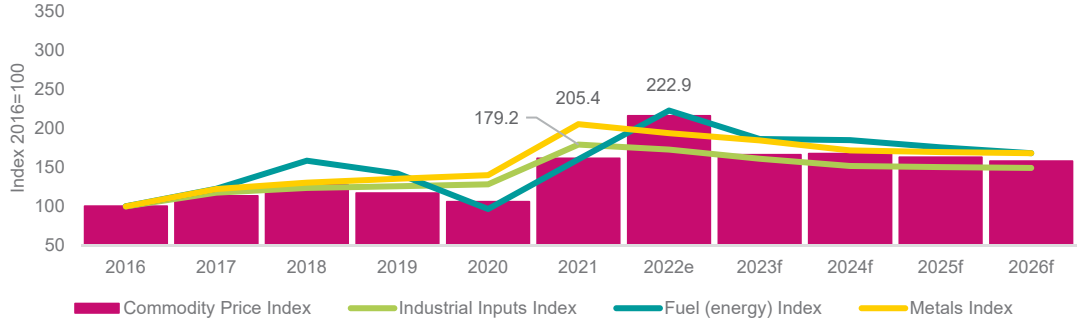
According to the World Bank – Commodity Markets Outlook Report (October 2023), prior to the recent conflict in the region, oil supply cutbacks by OPEC+ producers resulted in energy prices increasing by 9 per cent during Q3 of 2023. This resulted in the World Bank's commodity price index rising by 5 per cent over that period.

Notably, the same report outlines that prices are now 45 per cent above the average recorded during the period 2015-19. The main risk for commodity markets arises from the potential of the conflict escalating, leading to a dramatic increase in commodity prices across the globe.

According to the same report by the World Bank, it is expected that commodity prices will continue to fall in 2024 due to weak global growth, resulting from tighter financial conditions seen across many of the global economies.

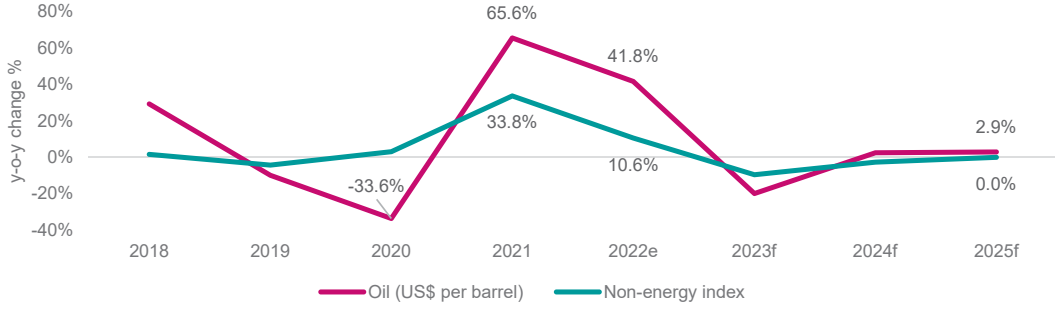
The below graphs illustrate how commodity prices, and energy in particular, increased between 2020 and 2022. Having fallen back in 2023, they are forecasted by the World Economic Outlook Database (October 2023) to remain consistent out to 2026, however any escalation of current conflicts or further global setbacks would remain a risk.

**Commodity Price Indices**




Source: IMF, World Economic Outlook Database, October 2023

**Growth in Commodity Prices**




Source: World Bank Economic Prospects, 2023

The above graph outlines the impact of fluctuating oil prices on non-energy pricing.

# Energy

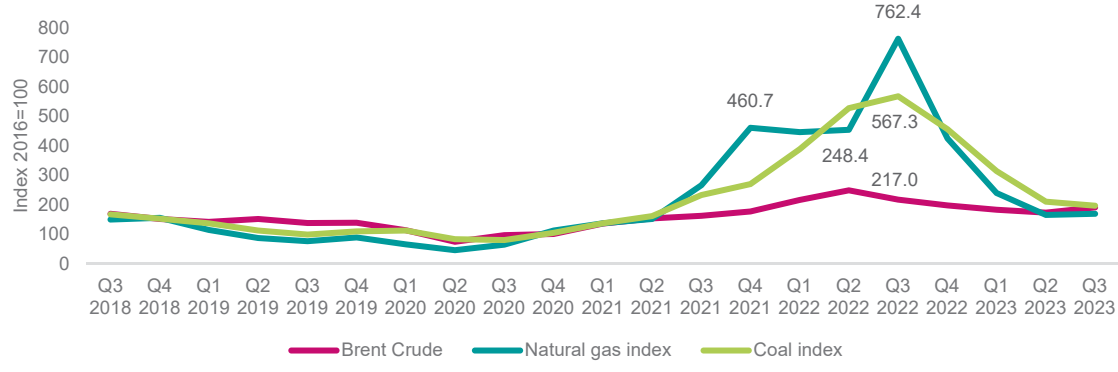
According to the World Bank – Global Economic Prospects Report (June 2023) and the World Bank – Commodity Markets Outlook Report (October 2023), energy prices eased since a peak in the third quarter of 2022, largely because of a warmer start to winter in the northern hemisphere. It is also reported that prices could fall lower, dependent on whether global demand is weaker than expected.

Given that demand from the Chinese economy is expected to account for more than 50 per cent of global oil demand, the outcome will be heavily influenced by the performance of the Chinese economy during 2023 and beyond. The same report by the World Bank also identifies the risk associated with a lack of expansion in U.S. oil production, in addition to low levels of spare capacity among OPEC members.

With recent developments in the Middle East in mind, such conflicts have always created volatility within energy markets consequently. Oil prices have risen 6 per cent due to ongoing concerns about the continuity of supply from the region and the impact it will have on global supply. Gas markets in the region have also been affected with prices rising by an additional 35 per cent when a gas field off the Israeli coast was closed.

Looking at European markets in more detail it is reported that the price of natural gas has risen since September, albeit due to the industrial action at Australian LNG facilities. Other notable events that have impacted gas markets relate to an explosion at a facility located in the Baltic Sea.

**Changes in energy prices**




Source: IMF Primary Commodity Prices

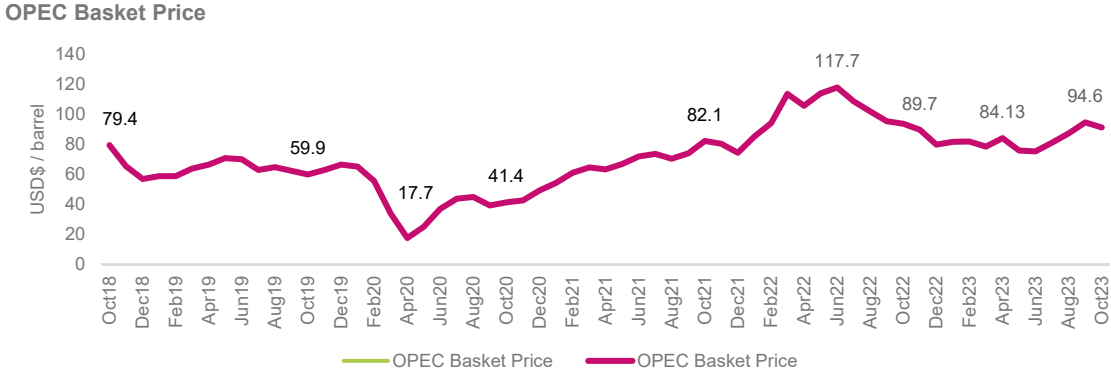
## Oil

As documented in the recent World Bank – Commodity Markets Outlook Report (October 2023), it is estimated that oil demand across the globe reached 103 million barrels per day (mb/d) during Q3 2023 – which would represent a record high.

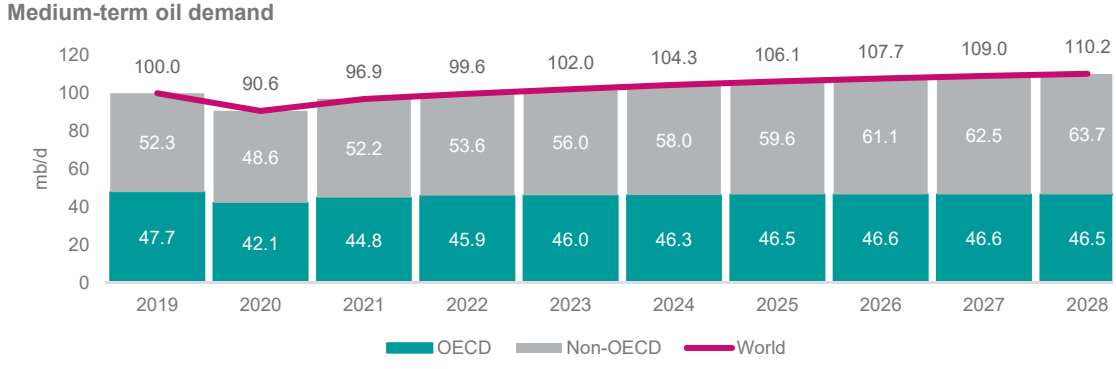
Looking at oil supply, the same report outlines that estimated production in Saudi Arabia during Q3 2023 was predicted to be the lowest in more than the preceding 10-year period outside of recessions. However, it is noted within the report that reductions to production by OPEC+ have been offset by increases in the Americas, led by the United States.

The report outlines that prices have been volatile during 2023 due to global growth prospects and ongoing geopolitical concerns in many regions.

The below graph, based on data from OPEC, illustrates how oil prices in 2023 started just above $81/bbl in January, reaching $84.13/bbl in April and up to $94.6/bbl in September before dropping back in October 2023.




Source: OPEC




Source: OPEC 2023 World Oil Outlook 2045

## Natural gas and coal

As reported by the World Bank – Commodity Market Outlook Report (October 2023), the price of both natural gas and coal was expected to moderate in 2023. A key reason for this is improved efficiency and energy demand reduction seen in key markets.

Due to the ongoing conflict in Ukraine, the European Union has opened new supply lines of liquefied natural gas (LNG) imports from Norway and North Africa. At the same time, demand from within the European Union for natural gas has fallen because of efficiency gains, policies changes and weaker economic growth, leading to a fall in production outputs within the industrial sector. On a global scale, it is envisaged that a reduced demand from China is also impacting gas markets.

From a further review of the World Bank – Commodity Market Outlook Report (October 2023), it was estimated that natural gas inventories within the European Union had reached 95 per cent of full capacity ahead of winter, which itself has started mildly and as a result, reducing demand.

Notwithstanding the above, natural gas prices across the European Union remain 82 per cent above their 2015-19 average, according to the World Bank – Commodity Market Outlook Report (October 2023). With the global energy transition gaining momentum, the same report notes that coal prices continued to decline.

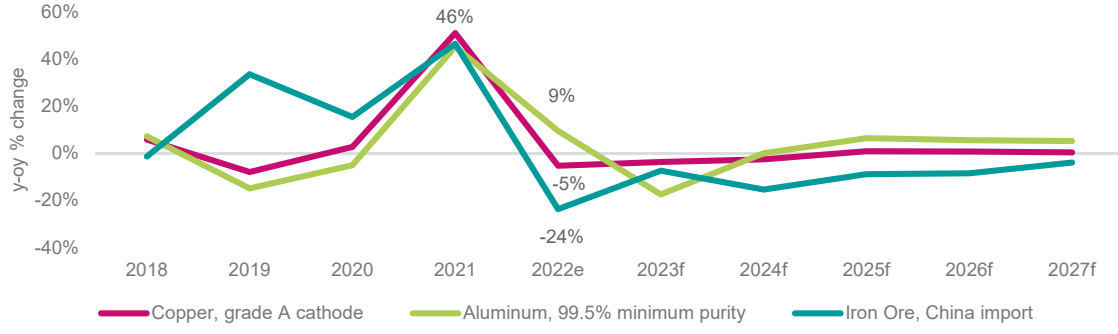
## Metals

From a review of the World Bank – Commodity Market Outlook Report (October 2023), metal prices experienced an increase during the early period of 2023. The same report also outlined that metal prices are expected to decline in 2023. It is noted that declining prices during 2023 reflect a correction in supply lines which were affected during the pandemic, as well as lower than expected global growth across many of the leading economies.

Like the oil and gas markets, the Chinese economy will also impact the metals market. As identified in the World Bank's before-mentioned report, China accounts for a significant portion of the overall demand across the globe, therefore any fluctuation results in a substantial change in the overall market.

The graph below shows that aluminium prices are expected to fall in 2023, with prices of iron ore and copper expected to rise, although the increase in copper prices being marginal.

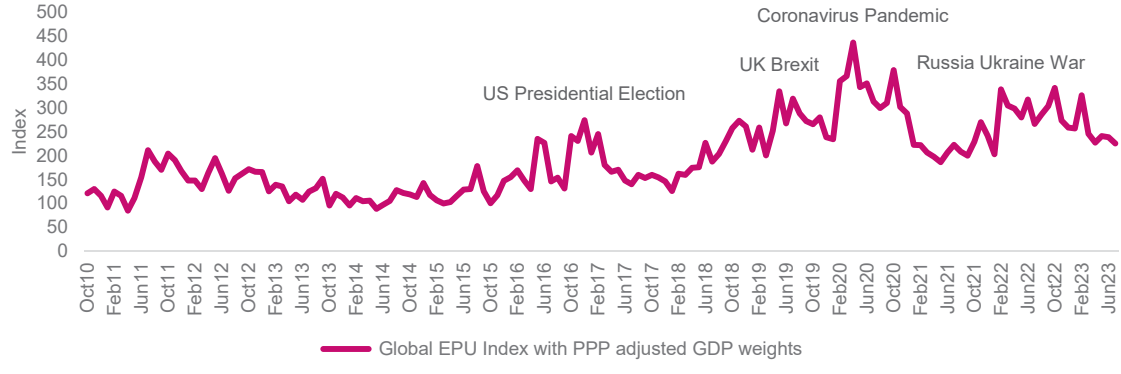
**Changes in metal prices**




Source: IMF, World Economic Outlook Database, October 2023

# Global economic risks

**Economic policy uncertainity**




Source: Economic Policy Uncertainty (www.policyuncertainty.com)

# Key economic risks

### Global inflation - recession

Throughout 2023, inflation has remained high and economies across the globe have seen a slump in projected growth levels following post pandemic improvements. Many believe that inflation will remain at elevated levels for several years, resulting in lower growth projections, but with the prospect of a deep recession becoming a real issue for many economies.

### Geopolitical conflict

Geopolitical conflicts continue to be a significant risk to global economies with ongoing conflicts threatening the stability of markets on a level not witnessed since World War II. There also remains a risk to global stability if conflicts were to escalate beyond the region.

### US–China tension

Trade tension between the US and China continues to pose a risk and competition is expected to rise within the technology sector with restrictions placed on tech exports to and from China, leading to exposed supply chains.

### Digital cyberattacks

New technologies are set to reshape economies with a drive towards artificial intelligence, autonomous vehicles and the use of drones; the digital world will be vulnerable to cyberattacks. This is already seen with critical infrastructure (energy, healthcare and transportation) and geopolitical and economic uncertainties due to a lack of suitable governance.

### Adverse weather and climate change

Extreme weather caused by climate change will require governments to make renewed and increased commitments in reducing their countries emissions, as well as assisting those countries most affected by adverse weather but without the financial means to combat the risk and respond to events. Continued focus will be placed on the oil, gas, airline and automotive industries, in addition to the food industry, as this will remain a prevailing risk in 2024 and beyond.

### Biodiversity loss

Biodiversity loss is caused by climate change, pollution, deforestation and habitat loss. This risk threatens global ecosystems, affects livelihoods, food supplies and income and may lead to disease outbreaks.

### Natural disaster

Natural disasters can be a preventable risk, and solutions such as reforestation, education, technology governance and economic support could help mitigate and reduce the risks caused by global warming, pollution and mining.

# Global construction prospects

## This review is for the period covering 2023 to 2027, analyzing anticipated construction growth during this time.

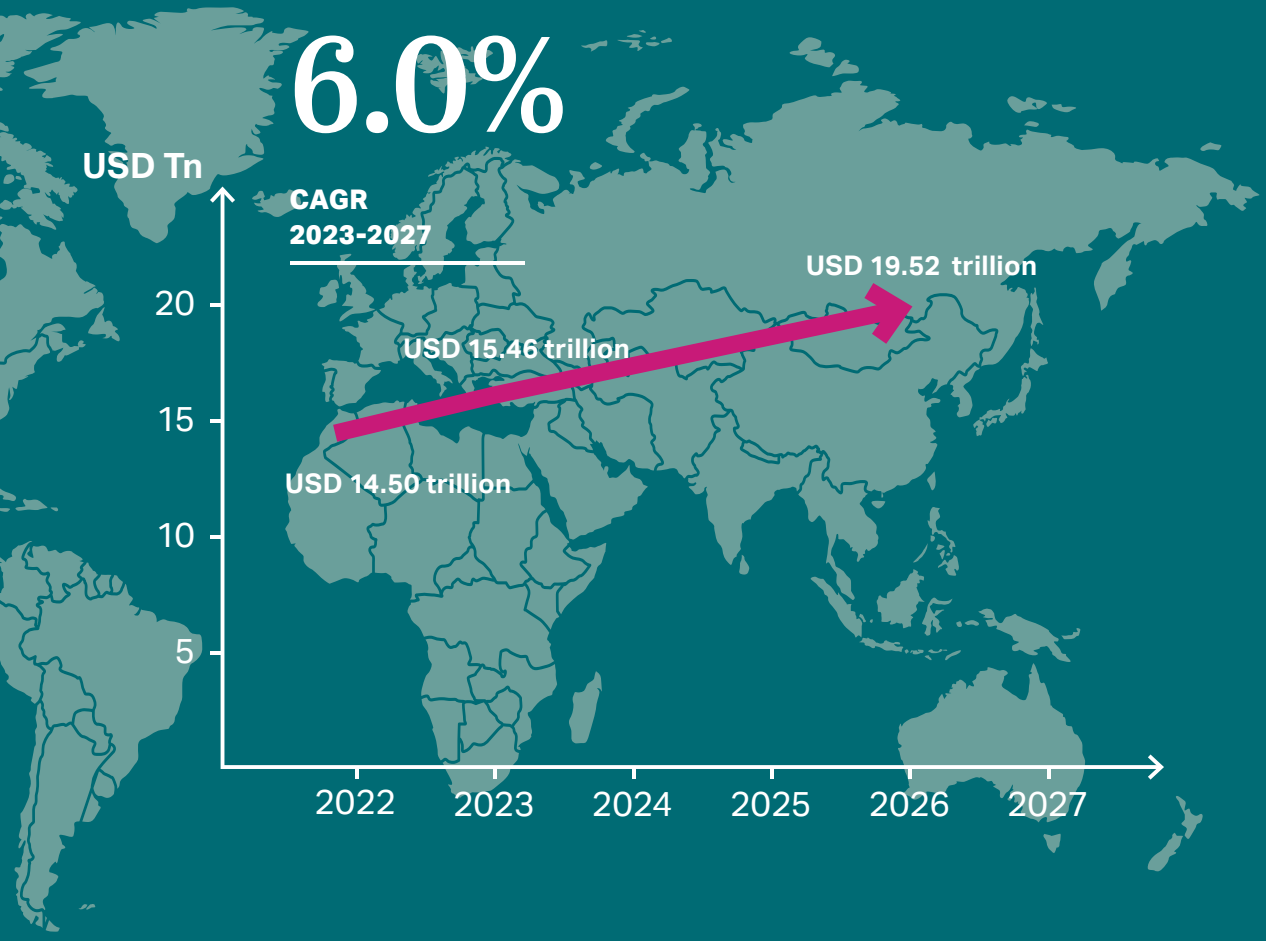
The global construction market is expected to reach USD 15.46 trillion in 2023 from USD 14.50 trillion in 2022 at a compound annual growth rate (CAGR) of 6.6 per cent.

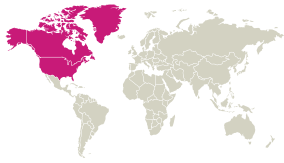
The market is expected to reach USD 19.52 trillion in 2027 at a compound annual growth rate (CAGR) of 6 per cent, according to the Business Research Company.

The RICS Global Construction Monitor for Q3 2023 outlines that activity across most markets showed modest growth in headline industry output, with the majority of growth seen within the infrastructure sector. Activity across private residential and commercial markets was seen as flat, almost negative.

It is noted that activity in Europe is down in comparison to other global regions, however activity across the Middle East region saw firm growth. Across the APAC region, markets within India and the Philippines saw robust growth, however, the RICS Global Construction Monitor for Q3 2023, reported a further easing in Singapore. It is also reported that markets in Australia, New Zealand and Sri Lanka expect some growth in private sector activity.

Consistent with emerging trends over the past number of years, the impact of higher interest rates and rising costs are still seen as the main issues encountered across global markets.





# North America

GDP from construction across the main economies is expected to reach USD 682 billion across North America, with the US accounting for USD 570 billion. For the US market, this equates to circa 2.20 per cent of all GDP generated from within the US economy. The remaining output value of USD 112 billion relates to the Canadian market, which accounts for 5.14 per cent of total Canadian GDP.

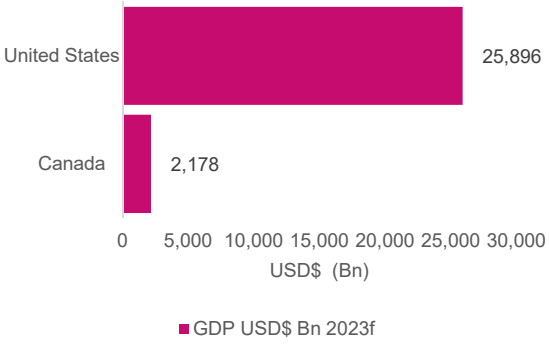
A recent GlobalData review outlines that the US dominates the North American construction market, ahead of Canada when comparing output values. It is reported that the US market is anticipated to grow by 3.6% CAGR over the forecast period of 2024-2027.

In addition, GlobalData outlines that the US construction market was valued at USD 2.1 trillion in 2022 and is projected to achieve an average annual growth rate (AAGR) of more than 4 per cent during 2024-2027, mostly across energy, transportation, housing and manufacturing end markets. However, it is also reported that due to ongoing inflationary and interest rate factors, coupled with shortages in available labour, the US construction industry is anticipated to show a decline in real terms in 2023.

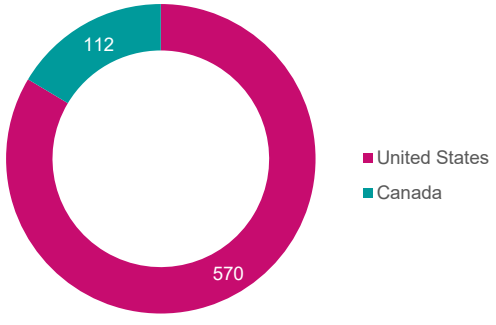
GlobalData continues to report that the Canadian construction market was valued at USD 349.1 billion in 2022 and is projected to achieve an AAGR of more than 1 per cent during 2024-2027 with end markets such as energy, commercial, residential and education underpinning growth.

Similar to the US market, the Canadian construction market is also expected to show a decline during 2023 on the back of sharp falls in the residential end market sector due to tightening monetary policies and a weaker economic outlook. According to the same GlobalData review, the Canadian market will also be impacted by high construction costs and shortages in skilled labour, leading to a decline in activity during 2023.

**North America GDP**




**GDP from Construction USD Bn**




Source: IMF, Trading Economics, World Bank

# Latin and South America

GDP from construction across the main economies is expected to reach USD 93.3 billion across Latin and South America, with Mexico accounting for USD 80.8 billion. This equates to circa 5.71 per cent of all GDP generated from within the Mexican economy. Chile accounts for USD 3.7 billion of the overall construction market (1.21 per cent of GDP). Peru accounts for a further USD 2.8 billion (1.17 per cent of GDP), with Brazil contributing USD 3.2 billion (0.17 per cent of GDP). The construction markets of Colombia and Argentina make up the remaining output of the region's main economies.

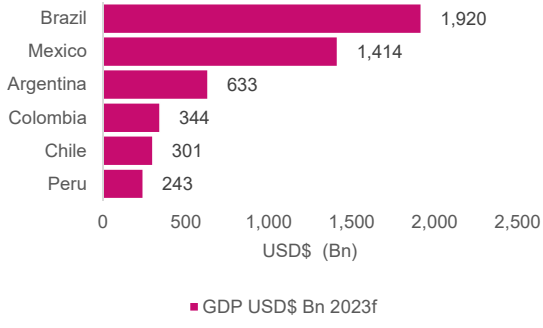
Economic growth across Latin America and the Caribbean is expected to decline from 3.7 per cent in 2022 to 1.5 per cent in 2023. Similar to other global regions, the local economies have been impacted by rising interest rates with inflation running above targets. According to the World Bank, Global Economic Prospects Report (2023), the main risks include slower growth within the economies of trading partners, in addition to ongoing and tightening monetary policies. Climate change and the impact of adverse events also pose a risk across the region.

According to the World Bank, Global Economic Prospects Report (2023), it is envisaged that metal prices will remain broadly stable. However, agriculture and energy prices are projected to be lower than last year.

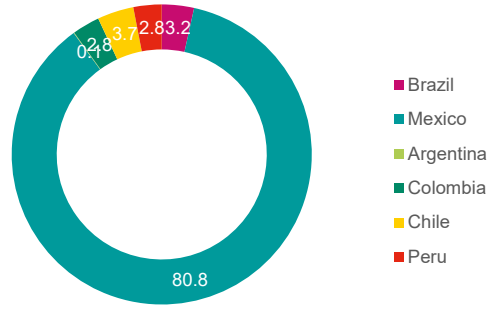
Looking closer at Brazil, as the main economy in the region, it is expected that growth will slow to 1.2 per cent in 2023 before rebounding to 1.4 per cent in 2024, according to the World Bank, Global Economic Prospects Report (2023). The same report also outlines that uncertainty about fiscal policy continues to harm business confidence and investment.

Economies within the Latin America and Caribbean regions are expected to recover in 2024, with a growth of 2 per cent projected by the World Bank.

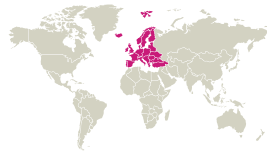
**Latin and South America GDP**




**GDP from Construction USD Bn**




Source: IMF, Trading Economics, World Bank



# Europe

GDP from construction across the main economies is expected to reach USD 191.9 billion across Europe, with Germany accounting for USD 62.8 billion. This equates to circa 1.54 per cent of all GDP generated from within the German economy. Following Germany, the UK accounts for USD 39.7 billion of the overall construction market (1.29 per cent of GDP). France accounts for a further USD 28.7 billion (1.03 per cent of GDP), with Italy contributing USD 22.9 billion (1.14 per cent of GDP). The construction markets of Spain, Turkey and the Netherlands make up the remaining output of the region's main economies.

The economic growth rate within Europe is expected to remain weak at 1.4 per cent during 2023, according to the World Bank, Global Economic Prospects Report (2023). As reported in 2022, economic performance is significantly impacted by events in Ukraine, as well as rising interest rates and inflation challenges.

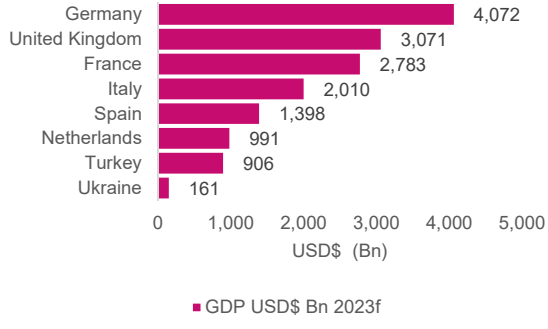
The same report outlines the risk associated with any worsening of the conflict between Russia and Ukraine and a continuation of inflation patterns across the region during 2024. The World Bank, Global Economic Prospects Report (2023) also identifies other risks to economic growth in Europe, such as any possible adverse weather events associated with climate change and the risk of energy insecurity linked to ongoing conflicts.

As reported by the World Bank's same above-mentioned report, if inflation remains high central banks may continue to raise interest rates which may in turn lead to lower than expected economic growth across the region on the back of higher borrowing costs.

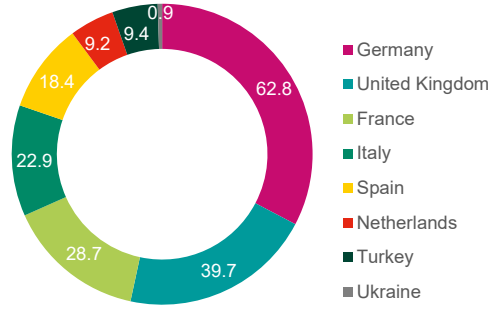
According to a recent RICS Global Construction Monitor publication, it is noted that recent surveys indicate a decline across the industry, due in part to lower economic growth and a tightening of credit conditions across the region. The same report outlines that the Construction Activity Index fell to -9 during Q3 of 2023, down from -1 during the preceding quarter.

Economies within the region are projected to grow by 2.7 per cent in 2024, dependent on the ongoing conflict in Ukraine, as projected by the World Bank.

**Europe GDP**




**GDP from Construction USD Bn**




Source: IMF, Trading Economics, World Bank

# Africa

GDP from construction across the main economies is expected to reach USD 10.1 billion across Africa, with South Africa accounting for USD 5.9 billion. This equates to circa 1.46 per cent of all GDP generated from within the South African economy. Following South Africa, Tanzania accounts for USD 2.2 billion of the overall construction market (2.89 per cent of GDP). Nigeria accounts for a further USD 1.0 billion (0.20 per cent of GDP), with Kenya also contributing USD 1.0 billion (0.92 per cent of GDP). The construction markets of Angola and Ghana make up the remaining output of the region's main economies.

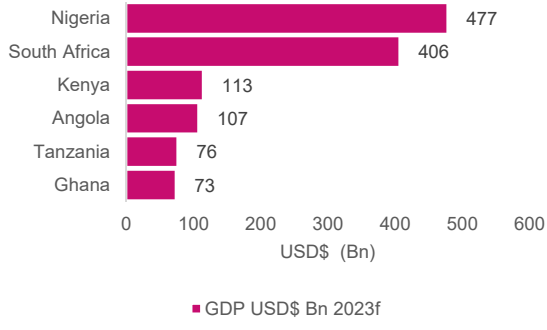
It is projected that growth will decline to 3.2 per cent in 2023, according to the World Bank, Global Economic Prospects Report (2023). This is mainly due to high inflation, higher borrowing costs and external global factors.

The same report outlines that some economies in the region are still recovering from the pandemic, with the burden of higher living costs adding to the already difficult economic position of many nations. It is feared that risks such a global economic slowdown, lower trade amongst partners, continued high inflation, coupled with financial distress in advanced economies, and more adverse weather events would not only subdue economic growth, but also increase the potential of poverty across the region.

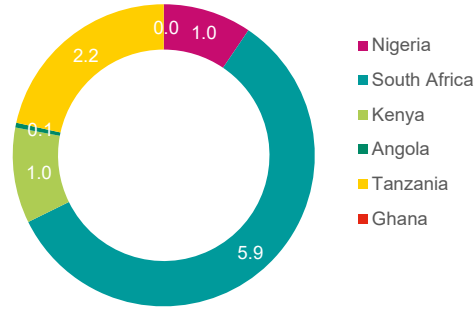
The World Bank, Global Economic Prospects Report (2023) also outlines that commodity prices may remain volatile should supply chain issues persist and/or if global geopolitical events continue and/or escalate.

The main economies within the region, Nigeria, South Africa and Angola, are projected to grow by circa 2.1 per cent across 2023-2024, as predicted by the World Bank.

**Africa GDP**




**GDP from Construction USD Bn**




Source: IMF, Trading Economics, World Bank

# Asia

GDP from construction across the main economies is expected to reach USD 1.477 trillion across Asia, with China accounting for USD 1.201 trillion. This equates to circa 6.68 per cent of all GDP generated from within the Chinese economy. Following China, Japan accounts for USD 192 billion of the overall construction market (4.54 per cent of GDP) and India accounts for a further USD 39 billion (1.15 per cent of GDP). Indonesia accounts for USD 20 billion (1.50 per cent of GDP), with South Korea contributing USD 17 billion (1.02 per cent of GDP). The construction markets of Kazakhstan, Malaysia and Cambodia make up the remaining output of the region's main economies.

According to the World Bank, Global Economic Prospects Report (2023), economic growth in the region was expected to slow in 2023 to 5.9 per cent.

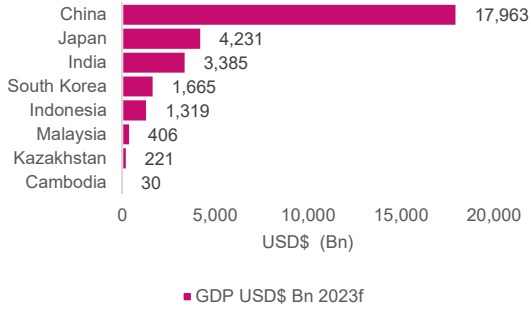
Like many other global economies, the main underlying risks to economic prospects in the region lie in a global slowdown across major economies, and in particular, the risks associated with monetary policy tightening or banking sector stress.

Other notable risks identified within the same report relate to social tensions arising from food insecurity and extreme weather events related to climate change. Consequently, the World Bank, Global Economic Prospects Report (2023) outlines that should such events occur, then the economic and humanitarian crises across many nations, in particular within Afghanistan and Sri Lanka, could have a greater impact.

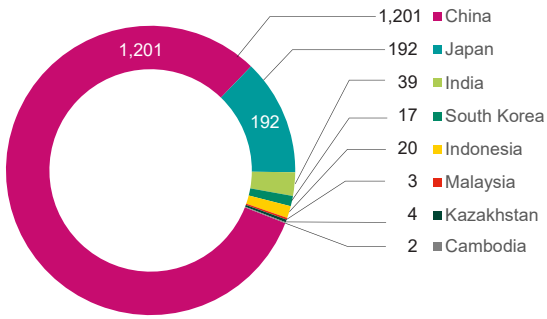
According to a recent RICS Global Construction Monitor publication, India and the Philippines are registering a strong performance with regional Construction Activity Index in the order of +60 during Q3 of 2023, and both countries experiencing growth across most market sub-sectors. It is also noted that the construction market in Malaysia is performing well, but at lower levels in comparison to India and the Philippines.

Despite global challenges, the economies within the region were projected to grow by 5.1 per cent in 2023 (World Bank).

**Asia GDP**




**GDP from Construction USD Bn**




Source: IMF, Trading Economics, World Bank

# Australasia

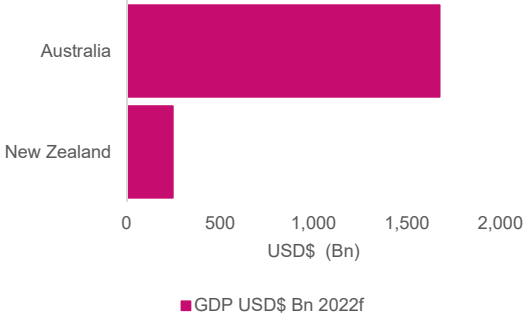
GDP from construction across the main economies is expected to reach USD 29 billion across Australia and New Zealand, with Australia accounting for USD 26 billion. This equates to circa 1.54 per cent of all GDP generated from within the Australian economy. The remaining output value of USD 3 billion relates to the New Zealand market, which accounts for 1.23 per cent of total New Zealand GDP.

According to the Business Research Company, activity within the Australian construction market is expected to show a decline during 2023 by 2.6%. As with most global construction markets, growth prospects are being affected by high levels of inflation, rising interest rates and associated financing costs, which are in part leading to increased construction costs. Furthermore, it is reported that there has been a decline in new building permits, indicating a general slowdown in activity. The same review from the Business Research Company outlines that the construction market in Australia is expected to show an average annual growth of 3.1% during the period of 2024 to 2027.

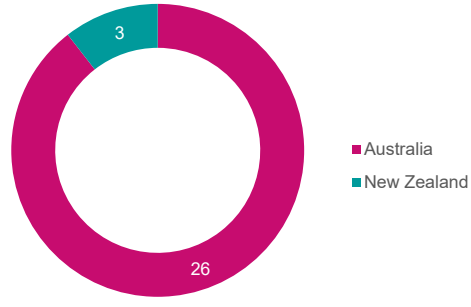
In relation to the New Zealand market, the Business Research Company review outlines that the market is expected to grow by 3.6% in 2023. Underpinning the growth prospects of New Zealand are the efforts required to rebuild damaged infrastructure, such roads, rail and schools, and provide flood protection following the cyclone earlier in the year. Despite this, the same review from the Business Research Company outlines that the construction market in New Zealand is expected to show an average annual growth of 2.6% from 2024 to 2027.

According to a recent RICS Global Construction Monitor publication, it is noted that workloads across the region, in both the private and public sectors, are expected to show some recovery in the 12-month period from Q3 2023.

**Australasia GDP**



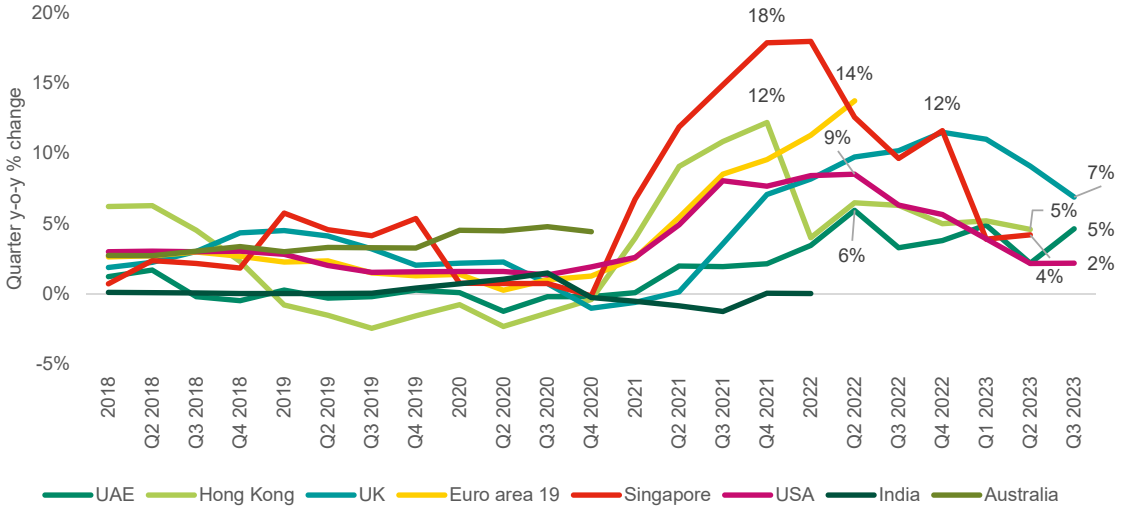

**GDP from Construction USD Bn**




Source: IMF, Trading Economics, World Bank

# International construction cost inflation

**International construction cost indicators**




Source: Based on AECOM Indices for UK, UAE; ENR USA Construction Cost Index; Singapore Building Construction Authority, Hong Kong Architectural Services Dept (Public Sector), Euroarea Eurostat Construction Output Index, India CIDC Construction Cost Index, AIQS Building Cost Index.

As the cost of construction resources and materials rise and economic instability persists, 2023 witnessed notable increases in construction costs worldwide. On the previous page, the chart illustrates the quarterly fluctuations in construction costs across various global indices.

The data reveals that the global impact of construction inflation became evident around early 2021, coinciding with the economic and supply chain disruptions caused by the pandemic.

While there are anticipations that price surges will moderate further in 2024, the construction sector is experiencing varying levels of growth and pace in different countries. Even as overall construction activity remains on an upward trajectory, there is a discernible divergence in output and project timelines across nations.

Both ongoing and future construction endeavors are grappling with the ramifications of this escalated cost scenario. Newly initiated projects are encountering challenges in terms of financial feasibility and budgeting, especially those on the brink due to the prevailing inflationary conditions. Capital-intensive projects, given their inherent risks and budgetary constraints which affect both public and private domains, are likely to confront increased obstacles in 2024.

Projects that are in advanced stages might be relatively insulated from immediate impacts, thanks to existing financial commitments and established project viability.

Nevertheless, the overarching financial strain, combined with inflationary pressures, could still permeate these ventures, affecting their subsequent phases.

“**Capital-intensive projects, given their inherent risks and budgetary constraints which affect both public and private domains, are likely to confront increased obstacles in 2024.**”

# 02 MENA market review

## IN BRIEF

# MENA economic review

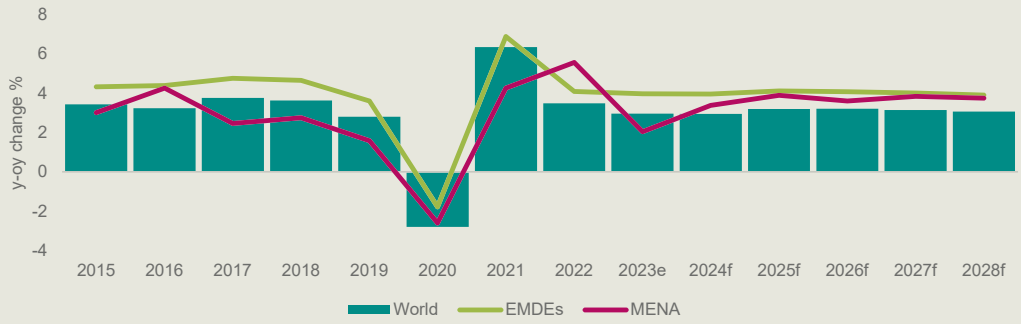
## As of Q3 2023, the International Monetary Fund (IMF) forecasted the Middle East and North Africa (MENA) regions' GDP to grow by 2.04 per cent for full year 2023. This represents a drop from the 5.56 per cent figure reported in 2022.

This slump in growth is attributed to many of the MENA economies being impacted by tighter fiscal policies and domestic challenges. The overall outlook for the MENA region continues to be uneven across its markets and countries, strengthened by the elements affecting global economies and the disparity of available fiscal stimulus between oil importing and exporting countries.

The Middle East encompasses several oil exporting countries, including Saudi Arabia, the United Arab Emirates (UAE), Qatar, Oman, Bahrain, Iran, Iraq, Syria, Kuwait and Yemen. These countries account for approximately 48 per cent of the world's proven oil reserves and circa 38 per cent of natural gas reserves. During periods of high oil prices, such as 2021-2022, these countries' economic outlook became bolstered as fiscal surpluses were created, and they became somewhat sheltered from the economic risks attributed to the rest of the world. This fiscal surplus provides considerable easing in terms of economic recovery and with the current and continued high oil prices at the centre of the Middle East's growth, it is allowing for greater fiscal flexibility and confidence in investment and the funding of diversification efforts across the GCC member states.

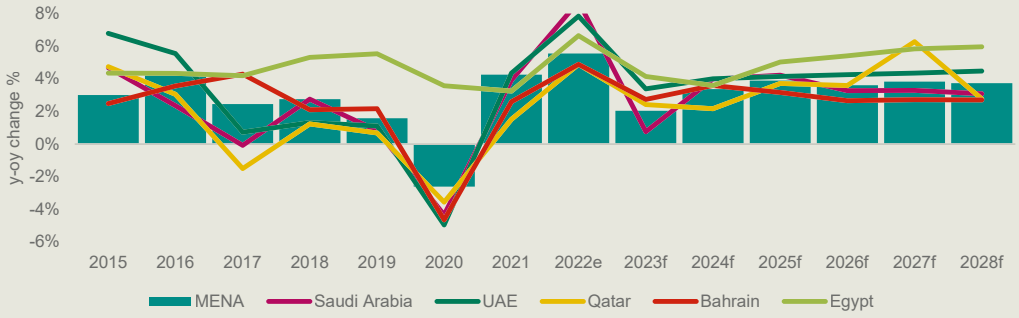
The Middle Eastern oil importing countries such as Egypt, Jordan and Lebanon are under substantial economic burden in comparison to their oil exporting counterparts. Despite this, Egypt's economic outlook had remained positive, largely due to structural and economic reforms made pre-coronavirus, as well as continued investments in its infrastructure and mega-projects. However, Egypt is facing mounting challenges with a shortage of hard currency, growing external debt and high inflation, affecting the living standards of over 100 million citizens in the most populous Arab country. Furthermore, after a borrowing binge quadrupled its foreign debt, Egypt needs more than USD 28 billion to meet repayments in 2024 alone. Exacerbating the challenges,

**World, EMDEs and MENA, GDP growth at constant prices**



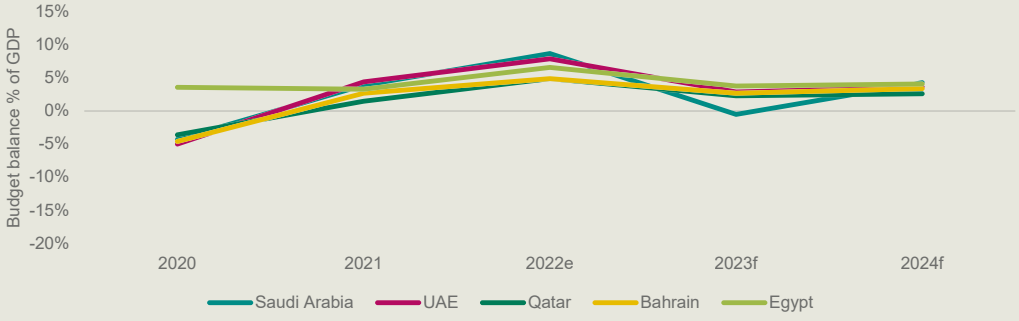

Source: IMF, World Economic Outlook Database, October 2023

**Selected MENA countries, GDP growth at constant prices**




Source: Haver Analytics, National Sources, Emirates NBD Research July 2023

**Budget balance % GDP for selected MENA countries**




Source: Haver Analytics, National Sources, Emirates NBD Research July 2023

the mounting geopolitical conflicts and a foreign currency shortage, has also led to a five billion USD backlog of imports stuck at ports.

The MENA's economic recovery has been subdued throughout 2023, with slowing global economies, increased commodity prices and the tightening of global financial conditions, causing outlooks to remain subdued for 2024 also.

The graph above shows the MENA GDP growth rate in comparison to emerging markets and developing economies. This is also tracked against the overall world economy from 2015 and forecasted to 2025.

According to the IMF, the MENA region's GDP is expected to grow in 2024, and maintain its growth levels between 2025 and 2028.

# 2023 MENA country statistics

Below is a reference to the key data for MENA countries in 2023. It presents statistical growth and forecasts for 2023, and in some instances, through to the end of the review period 2028. The table identifies the country's GDP value, import and exports against GDP and population growth.

| | Algeria | Bahrain | Egypt | Iran | Iraq | Jordan | Kuwait | Oman | Qatar | Saudi Arabia | UAE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land area, '000 km2 (1) | 2,381.7 | 0.8 | 995.5 | 1,628.8 | 434.1 | 88.8 | 17.8 | 309.5 | 11.6 | 2,149.7 | 71.0 |
| Capital city | Algiers | Manama | Cairo | Tehran | Baghdad | Amman | Kuwait | Muscat | Doha | Riyadh | Abu Dhabi |
| Population, million, 2023f (2) | 46.0 | 1.6 | 105.7 | 86.5 | 43.3 | 10.3 | 5.0 | 5.1 | 2.9 | 32.8 | 10.1 |
| Population growth, CAGR 2023-2028 (CAGR %) (2) | 1.3 | 2.5 | 2.0 | 1.0 | 2.6 | 0.7 | 2.0 | 3.2 | 0.6 | 2.0 | 1.8 |
| GDP, USD, billion, current, 2023f (2) | 224.1 | 45.0 | 398.4 | 366.4 | 255.0 | 50.0 | 159.7 | 108.3 | 235.5 | 1,069.4 | 509.2 |
| Real GDP growth (2022-2023), % (2) | 3.8 | 2.7 | 4.2 | 3.0 | -2.7 | 2.6 | -0.6 | 1.2 | 2.4 | 0.8 | 3.4 |
| GDP/ Capita (PPP), USD, 2023f (2) | 13,682 | 60,715 | 17,123 | 19,942 | 11,742 | 12,809 | 51,765 | 39,336 | 114,210 | 68,453 | 88,962 |
| Net lending/ borrowing, 2023f % of GDP (2) | -8.6 | -5.0 | -4.6 | -5.5 | -7.7 | -7.0 | 14.0 | 6.2 | 10.8 | -0.3 | 5.1 |
| Volume of imports of goods & services, % of GDP (2) | 14.3 | 1.1 | -15.7 | -15.0 | - | 3.0 | - | 7.1 | 2.4 | 8.7 | 4.2 |
| Volume of exports of goods & services, % of GDP (2) | -11.6 | 2.8 | 2.9 | -2.4 | - | 2.3 | - | 9.2 | -3.0 | 1.3 | 3.4 |
| Account balance, USD, billion, current (2) | 6.5 | 3.0 | -6.8 | 12.6 | -4.9 | -3.8 | 48.4 | 5.5 | 41.5 | 63.6 | 41.6 |
| Unemployment rate, % of total labour force (2) | - | - | 7.1 | 9.4 | - | - | 2.2 | - | - | - | - |

Source: (1) World Bank (2) IMF

# MENA economic challenges and risks

The MENA region continues to face the same economic challenges and risks as previous years, however, notably in 2023 the events of the Morocco earthquake in September 2023 and the escalation of geopolitical conflicts has contributed to higher uncertainty in the economic outlook for the region. The impact of the conflict remains unclear and will depend on the duration, intensity and spread of geopolitical tensions. Continued political instability, extreme unemployment, economic uncertainty, economic relief disparity and the ongoing geopolitical conflicts, all remain challenges to the stability and economic growth of the region.

The key risks associated with the MENA region include:

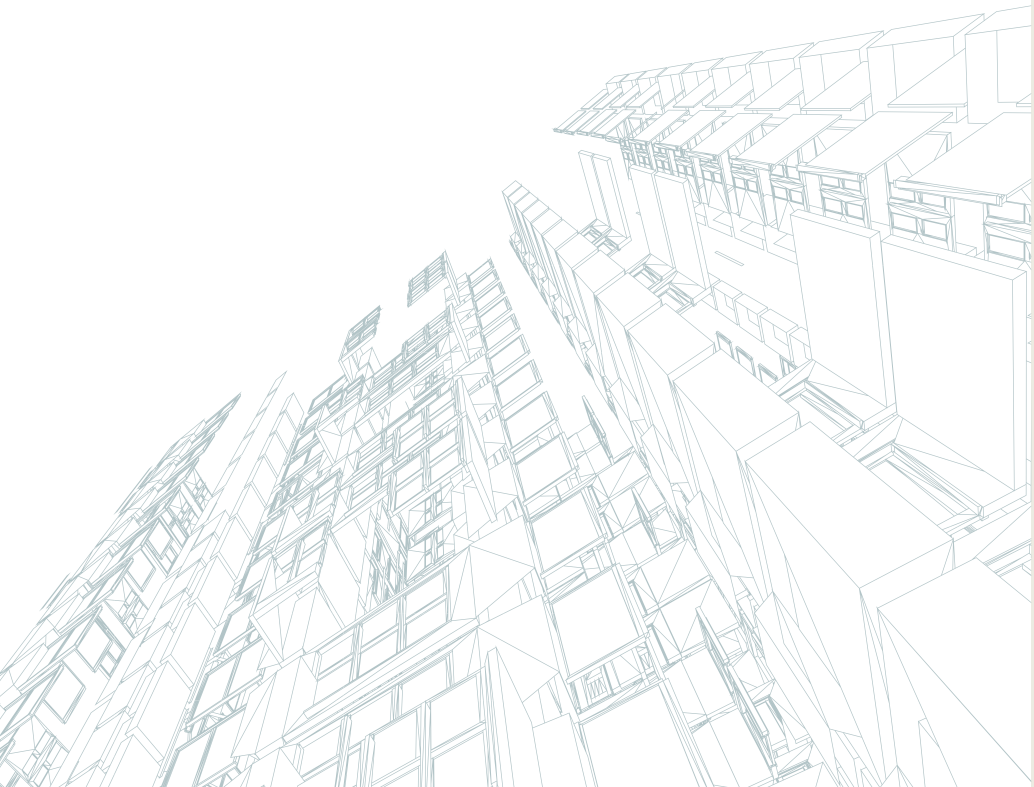
1. **Conflicts**
   Violence, protests and social unrest.
2. **Oil prices**
   Exporting and importing reliance.
3. **Governments**
   Institutional/social fragility and corruption.
4. **Unemployment**
   and under-employment, especially for youths and females.
5. **International ties and trade tensions**
6. **Cyberattacks**
   Disruption of operations or theft of data or money.
7. **Human capital**
   Education and skills gaps.
8. **Climate change**
   Extreme weather, rising sea levels, floods and droughts.
9. **Pandemics**
   New viruses/variants.
10. **Food security including water**

# MENA construction market review

## The overall outlook for the MENA region's construction sector remains confident, strengthened by growing pipelines and continued investment in Saudi Arabia and the UAE.

The backdrop to the market optimism is centred around buoyant and increasing project pipelines across the UAE and Saudi Arabia, which are set to be the focus for the region's construction sector in 2024 and beyond.

The resilience and driving force of the MENA region's construction sector is focused on the need to develop and diversify their economies to meet the demands of its rapidly growing population and reduce economic reliance on finite and economically volatile fossil fuels.



According to MEED, the pipeline of projects across MENA has grown to an estimated USD 3.7 trillion, with the GCC equating to over 84 per cent (USD 3.1 trillion) of this market value. The largest segment of construction remains in transportation infrastructure and building real estate, including the development of social infrastructure, schools and hospitals, to advance existing and growing populations.

Project awards in the Middle East for 2023 was set to increase by over 50 per cent compared to awards in 2022 (based on Q3 2023 data). Figures for 2023 have posted new five-year records for construction activity in the region and showcase the very strong and positive market compared to pre-pandemic levels and over the last 10 years.

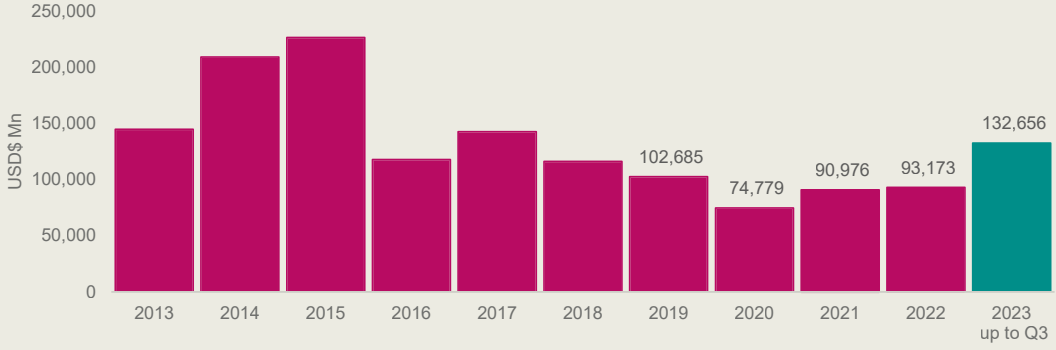
Considerable projects in non-energy construction have been awarded in 2023, especially in the UAE and KSA, with the UAE posting a huge 232 per cent increase compared to 2022 figures and KSA recording a 94 per cent increase with awards in Q4 still yet to be published.

Awards in Qatar rose 41 per cent and all other MENA regions awarded positive growing markets compared to 2022. The only exception was Egypt, which has seen a 63 per cent decline in project award values compared to the previous year. Egypt's softening construction market can be attributed to sharp inflationary pressures and reluctance of foreign investment due the considered volatility in the market

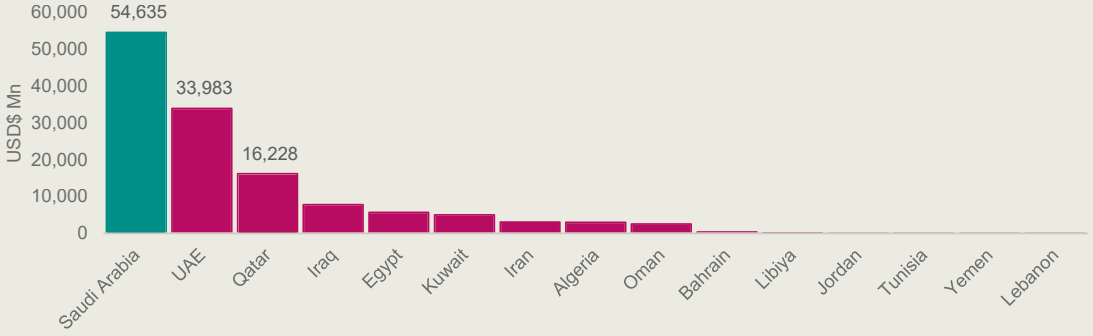
In KSA, development parties in the region continue to be focused on the expansion of its infrastructure projects to support the development and expansion of its PIF led giga-project programs. The UAE's increase in project awards with its marked focus on the building sector and residential real estate, marks a considerable return to a buoyant construction market.

MENA project awards are expected to grow further in 2024, mainly due to Saudi Arabia striving to meet the demands of its Vision 2030.

**MENA projects awarded yearly**




**MENA projects awarded 2023**




Source: MEED

# MENA awarded contracts

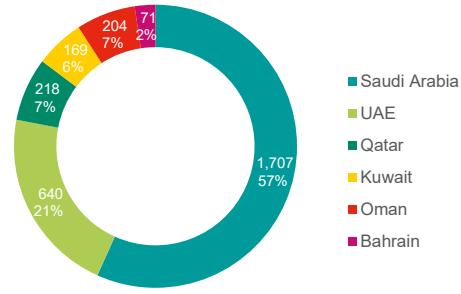
The country with the highest value of awarded projects in 2023 was Saudi Arabia, with an approximate total of USD 55 billion (tracked to end Q3 2023). This equates to a 57 per cent increase from the same time the previous year and an overall 41 per cent market share (recorded by MEED). This was followed by a very strong posting for the UAE market with USD 34.0 billion of project awards, equivalent to over 200 per cent from the previous year and holding a 26 per cent market share. In third place was Qatar with USD 16.2 billion, equating to a 12 per cent market share.

The busiest sector for project awards was building construction which saw a 19 per cent share, followed by gas construction, also at circa 19 per cent. Water projects came in third with 16 per cent, followed by transportation and infrastructure projects at 14 per cent and chemical and power projects at 11 and 10 per cent respectively.

Of Saudi Arabia's USD 55 billion investments this year, USD 9.2 billion was committed to the commencement of infrastructure packages for the Government/PIF led NEOM giga-project, Diriyah Gate Development Authority (DGDA), Rus al-Madinah Holding (RMH), Royal Commission of Riyadh City (RCRC) and The Red Sea Development Company (TRSDC). This signals a continued commitment to their ambitious diversification plans and enabling works for major construction builds that lead into 2024 and beyond.

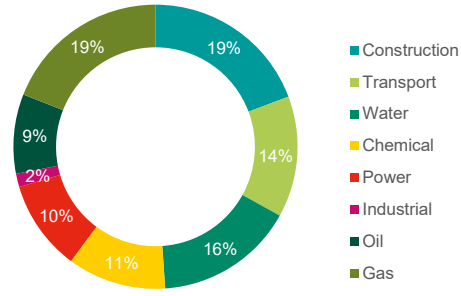
According to MEED, a further USD 30.8 billion was awarded for buildings (USD 7.4bn), power (USD 7.7bn), industrial (USD 1bn), water (USD 8.2bn) and chemical (USD 6.6bn) projects. With key projects awarded for Saudi Power Procurement Company (SPPC) Solar PV Power Plants, Red Sea Global awarding Amaala utilities package, NEOM's continued awards of projects such as Oxagon's NEOM Industrial City Connector (NICC) depot line and dredging/ quay wall package, Shusha Island Development Infrastructure Works, Modular Staff

**GCC Construction Market Value 2023**



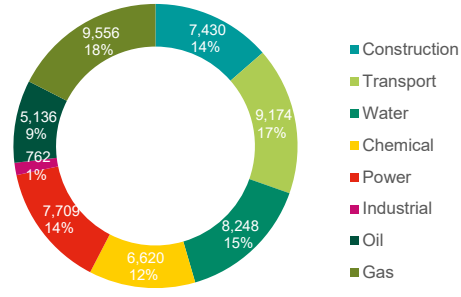

Source: MEED 2023 Q1 - Q3

**Gulf project awards % 2023**



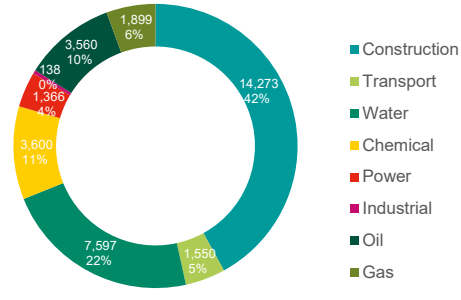

Source: MEED 2023 Q1 - Q3

**KSA project awards % 2023**




Source: MEED 2023 Q1 - Q3

**UAE project awards % 2023**




Source: MEED 2023 Q1 - Q3

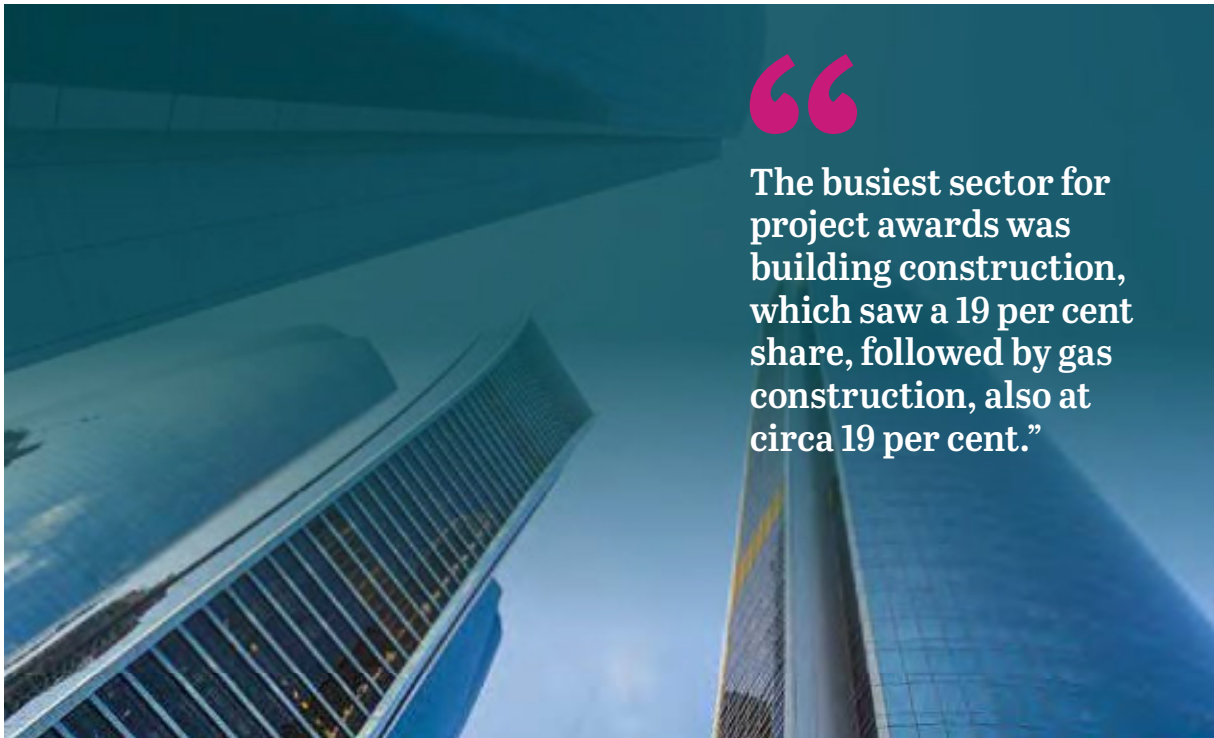
Accommodation Apartments and Water Transmission Lines, further highlighting the scale and commitment to the Kingdom's diversification efforts.

The UAE saw USD 15.8 billion of its USD 33.9 billion awarded to building and infrastructure works in Q3 2023. This mainly consisted of residential housing projects with key developers awarding the following values; RAK Hospitality USD 2.0 billion, Abu Dhabi Housing Authority USD 1.53 billion, Emaar USD 0.76 billion, Damac USD 0.74, Al Habtoor USD 0.70 billion, Sobha USD 0.56 billion, Binghatti USD 0.47 billion. Other key projects were awarded for:

- ADNOC - Maximizing Ethane Recovery And Monetization (MERAM) and Mirfa Seawater Treatment Plant,
- Marjan/RAK Hospitality/ Wynn Resorts joint venture to build Al-Marjan's Multipurpose Integrated Resort,
- Abu Dhabi Housing Authority - West Baniyas Residential Development,
- Tiger Group's Tiger Tower in Business Bay, and
- Al Habtoor Group's - Al-Habtoor Tower.

The outlook for the UAE remains buoyant due to the boosted tourism and property purchases since early 2022 following the Ukraine-Russia conflict, increased activity in upstream gas production, reworked metro and rail expansions and the reignition of shelved development projects. In addition, its commitment to the development of technology companies has also helped to set the nation up for positive growth in acute juxtaposition to the many struggling economies across the globe.

As recorded by MEED, Qatar saw an increased value of project awards this year reaching USD 16.8 billion with USD 11.5 billion being made up of projects related to gas production. Qatar's key focus continues to be on gas as they look to increase production as part of their long-term expansion strategy to boost LNG capacity by 64 per cent for 2027. Further investments were seen in chemical projects, such as the joint venture between Chevron Phillips Chemical and Qatar Energy to build a Ethane Cracker at the Ras Laffan Petrochemical Project (RLPP) and power projects such as Kahramaa - 132Kv to 66Kv New Extra High Voltage Underground Cables (EHV/HV), alongside several investments by ASHGHAL in education and infrastructure projects.



**"The busiest sector for project awards was building construction, which saw a 19 per cent share, followed by gas construction, also at circa 19 per cent."**

In Egypt, USD 2.1 billion of its USD 5.7 billion recorded in 2023, compromised projects relating to the expansion of its high-speed rail network. A consortium made up of Siemens Mobility, Orascom Construction and The Arab Contractors signed contracts with the Egyptian National Authority for Tunnels (NAT) to design, install, commission and maintain a 1,800 kilometre high-speed rail network. Other key awards were in the chemical sector with Egyptian Chemical Industries - Aswan Nitric Acid & Ammonium Nitrate Plant, alongside Cairo Airport Expansion and Logistic Park and multiple residential projects across the region. Although Egypt is facing challenges in terms of its economic growth, the country's construction pipeline remains strong with multiple strategically important projects in development to meet the Government's vision for 2030.

Amidst political restrictions in Kuwait, USD 5.0 billion has been awarded in 2023, notably by the Public Authority for Housing Welfare (PAHW) South Saad Al-Abdullah Residential City - Infrastructure Works (USD 1.1bn) and the Ministry of Public Works (MPW), Kuwait International Airport Terminal 2 - Package 3 (Aircraft Parking, Runways & Service Buildings) (USD 0.76bn). Positive steps in Kuwait's construction sector have been witnessed this year with major project-focused memoranda of understandings (MoUs) signed with China, during a visit by the HH Crown Prince Sheikh Mishal al-Ahmed al-Sabah to support growth in the development of housing projects, renewable energy, water treatment, recycling and ports.

**"In Egypt, USD 2.1 billion of its USD 5.7 billion recorded for awarded contracts in 2023, compromised projects relating to the expansion of its high-speed rail network."**

> **According to MEED, a further USD 30.8 billion was awarded for buildings (USD 7.4bn), power (USD 7.7bn), industrial (USD 1bn), water (USD 8.2bn) and chemical (USD 6.6bn) projects in KSA in 2023."**

Oman awarded USD 2.5 billion of projects in 2023, with 0.8 billion awarded by Nama Power and Water Procurement Company for the construction of Manah I Solar IPP and Manah II Solar IPP. The two significant Independent Power Projects (IPPs) are planned to produce electricity via solar power in the Wilayat of Manah, the Governorate of A'Dakhiliyah.

Minimal awards were recorded for Bahrain with only USD 0.39 billion awarded for 2023. Looking across Bahrain's pipeline of projects, the launch of Bahrain's USD 30 billion Strategic Projects Plan, which is set to increase the total land area by more than 60 per cent, and the tendering of USD 3.5 billion King Hamad Causeway project as a public-private partnership, show considerable prospects in the country in the journey to realise its Economic Vision 2030.

Furthermore, in conjunction with Bahrain being known as a gateway country for business in Saudi Arabia, the considerable uplift in business activity in Saudi Arabia means that the outlook for the country is expected to remain strong.

# Top five awarded contracts in 2023

## SAUDI ARABIA

| Awarded project name | Contractor | Value USD Mn |
|---|---|---|
| **NEOM City, Oxagon, NICC: Connector South** | Webuild, Shibh Al Jazira Contracting | 2,132 |
| **SWPC, Ar Rayis I IWP: Rayis to Rabigh IWTP** | Alkhorayef Water and Power Technologies Co. (AWPT) | 2,079 |
| **Red Sea, Amaala: Utilities Package** | EDF and Masdar | 2,000 |
| **KSPF - King Salman Park: Landscape Works Within Loop (Package 6.0)** | Nesma & Partners | 2,000 |
| **Mawani: Upgrade of Container Terminals at King Abdulaziz Port in Dammam** | China Harbour Engineering Company / 1.86bn | 1,860 |

## EGYPT

| Awarded project name | Contractor | Value USD Mn |
|---|---|---|
| **NAT - Alexandria Metro: Phase 1, Lot I** | Orascom | 1,394 |
| **NAT: 10th of Ramadan Railway LRT, Phase IV** | Korea Hydro & Nuclear Power Co | 640 |
| **Egyptian Chemical Industries: Aswan Nitric Acid & Ammonium Nitrate Plant** | Tecnimont S.p.A and Orascom Construction S.A.E | 300 |
| **MCA: Cairo Airport Expansion and Logistic Park** | Hassan Allam Utilities + Agility | 280 |
| **EBNY: Green Avenue** | Asass Constructions | 250 |

## UAE

| Awarded project name | Contractor | Value USD Mn |
|---|---|---|
| **ADNOC: Maximizing Ethane Recovery And Monetization (MERAM)** | Team of National Petroleum Construction Company and Tecnicas Reunidas | 3,600 |
| **ADNOC: Mirfa Seawater Treatment Plant** | Metito, Orascom Construction | 2,500 |
| **Marjan, RAK Hospitality, Wynn Resorts: Al-Marjan Multipurpose Integrated Resort** | ALEC | 2,000 |
| **Abu Dhabi Housing Authority: West Baniyas Residential Development** | Q Holding PJSC | 1,372 |
| **DEWA: MBRM Solar Power Plant (IPP), Phase 6** | Masdar | 1,200 |

## QATAR

| Awarded project name | Contractor | Value USD Mn |
|---|---|---|
| **Chevron Phillips Chemical, Qatar Energy: RLPP - Ethane Cracker** | Samsung Engineering, CTCI Corporation | 2,800 |
| **Kahramaa: 132Kv to 66Kv New Extra High Voltage, Underground Cables (EHV/HV)** | Elsewedy | 328 |
| **ASHGHAL, Qatar Public Private Partnership Schools Development: Package 2** | Imperial Trading & Contracting Company and Al-Aali international and Inshaa Contracting & Trading. | 264 |
| **Ashghal: Al Markhiya School** | Ertibat Engineering (ECC) | 160 |
| **Qatargas, North Field South: Site Preparation Works Package** | Al Jaber Engineering | 145 |

Soure : MEED

# MENA construction considerations

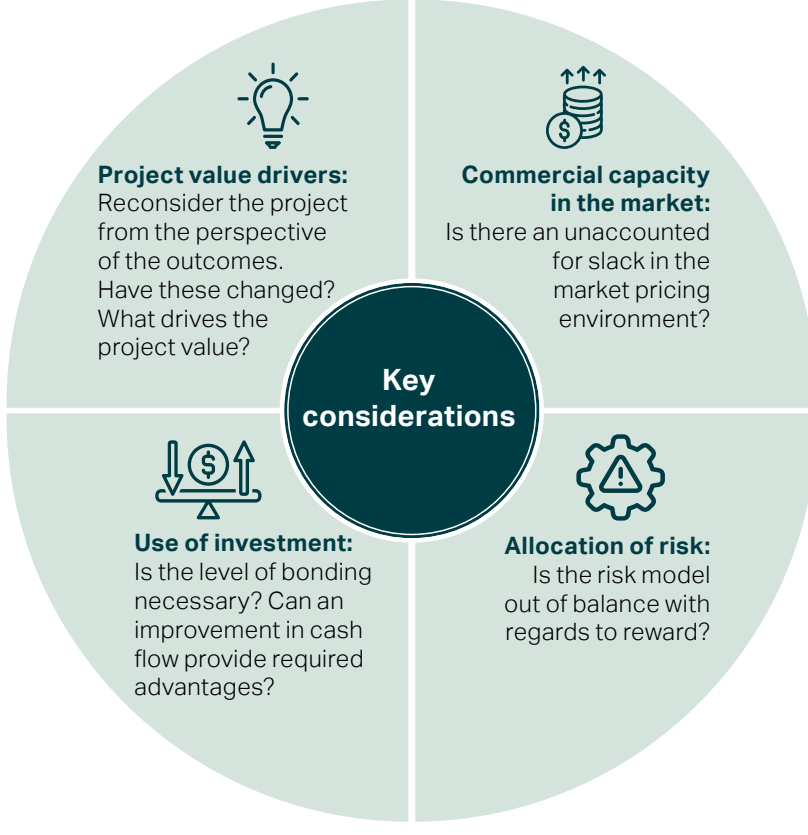
The growth of the construction market will continue to depend on MENA governments implementing stimulus packages for 2024 and beyond.

There are revised mindsets across construction markets as clients and construction organizations battle with market price volatility and delays to project execution and delivery, specifically over the last three years. This is encouraging certain developers and contractors to renegotiate existing prices (as contracts allow) and focus on commercial considerations during contract renegotiation. Overall, there is a focus to improve transparency, encourage healthier agreements between client and contractors and enhance the procurement stance of projects in the region.

However, the RICS emphasizes that during negotiations certain considerations should be made, such as reviewing project value drivers, assessing capacity within the construction market and allocating risk. The allocation of risk and overall security should be key considerations during the review and decision-making process.

An important lesson learned from 2021 onward, cautions that contractual parties need to diligently review and understand the relief provisions within construction contracts. In MENA (particularly the Middle East), it is common to see standard contract terms and conditions adapted and amended; this will be an important consideration with certain provisions, like Force Majeure (which typically does not explicitly list pandemics and epidemics), to be amended to ensure a balance of risk between the parties.

The pandemic caused many setbacks in construction activity, but the bolstered construction activity across the region provided new focus and opportunities as businesses are now realigning to drive new efficiencies and help rebuild broken supply chains and seek more collaborative approaches.



# MENA construction – strengths, weaknesses, opportunities and threats

Looking at the key strengths, weaknesses, opportunities and threats for construction in the region, it is clear there are many strengths and opportunities set to support the buoyancy and growth of the MENA construction market moving into 2024. However, this is expected to be disproportionate across countries.

Leading into 2024 and post-pandemic conditions, a new normal is expected in the region with an opportunity for transparency, trust and a collaborative approach within supply chains and between stakeholders. The change is anticipated to see greater cashflow management and improvements to contractual terms and conditions.

Some of the key topics leading into 2024, in terms of recovery and mitigating risk in the MENA region, are:

## Strengths

- Capability of delivering complex and bespoke structures.
- International input, supply, location and ability to import.
- Construction speed.
- Reduced bureaucracy.
- Cheaper cost of labour.
- Diversification and government incentive to invest.
- Creating and providing employment opportunities.
- Supporting local talent and industries.
- Economic value creation.

## Weaknesses

- Payment delays.
- Procurement timescales and awarding contracts before design completion.
- Resources, transient population and talent gap
- Lack of skilled labour.
- Quality issues.
- Safety issues.
- Carbon emission and environmental impact.
- Missed opportunities for lessons learnt from project to project.
- Cyber security.

## Opportunities

- Collaboration among industry stakeholders.
- Modular construction
- Sustainable construction processes.
- International investment.
- ESG funding.
- Public Private Partnerships.
- New business markets.
- Digital transformation.
- New materials and construction techniques.
- Encouraging career opportunities for young graduates.

## Threats

- Continued regional conflicts.
- Supply chain disruptions.
- Inflation and escalation.
- Precedence of contract awards to lowest price.
- Staff retention and availability.
- New pandemic variants.
- Delay in adopting new technology and missed innovation opportunities.
- Misuse of value engineering with a risk to quality.
- Market capacity limitations.

# MENA construction risk mitigation

In terms of weaknesses and threats, significant challenges remain to the construction market and its successful delivery and recovery.

One of the key challenges to be faced in 2024 will be the availability and capability of the construction markets resources to mobilise and enable project pipelines. Significant resources are required to meet the demands of construction projects in 2024 to facilitate construction and manufacturing capacity, the readiness of the industry's supply chains and organisations' ability to retain staff will play a pivotal role in ensuring successful delivery in 2024 and beyond.

According to a MEED report, 'as the construction industry grapples with higher costs, clear communication and consensual project adjustments are key to addressing stakeholder interests'.

Some of the key topics leading into 2024, in terms of recovery and mitigating risk in the MENA region, are shown below:

# MENA construction trends and prospects

## Key trends and opportunities in the region:

### Artificial Intelligence (AI)


With the rapid advancements in AI in 2023, the construction sector is undergoing considerable focus into the capabilities and implementation of AI-supported construction methodologies. This includes, generative designs, design optimisation algorithms, safety and program monitoring and control, autonomous vehicles and equipment, robotic construction, predictive analytics for supply chain management, inspections and defects monitoring, drone surveying, smart buildings, predictive cost models and collaborative project management platforms. Integration of AI in construction is an ongoing process, but is set to improve efficiencies with reduced cost and improved turnaround times with enhanced safety and sustainability.

### Digital transformation

The construction industry is gradually adopting digital technologies such as Building Information Modeling (BIM), drones and construction management software to enhance efficiency and reduce costs.

### Adaptation to changing work environments

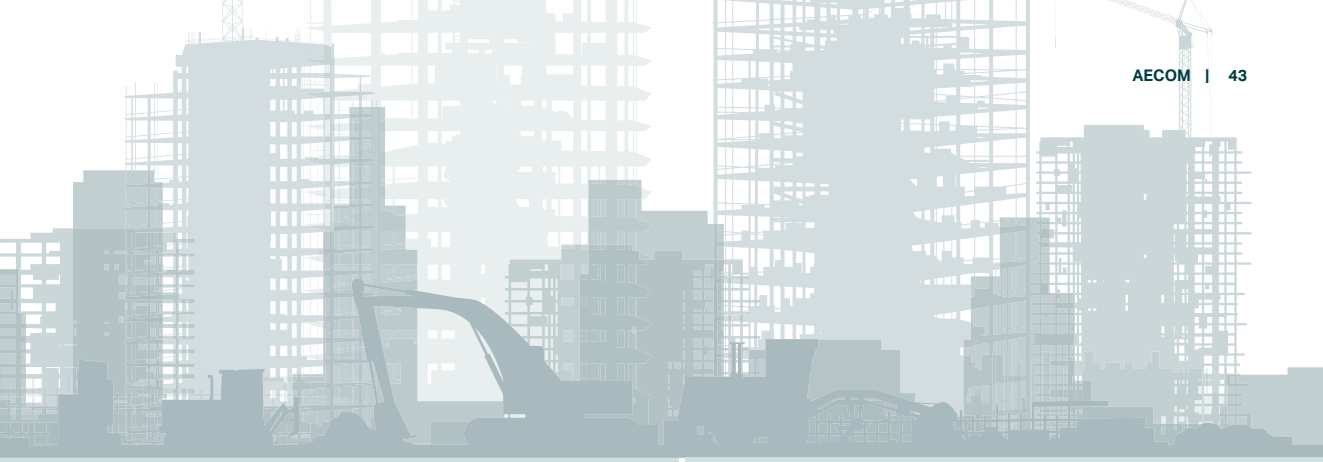
The construction industry is adapting to changing work environments, including remote working and digital collaboration tools. This adaptation is likely to continue influencing project management and communication in the sector.

### Environmental, Social and Governance (ESG)

ESG considerations are becoming increasingly important in construction as stakeholders recognise the industry's significant influence on the environment, society and corporate governance. Investors and financial institutions are increasingly incorporating ESG criteria into their decision-making processes, and this trend has implications for Foreign Direct Investment (FDI) in construction. Investors are showing preference for construction projects that align with ESG principles and FDI inflows may be influenced by the perceived environmental and social responsibility of the projects. This is also alongside the need for preferential green financing forms such as green bonds and sustainable loans.

### Safety

Safety is a focal point on all projects for both construction workers and the public. Revised safety regulations will soon be applied to construction equipment and machinery on future construction projects by contractors and developers alike. With the focus on reducing the spread of coronavirus still present as we head into 2023, maintaining newly adopted safety protocols are essential in ensuring construction sites remain operational.



## Public-Private Partnerships (PPPs)

Governments in the region are increasingly turning to PPPs to fund and manage large-scale infrastructure projects. This approach allows for governments to seek private sector expertise and investment to develop and manage critical infrastructure projects. PPP projects can further contribute to job creation and stimulate economic activity. The construction phase, in particular, generates employment opportunities, while ongoing operations can contribute to economic growth.

## Smart cities initiatives

Several cities in the MENA region are embracing smart city concepts. This involves integrating technology into urban infrastructure to enhance efficiency, sustainability and the overall quality of life for residents. In the UAE, Dubai has its Smart Dubai Initiative and Abu Dhabi has smart city goals embedded in its 2030 Urban Structure Framework Plan. In KSA, Riyadh's King Salman Energy Park (SPARK) aims to become a smart industrial city and Jeddah Economic City (JEC) incorporates smart technologies and services. Bahrain's Vision for Manama has Smart City Components and Egypt has its New Administrative Capital (NAC) Smart Infrastructure.

## Infrastructure, residential and mixed-use developments

Non-energy sectors will remain the spotlight across the MENA regions construction market, with many countries already investing heavily in infrastructure and residential projects to fill the demands of population growth and urbanization. This includes transportation (roads, bridges, airports), energy (power plants), water, residential, commercial, and recreational spaces.

## Vision plans (recovery from economic challenges)

MENA region countries are facing economic challenges due to factors like conflicts and fluctuating oil prices. However, there are expectations of economic recovery and investment in construction plays a crucial role in stimulating growth. Many countries in the region have long-term development plans and visions that include substantial investments in infrastructure. These initiatives aim to diversify economies and create sustainable growth.

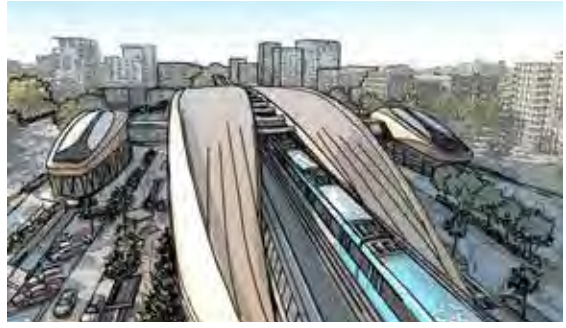
## Supply chain diversification

As a lesson learned from the pandemic, contractors had little choice but to pay premium prices for materials and alternative suppliers due to the disruptions caused. 2023 will further see stakeholders in the construction industry re-evaluating and streamlining current procurement relationships. This may come with a risk in coordination, however, the industry envisages cost efficiencies through diversification.

# United Arab Emirates (UAE)

## 2023 highlights

### Dubai Metro Blue Line, GCC Railway and Etihad Rail



In November, the Dubai Metro Blue Line project was approved; a new 30 km metro route that will link key areas in the Emirate through 14 stations. In February, Etihad Rail announced 'The National Rail Network is complete' and commercial freight operations have begun. The 1,200km long Etihad Rail stitches the seven emirates together and will transport both cargo and passengers across 11 hubs in the UAE. Etihad Rail is expected to carry millions of passengers annually between major cities with travel times approximated to be 50 minutes from Dubai to Abu Dhabi, and 100 minutes from Abu Dhabi to Fujairah. In further rail news, during November 2023 in a meeting between the Committee of GCC Ministers of Transport and Communications in Muscat, it was agreed that the target date for operating the 2,117Km GCC railway project would be December 2030.

### Vertiports and air taxi services

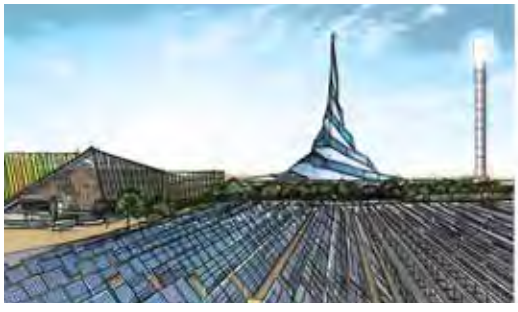
In February 2023, His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, announced he had approved designs for air taxi stations and that air taxis will begin flying in Dubai within three years. Vertiports, also known as a vertical airports, are places where drones and other Advanced Air Mobility (AAM) vehicles can land and take off. Dubai is aiming to be one of the first in the world to implement eVTOL (electric Vertical Take-Off and Landing). Meanwhile, the UAE General Civil Aviation Authority (GCAA) and the Mohammed bin Rashid Aerospace Hub (MBRAH) at Dubai South announced an agreement to establish the world's first AAM integrator centre, with the world's first ever vertiport certification process now underway.

### Jebel Ali Palm/Nakheel

In May 2023, HH Sheikh Mohammed bin Rashid, Vice President and Ruler of Dubai, approved the master plan for The Palm Jebel Ali. This luxury lifestyle mega project occupies an area twice the size of Palm Jumeirah and signifies the start of new growth in the Jebel Ali region and the Emirate's expansion in accordance with the Dubai Economic Agenda D33 and the Dubai 2040 Urban Master Plan. The first waterfront house project has already been announced by Nakheel, the developer of The Palm Jumeirah, in response to high demand for opulent real estate in the Emirate. When finished, Palm Jebel Ali will stretch roughly 110 km along Dubai's coastline and will have seven islands and sixteen fronds, along with 80 hotels, resorts and amenities for 35,000 families.

## COP28

Between 30 November 2023 and 13 December 2023, the COP28 climate conference was held at Expo City Dubai, UAE. COP28 brought together 84,000 attendees, over twenty times the number that attended the first COP (4,000). One of the major key outcomes of the conference was getting 195 nations to sign a twenty-one-page agreement, titled 'Decision of the First Global Stocktake'. This agreement was made to transition away from fossil fuels: *"Transitioning away from fossil fuels in energy systems in a just, orderly and equitable manner and accelerating action in this critical decade to achieve net zero by 2050 in keeping with the science"*. This is the first international agreement that explicitly calls for moving away from fossil fuels.



## Mohammad Bin Rashid Al Maktoum Solar Park

During COP28, His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, inaugurated the largest concentrated solar power (CSP) project in the world, within the fourth phase of the Mohammed bin Rashid Al Maktoum Solar Park in Dubai. The 950-megawatt (MW) fourth phase is the largest investment project that uses three hybrid technologies: 600MW from a parabolic basin complex, 100MW from the CSP tower, and 250MW from photovoltaic solar panels. The project features the tallest solar tower in the world, at 263.126 metres, and the largest thermal energy storage capacity with a capacity of 5,907 megawatt hours (MWh), according to the Guinness World Records.

## Redevelopment and attractions

During 2023, Dubai's La Mer, The Pointe and Dubai Pearl have undergone redevelopment. La Mer's name has been changed to "J1 Beach" by Merex Investment Group, with dining experiences set to open Q1 2024. Tenants of The Pointe were served notice by Nakheel to vacate and relocate as developments plans are underway and demolition works continues at the Dubai Pearl site, now owned by Dubai Holdings, with future plans yet to be announced. In Abu Dhabi, Modon Properties revealed the highly anticipated masterplan for Hudayriyat Island, spanning more than 51 million square metres, equivalent to 53.8 per cent of Abu Dhabi Island. The project is set to provide highly desirable living environments by following a model of sustainable living. On Saadiyat Island, the Zayed National, the Guggenheim and Natural History museums continue to take shape.

# Kingdom of Saudi Arabia (KSA)

## 2023 highlights

### World Cup 2034

In October 2023, KSA was confirmed as the host of the FIFA World Cup 2034, after the remaining potential bidder (Australia) withdrew from the race. The bid includes a minimum of 14 all-seater stadiums, of which at least four should be existing structures, and the capacity must be at least 80,000 seats for the opening and final matches, 60,000 for the semi-finals and at least 40,000 for all other matches. Stadiums are already being built in KSA for the 2027 Asian Cup, which is already helping KSA to upgrade and build stadiums. The most prominent development is the construction of a new stadium in the North of Riyadh and the upgrading of five existing stadiums.

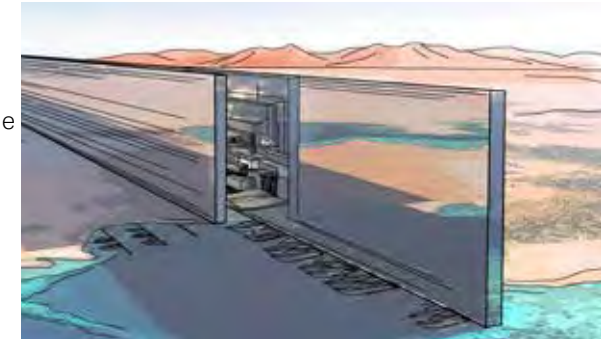
### Expo 2030

On 28 November 2023, during the 173rd General Assembly of the Bureau International des Expositions (BIE), Member States elected Saudi Arabia as the host country of the World Expo 2030. Saudi Arabia's proposed theme for the Riyadh Expo 2030 is *'The Era of Change: Together for a Foresighted Tomorrow'*, with three sub-themes. These include: *'A Different Tomorrow'*, focused on science, innovation and pervasive technologies, *'Climate Action'*, concentrated on the impacts of climate change and creative solutions to protect our ecosystems and *'Prosperity for All'*, centred around creating a better future by proactively understanding the voices, needs and contributions of everyone, ensuring a celebration of differences as sources of strength.

### New Murabba

In early 2023, the New Murabba Development Company (NMDC) was established by Saudi Arabia's Crown Prince Mohammed bin Salman bin Abdulaziz al-Saud with the goal of creating the world's largest modern downtown area in Riyadh. 19-square kilometers of area will be covered by the development, which is situated northwest of the capital. It will have approximately 980,000 square meters of retail space, 9,000 hotel rooms and over 104,000 residential units. The focal point will be the 400-cubic meter Mukaab, which will be the first immersive tourist attraction in the world with virtual and digital technologies. The project is expected to be completed by 2030 at a cost of more than $50 billion.

## NEOM The Line

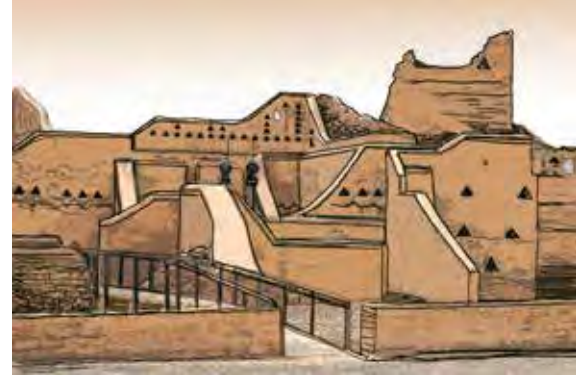


NEOM has moved to the building phase of its vision, with infrastructure works underway on 'The Line', 'Oxagon' and 'Trojena'. Its first destination, 'Sindalah', is expected to open its doors in 2024. Numerous announcements were made during 2023 with key destinations such as 'Leyja', 'Siranna', 'Epicon', 'Utamo' and 'Norlana' all being launched. Alongside these announcements, NEOM also inaugurated the 'NEOM Investment Fund' (NIF), a strategic investment arm set to invest globally through mergers and acquisitions, as well as venture capital in technology startups. The fund has a clear focus on pioneering growth companies and next-generation industries. NIF will also develop joint ventures and partnerships with large multinationals, institutional investors and innovators within NEOM.

## Rea Sea Global

July 2023 marked six years since the Red Sea was first announced by His Royal Highness the Saudi Crown Prince Mohammad Bin Salman as an international tourist destination as part of the Kingdom's 2030 Vision. The Red Sea's most recent construction report highlights the progress made throughout the destination, including a further 13 hotels and overall status of the supporting infrastructure. Phase one of the international airport and the first three hotels are scheduled to open this year. Over 100 construction contracts are in place, with a similar number out in the market for tender. Red Sea Global also announced that it will operate its own luxury hotel brand at The Red Sea destination, named Shebara.

## Diriyah Gate



In December, at Bashayer 2023, Diriyah Gates inaugural event to celebrate Diriyah's growth, a series of luxury hotels were unveiled, including Oberoi, Six Senses, The Ritz-Carlton, Address, Capella, Four Seasons and Bab Samhan. Alongside this, a number of entertainment and cultural projects were discussed, including the Royal Diriyah Golf Club, the Royal Diriyah Equestrian and Polo Club, Diriyah Art Futures and the Royal Diriyah Opera House. The Diriyah Gate neighbourhoods of Wadi Safar, Wadi Hanifah Park, Bujairi District, Arts District, Samhan District and Diriyah Square, are under development across three phases as part of the masterplan. MEED Projects recorded USD 12.6 billion of projects are under construction at Diriyah Gate, while USD 9.5 billion of projects are in the design and tendering stages.

# KSA: Key developments overview

Key projects that are paving the way for the Kingdom's Vision 2030 are:

**NEOM:** At the centre of Saudi Arabia's Vision 2030 program, NEOM is a new futuristic mega-city located in northwest Saudi Arabia, on the Red Sea coast. It has a total estimated value of USD 500 billion. NEOM is expected to host a population of more than one million and is set to be a hub for innovation and a sustainable ecosystem for working and living.

**Diriyah Gate:** A USD 50 billion mixed-use historic, cultural and lifestyle destination west of Riyadh. The project's intent is to showcase Saudi Arabia's 300+ year history through a set of heritage, hospitality, education, retail and dining experiences for residents, tourists and frequent visitors.

**The Red Sea Project:** Set across 28,000km$^2$ and nine islands, this giga-project is underway. Consisting of 50 hotels (circa 8,000 keys), a new airport and leisure and lifestyle facilities served by 75km of new roads.

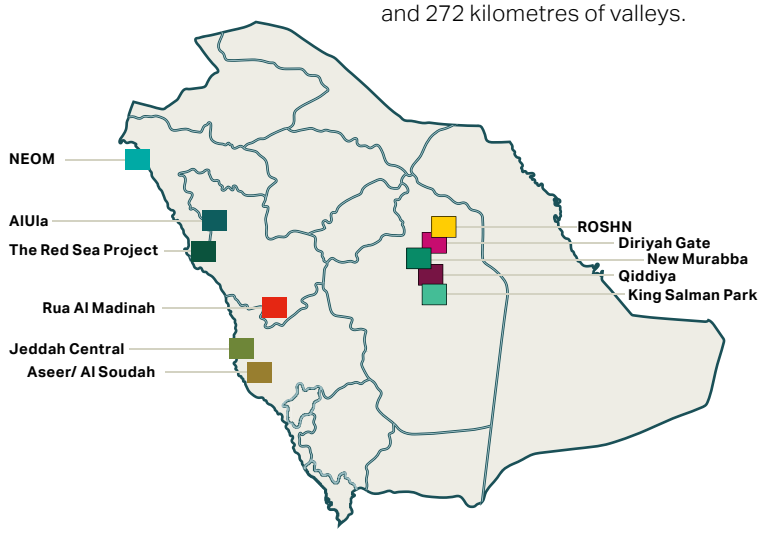
**AMAALA:** An ultra-luxury tourism project, spanning 4,100km$^2$ and will include 2,500 hotel rooms, estate homes and 800 villas. The target is for an operational zero-carbon footprint with the project tracking more than 15 sustainability criteria.

**Qiddiya:** An entertainment, sports and arts hub, located in southwest Riyadh. Qiddiya is set to include a Six Flags theme park, FIA grade-one racetrack, a Jack Nicolas golf course and several arts and cultural centers.

**ROSHN:** Around USD 90 billion has been assigned to create large-scale modern and integrated communities for Saudi nationals in nine cities across four regions in KSA. The project has a goal to increase the rate of home ownership to 70 per cent. The first contract to be signed is a 3,000-home community, including associated infrastructure, in North Riyadh close to King Khalid International Airport.

**AlUla:** As a cornerstone of the Kingdom's cultural and touristic ambitions, the AlUla project looks to develop one of the country's most important archaeological and cultural destinations and prepare it to welcome visitors from around the world. This major investment aims to make the AlUla region the Kingdom's cultural capital and another key tourist destination.

**Green Riyadh:** A large-scale urban forestation project across Riyadh city to plant circa 7.5 million trees in 3,330 neighbourhoods, 43 parks, 9,000 mosques, 6,000 schools, 64 universities, 390 healthcare facilities and 1,670 public facilities. Trees will also line 16,400 kilometres of streets, roads, utility lines (pylons, oil pipelines, etc.) and 272 kilometres of valleys.



# KSA schemes

| | NEOM | Diriyah Gate | New Murabba | ROSHN | Rua Al Madinah | KSI Airport | Red Sea Global | Jeddah Central | AlUla | Aseer/Al Soudah | SEVEN | Qiddiya | King Salman Park | Sports Boulevard | Saudi Downtown | Boutique Group |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Value USD Bn** | 500.0 | 63.0 | 50.0 | 42.8 | 37.0 | 30.0 | 27.5 | 20.0 | 15.0 | 13.3 | 13.0 | 10.0 | 9.4 | 6.5 | 6.0 | 1.5 |
| **Awarded USD Bn** | 29.5 | 3.8 | 0.1 | 2.8 | 1.2 | 0.1 | 8.4 | 0.3 | 0.6 | 0.1 | 4.0 | 3.7 | 2.3 | 3.7 | 0.0 | 0.2 |

# KSA schemes value USDbn

Soure : MEED

# KSA schemes awarded value USDbn

Soure : MEED

# KSA: Key challenges in 2023

**Inflation**

- Oil and energy prices
- Metal prices
- Timber prices
- Cost of living
- Salaries
- Supply and transportation costs
- Pricing of risk
- Readiness of supply chains

**Resourcing**

- Mobilisation
- Staff retention and attrition
- Resource capacity
- Availability in the market
- Restricted contracting capacity
- Accommodation

**Competition**

- Unviable award prices
- Tendering rates at historic levels
- Contractor liquidity
- Focus of contractors on securing works over delivery
- Risk adverse pricing

The major challenges for the KSA construction market are centred around inflation, readiness of supply chains to meet local cities and remote location demands, and the ability to attract private sector and foreign investment.

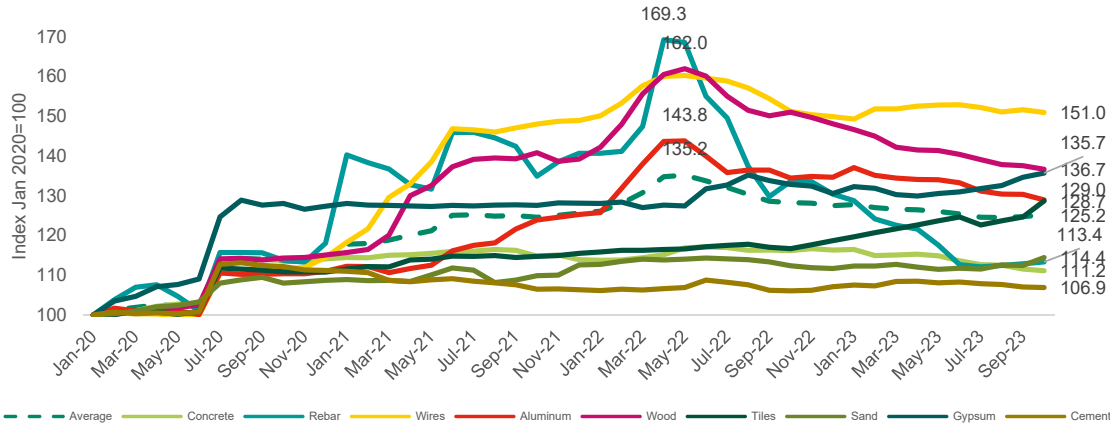
As Saudi Arabia's ambitious plans begin to move from inception and design phases to construction, the market is expected to experience some of the following challenges:

- Ability and willingness of contractors to fix prices and fluctuation clauses. This will need more collaborative procurement and sharing of risk.
- Impacts on lead times and therefore schedule, as the industry adapts to find alternative markets for materials e.g. aluminium, steel, rebar, timber.
- Tenders that are considered competitive bids are routinely being undercut, raising further concerns about financial stability. This means a higher risk of insolvencies.
- Global supply disruptions put further pressures on supply certainty and pricing. Sea freight capacity and costs are currently lower than the peak reached in September 2021, but costs remain considerably higher than industry norms.
- Securing of supply: Considerations should be given to potentially placing advanced orders and payments for specific materials up front where there is enough certainty on scope and specification to be able to do so with confidence, as ongoing price escalations continue to be an issue.
- Industry draw and focus on giga-project growth, leading to difficulties in staff retention and therefore project continuity as schemes become under-resourced, leading to potential negligent contracts.

# KSA: Construction material price inflation

Highlighting the impacts of material price fluctuations during 2023, data from the General Authority for Statistics within Saudi Arabia allows us to demonstrate the extent to which the global economic volatility has had on local and regional markets.

**KSA costruction material price index**




Source: General Authority for Statistics Kingdom of Saudi Arabia

Indexing construction material prices from January 2020 can be seen that the average increase in material prices between January 2020 and October 2023 is estimated to be around 25 per cent. The initial rise seen in July 2020 can be attributed to the impact of supply chain disruptions caused by the initial phase of coronavirus and adjustments made to prices as Saudi Arabia implemented its VAT increase from five to 15 per cent. As we get to 2021, notable spikes and drops were experienced as global cases of coronavirus surged and lockdowns continued to further disrupt supply chains and exacerbated price volatility.

As we reached February 2022, the Russia-Ukraine conflict began and China begun to implement further strict lockdowns that resulted in further supply and demand disruptions. This is seen with how metal prices escalated to nearly 70 per cent in April 2022. As we move towards the end of 2023, it is evident that material prices have softened further from prices experienced at the end of 2022. For example, rebar prices have eased from peaks of 70 per cent in April 2022 to 13 per cent in October 2023. Considering less volatile materials, like concrete, which has remained relatively subdued since adjustments experienced in June 2020, it still presents a notable 11 per cent increase since 2020.

Evaluating material prices against overall construction costs in 2020-2023, the current material price escalation has the potential to impact CAPEX costs in the region of plus eight per cent and minus 12 per cent over the last three years. Many existing construction contracts do not address material escalation or purposely exclude change orders for material escalation, resulting in the risk being firmly left with contractors, subcontractors and suppliers to mitigate.

**Note:** The average index is unweighted, therefore wood plays a considerable role in the calculation of the average (an increase from 100 to 150 (+50 per cent)). The amount typically used in Middle Eastern construction is limited. This factor would reduce the overall average increase.

# Tender Price Index (TPI)

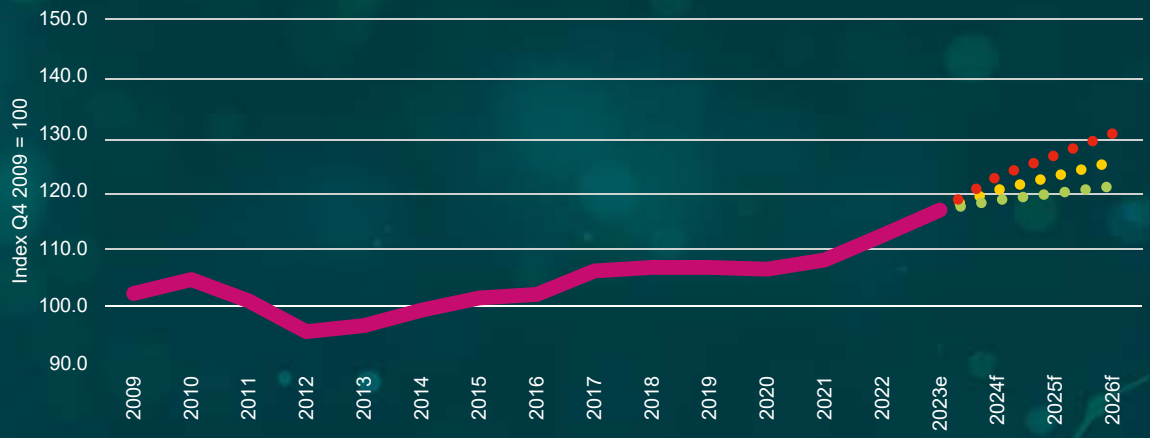
## The TPI is AECOM's assessment of construction tender prices in the market. It is compiled by AECOM's Middle East business intelligence team and is based on actual returns of projects.

The index is a measure of average price increases across differing markets, project types and locations. It should be regarded as a guide only when looking at any specific project, as the pricing of individual projects will vary depending on factors such as their scope, complexity, location, timescale and end-user requirements.

Received tender returns have been noted as irregular between parties, with increases being considerably higher than expected as contractors extrapolate high inflation across multi-year contracts and price in excessive risk. In stark contrast, there have been cases where the decreases are lower than benchmarked norms in a bid to oust competition and utilise dormant resources/stock.

It has also been evident that construction organizations are operating at lower margins across the region. These are seen to be hedging markets and will subside once economic volatility eases.

# UAE Tender Price Index




| Annual percentage change (average) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| -17.1 | 2.4 | -3.5 | -5.3 | 1.1 | 2.7 | 2.1 | 0.6 | 4.0 | 0.6 | 0.0 | -0.4 | 1.5 | 4.0 | 4.1 |

Source: AECOM

AECOM's TPI for the UAE in 2023 is posted at 4.1 per cent. This is a reflection of the higher-than-expected inflation pressures and considerable commodity price hikes.

According to the IMF, the UAE's economic growth has been robust this year, led by a strong rebound in tourism, construction and activity related to the Dubai Expo 2020, as well as higher oil production in line with the OPEC+ production agreements.

Although the UAE's market is somewhat sheltered from the double-digit inflation factors experienced in other nations, there is still a cause for concern in 2024.

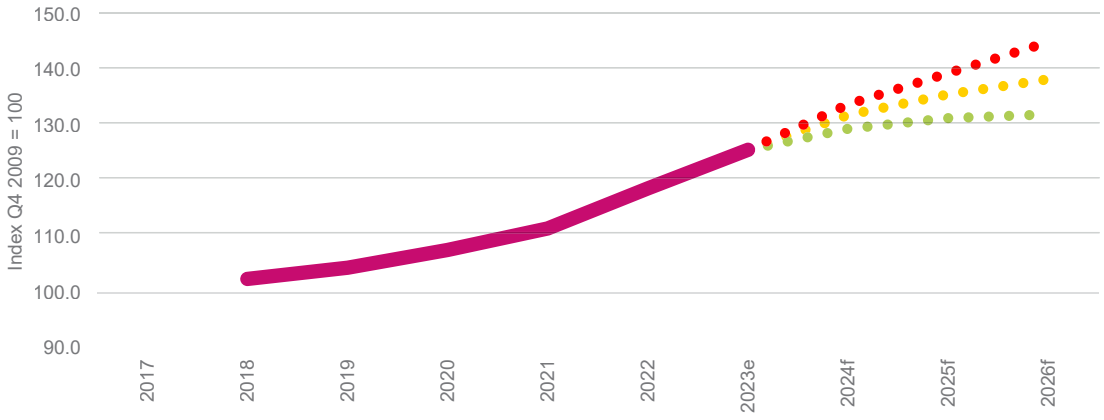
Historically, tender returns are sluggish to reflect price increases as tender periods can be prolonged across price hike cycles and tenderers look to keep historic norms in a bid to be more competitive.

Taking a look at the economic forecasts for 2024, price increases are anticipated to fluctuate throughout the year as ongoing market volatility continues. In addition, as top tier contractors focus attention on the intensifying and potentially lucrative KSA market, the UAE's construction sector is likely to see less competitive and risk adverse pricing for larger scale works. This may require tendering entities to re-evaluate tender scoring mechanisms away from traditionally skewed lowest price awarding of contracts.

As global inflation and fiscal burdens continue their journey at rates greater than those experienced in the UAE, further pricing pressures are likely to emerge. For example, imported construction materials, goods and equipment, such as MEP equipment, and systems from Europe, which are facing far greater pricing stresses than what is experienced locally, are likely to continue to push project prices up further.

In consideration, AECOM forecasts that the UAE TPI has the potential to increase between 3.5-5.0 per cent in 2024, as global market volatility continues to be sustained.

# KSA Tender Price Index




| Annual percentage change (average) | | | | | |
|---|---|---|---|---|---|
| **2018** | **2019** | **2020** | **2021** | **2022** | **2023** |
| **2.5** | **2.0** | **3.0** | **3.6** | **6.4** | **6.5** |

**Note:** KSA TPI represents a national average.

Source: AECOM

As we entered 2023, sentiment for KSA's construction market gained considerable momentum with numerous construction tenders on the table and sizeable packages reaching award stages. The effects and demands of the sizeable giga-projects and large-scale city projects are starting to become a reality and the risks associated with these projects, under existing market volatility, are becoming more widely understood. According to the analysis of tender returns, commodity prices and market testing sees AECOM's TPI growth for 2023 estimated at 6.5 per cent.

Looking to 2024, KSA is set to face all the same challenges as their counterpart in the UAE in terms of increased input costs, 'push inflation' (labour, plant, materials etc.), but with the added potential of its large-scale project pipeline to cause 'pull inflation' via increased demand for products or services. Considering this, the TPI for KSA in 2024 is forecasted to be in the region of 5.0-7.5 per cent.

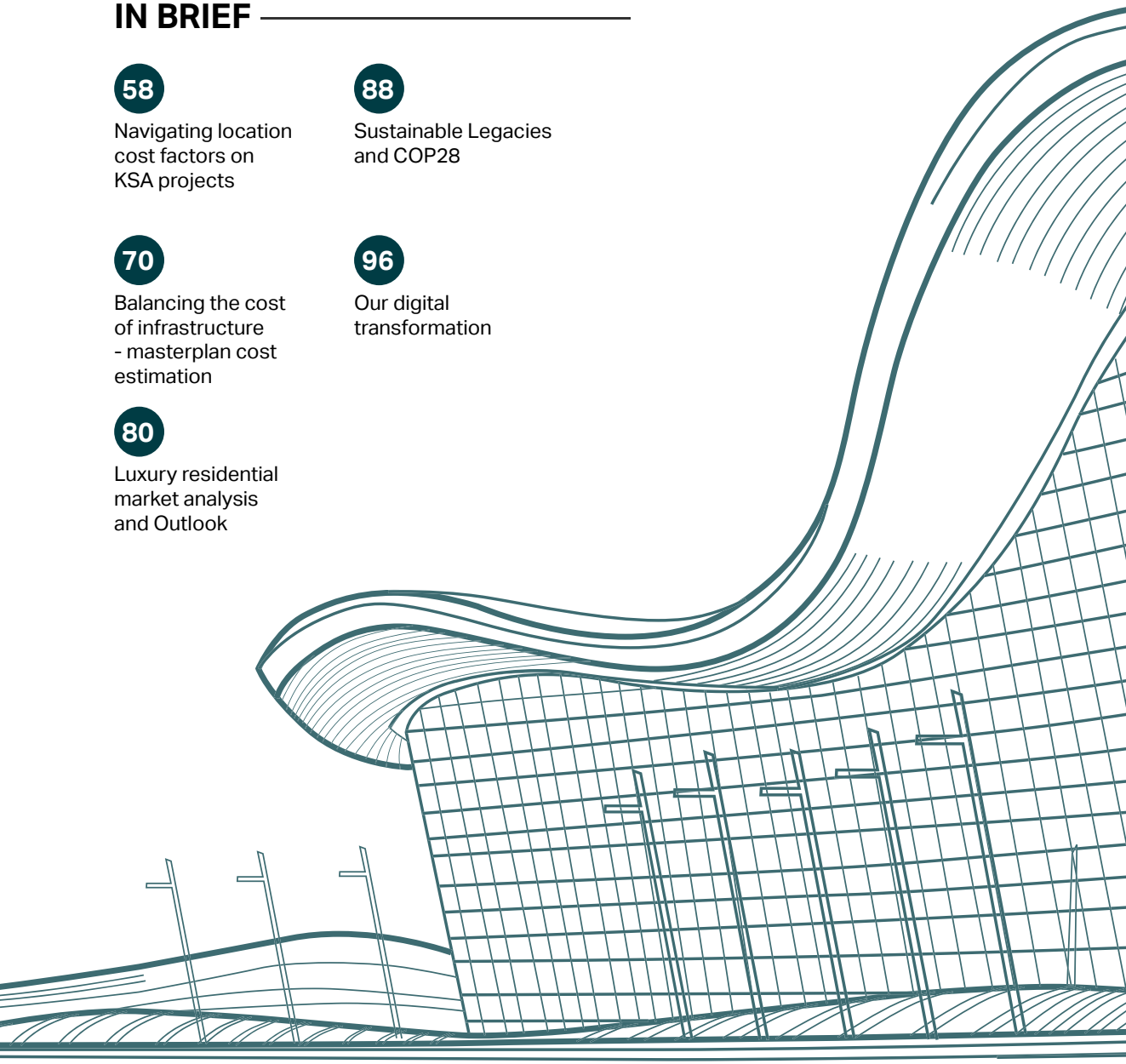
In 2022, AECOM's TPI for Saudi Arabia reflected an uplift of 6.4 per cent as the market began to experience considerable commodity price hikes and pricing pressures. During this time, construction inflation was expected to be higher, as activity across the market continues to increase. Organisations also continued to implement prudent business costs revisions to mitigate the induced impact of the pandemic and increase market competitiveness as organisations looked to establish footholds with key clients for long-term growing pipelines.

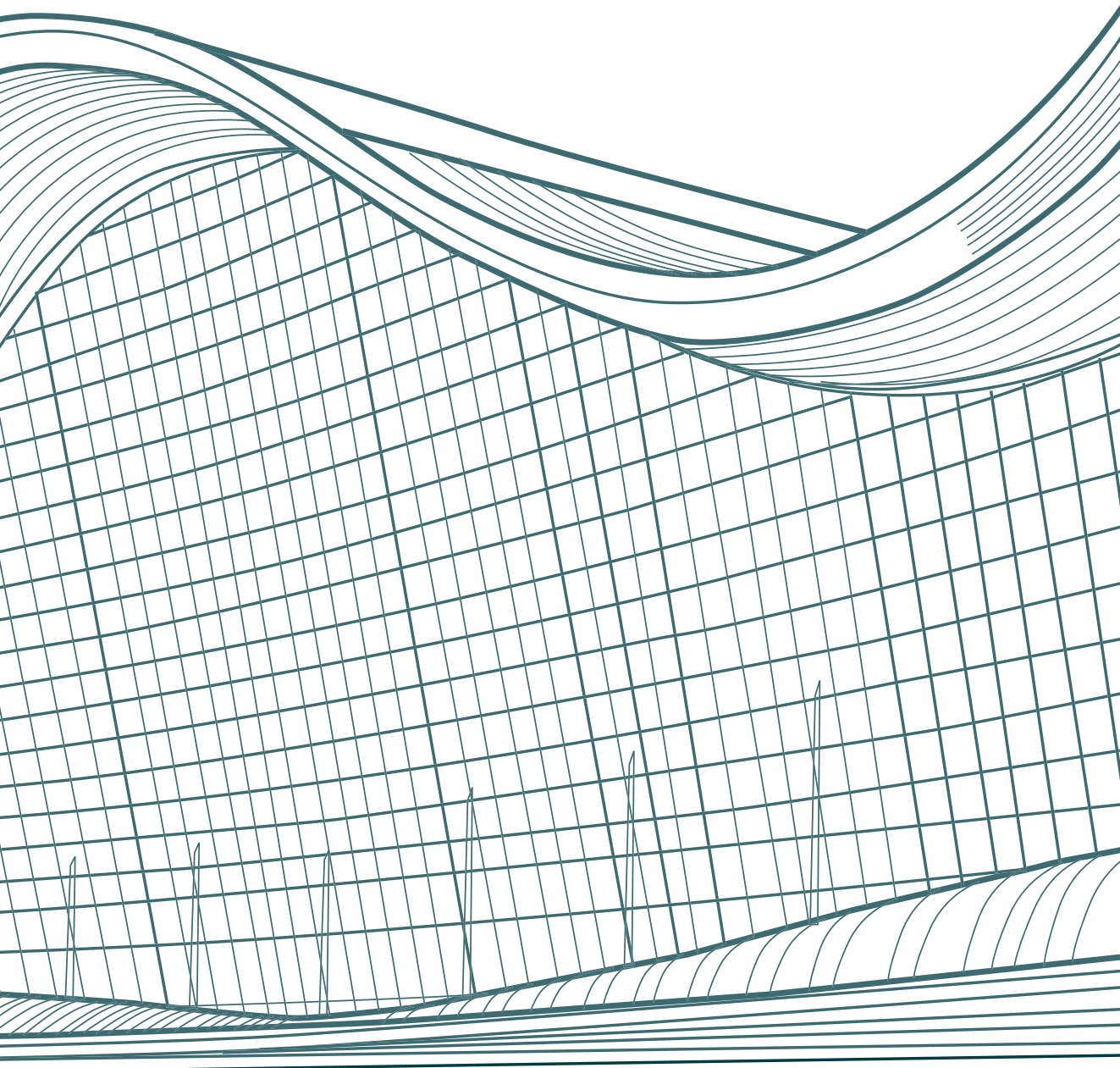
As a cautionary note and a lesson learned from 2008, our businesses must be prepared and more responsive to the risks connected with market conditions. As KSA awards numerous new projects to meet the country's objectives, through fast-track delivery routes, the resultant rubber band effect has the potential to strain the region's supply and demand stability, resulting in hyperinflation, peak demands and undersupply. In a worst-case scenario, this could result in project costs escalating beyond economically viable levels.

# 03 Delivering a better world

## IN BRIEF







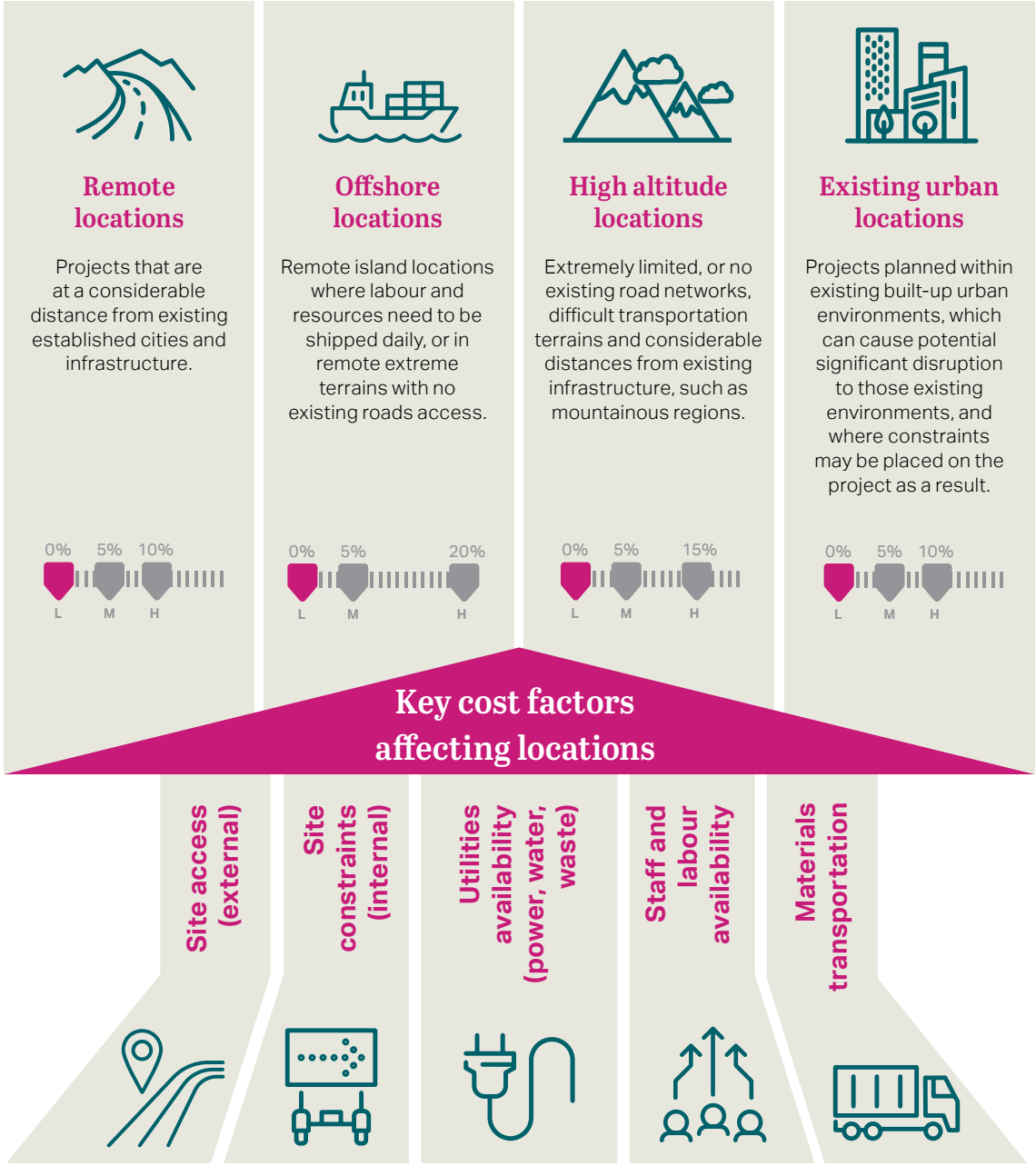
# Navigating location cost factors on KSA projects

**Following on from our previous article, 'Navigating cost pressures on KSA projects' where we explored the unique challenges that should be considered by estimators when addressing the unique cost pressures associated with currently developed giga-projects, in this article we look at the challenges presented by the *locations* of these monumental projects in the Kingdom.**


Giga-projects on the surface are essentially extremely large construction or civil engineering projects, but still present the same traditional questions and challenges to the cost estimator. This includes: site access, internal site constraints, local availability of utilities (such as power, water and waste removal), availability and staff transportation, labour and the materials both to the site and within the site to their final location on the project.

What is unique to most giga-projects is not just their scale, but also their location. This requires greater exploration and consideration of these traditional challenges, as well as a better understanding of the impact and challenges of the project on the wider area and infrastructure, as well as potential additional constraints of the site itself.

# Definition of locations:




In the following article, we shall examine the challenges of location in terms of the suitability of existing infrastructure, existing facilities, logistics, geographical constraints, limitations of site topography and scale, as well as market pressures.

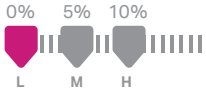
# Suitability of existing infrastructure

The location of projects can sometimes pose unique challenges with respect to simply getting to the site, not to mention the provision of water and power, as well as the transportation of goods and labour power to the site. In itself, this is nothing new, as many road, rail and power projects have faced and overcome similar issues in the past. What is unique in the context of the giga-project is again the scale of these requirements, with particular reference to the potential volume of project/construction traffic required for roads, as well as the location and availability of power, water and sewage treatment facilities.

More often than not, the existing infrastructure is either insufficient to meet these demands or in exceptional cases, non-existent. The location of the project can exacerbate the issue, dependent on whether it is just its remoteness, an off-shore location, or one at high altitude. Equally, as stated above, some giga-projects are located within existing urban areas, however, due to the scale of the project, these throw up their own unique challenges and pressures on their surroundings.

These factors are explored further below.

## Remote locations

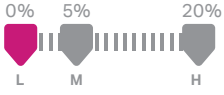



Remote locations traditionally have little or no existing infrastructure. This challenge in itself is nothing new, however, it is the magnitude and time scale of the project that needs to be considered in the context of what is available. For this challenge the estimator should raise the following questions:

1. Where will materials and labour be transported from or to?
2. What road infrastructure is available?
3. Are there new roads planned or any under construction that could be utilised, or have we to consider the construction of temporary roads as part of our bid or estimate?
4. What size of goods are to be transported? What number of vehicle movements are required over the duration of the contract?
5. Can these be minimised by the use of alternative transportation strategies, such as air freight or the construction of temporary airports or ports (if the project is located near a body of water or the sea)?

With regards to the utilities for the works, similar issues are faced, however, these can be addressed more readily through the use of generator farms for power, temporary sewage treatment plants or sewage storage tanks, temporary water tanks and using tankers to supply water and remove waste water. However, this adds to the possible congestion on the available road networks and care should be considered as to the space constraints that exist within the proximity to the site.

# Offshore locations



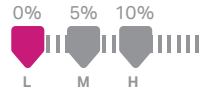

Leading on from the remoteness factor, some projects may have the added constraint of being located offshore. An example of this being the development of an existing island, up to the construction reclamation of an entirely new island. Although island construction is not unique, what is different in this context is that these are possibly being 'activated' for the first time, hence there may be no facilities available nearby to be utilised, or where these do exist, they are not suitable for the demands to be placed on them by the planned large-scale construction.

For such projects, the constraints and questions explored in the remote location section still apply, however, these introduce an entirely new dimension when having to consider transportation over water, and also possibly understanding tighter space constraints with respect to the nature and size of the final location. Some additional considerations to be captured within the bid or estimate then may be as follows:

1. Is there any plan to construct a port or ferry terminal nearby, if so will this be available for use during construction?
2. Where is the nearest usable access point from the mainland and how easily is this reached by the existing road network?
3. Would permission be granted to construct a bridge or temporary port at this location?
4. How far off shore is the island, can a temporary bridge be constructed or would this not be permitted for environmental reasons, inclement weather patterns, or is this simply not feasible due to the distance from shore?
5. Can goods be transported by water from the nearest commercial port directly to the island or temporary harbour facility?
6. Is there space for temporary generator farms on the island, or do these need to be located on the mainland and a subsea cable installed temporarily to provide power?
7. How will water be provided to the island both potable and for the work?
8. How will waste water and sewage be managed, is there space to locate temporary treatment and storage facilities?
9. Is there space for material and plant storage, or should temporary barge platforms be considered?
10. What types of marine vessels are required and should these be purchased outright or chartered from local entities, if available?

All these unique challenges should be considered and addressed in order to avoid any unwelcome surprises later on in the project lifecycle.

# High altitude locations




As well as being remote, some of the current giga-projects have a further constraint of altitude. These projects are being developed in mountainous regions where there are other factors that require detailed consideration, in addition to those being just remote projects. Again, this is nothing new to the industry, as development in mountainous regions has been a fact of life around the globe; from Colorado to the Alps. These areas have the advantage of a more historic developed infrastructure to assist their development, in terms of road, air, vernacular or funicular railways, and even cable cars to provide additional or complimentary solutions to the transport of people, goods and materials to the project site.

In the case of remote projects where these facilities are not available or where there is even no existing road network, we can look to other sectors of the construction industry where similar challenges are faced on a regular basis, such as power transmission, major pipelines and even power plant or mine construction. In these sectors, to overcome these logistical challenges temporary roads can be constructed, however, this is not always desirable due to either environmental concerns. In the case of power transmission, for a series of sites that are required for short construction durations, helicopters can be used to deliver materials either directly to the area of construction or to central staging areas. Here the material can then be delivered over a short distance overland to the place of final assembly over a temporary haul road. Although given the shear scale of a giga-project, such solutions may be acceptable for isolated activities, however, as a more widespread solution, road or temporary rail would offer a more economic alternative.

In addition to transportation, another key factor is the provision of power, water and the removal of waste and sewage from the site location. Although temporary solutions such as storage tanks, STPs and generator farms exist, there is the added problem of the topography as there may not be enough space on the suitable areas to locate these on the site. These may have to be located some distance from the site, leading to the need for larger pumps and more generators to provide higher voltages to overcome voltage drops over distance, and the need for more access roads to be provided to reach them for operation and maintenance.

A final consideration is the possibility of a higher frequency of inclement weather, as exposure to high winds and lower temperatures occurs at altitude. This means that the effect of weather events on productivity should be considered within the bid or estimate. The added considerations to examine when estimating or bidding for such projects can be summarised in the points below:

1. Availability and capacity of current road networks - Is there a road network in existence and can these support the volume of traffic that will be required to service the site?

2. Surrounding topography - If additional roads are required, can these be constructed easily or are there plans to construct new roads to the site that would be available during construction?

3. Environmental constraints - Are there any environmental concerns that would be an obstacle to the construction of additional temporary or permanent roads to assist in construction?

Taif, KSA

4. Would alternative means of transporting goods, labour power and materials to the site, such as rail, cable or helicopter be an economic consideration to use should the construction of roads be problematic?

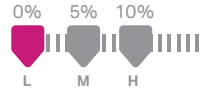
5. How can power and water be provided for the construction process if suitable space is limited? Could the provision of permanent utility infrastructure be constructed first and used during construction?

6. If the permanent utility infrastructure cannot be completed during the early phases of construction, what other solutions are available?

7. What are the prevalent and seasonal weather conditions and how can the construction be sequenced to minimise the impact of inclement weather events?

For the above, it can be observed that more consideration should be taken for the techniques to be used and the sequencing of construction activities. Through careful consideration, the cost impact of the unique constraints on the project could be minimised.

# Existing urban locations




Not all of the currently planned portfolio of giga-projects are in undeveloped or remote locations, there are some that are to be developed within or near the confines of existing urban areas. In these situations, the estimator could be forgiven for assuming that the unique cost pressures associated with the giga-project would be relieved to the point of no material commercial impact. However, to make such an assumption would be unwise, as the secret is in the name, it's a giga-project.

The challenges that will be faced in these locations are a direct consequence of the scale of the overall project. Although existing infrastructure, in terms of roads and utilities, are more readily available due to the scale and sometimes plot geometry, as well as location within the greater 'giga plot', there are still likely to be unique problems encountered.

A primary amongst these is the volume of traffic that will be required to service construction. Although there is most likely an existing road network, there will be significant additional disruption and volume on these roads, and several of these may require to be closed or diverted over the duration of the development of the giga-project portfolio. An added complication is possibly a greater need to liaise with authorities and other stakeholders than would be usually required for more remote locations. This is to ensure that oversized loads and any necessary diversions can be coordinated in a timely manner. Additionally, some existing roads may be removed during construction as a requirement of other projects within the wider portfolio during development.

Another constraint would be the availability of access to the site, these can, and most likely will, change over the duration of the project, hence why special consideration should be taken here when assessing the impact of logistics on the cost of the estimate or bid. As well as the external logistic concerns, the nature of these urban giga-project developments may be further complicated by the construction of large-scale developments in close proximity to one another. This will put more pressure on access and available space for laydown areas, site establishments and temporary utility compounds.

A further complication may be the need to service or upgrade the services to the plots. This could mean that utilities for other plots may require to cross the site, requiring the contractor to allow access to third party contractors to complete their works during construction. Although this is a common situation in most urban projects, again it is the scale in these instances which can make these challenges unique, as the number and capacity of these services may be considerable and may constrain access to large areas of the site during the construction duration. Such instances need to be considered within any bid or estimate in order to avoid budgetary issues later on.

Finally, the location of the site within any greater 'giga plot' may introduce other constraints. If located centrally within the greater plot, care should be taken to allow for the constraints posed by the changing nature of internal site haul roads. An additional consideration will be the interfaces of your particular project with that of the surrounding projects, such as services and utility infrastructure to be shared with

Riyadh, KSA

adjacent developments, as well as common physical elements such as foundations, walls or roadways. When estimating or bidding for giga-projects in these locations, consideration should be given to the following and due allowance made within the cost:

1. Current road network and any possible changes that may be required.

2. Authorities and other stakeholders to be engaged in respect of road diversions, utilities and accesses to the site. Also, potential constraints that may be imposed, as example, with respect to deliveries only being allowed at certain, often inconvenient, times of the day.

3. Location of your plot within the greater plot - what interface requirements need to be considered with respect to adjacent developments within the plot and access to your plot.

4. Timing and progress of other developments within the overall 'giga plot' and what impact will this have on the access and activities on your plot.

5. Capacity of existing surrounding infrastructure and utility networks. Will this be sufficient to accommodate the planned giga-project?

Although these constraints are commonplace for most urban developments, all of the above need to be considered under the lens of the sheer scale of the overall activity over the wider project.

# Existing facilities and infrastructure

In most normal reasonably scaled developments, the availability and capacity of existing facilities and infrastructure is usually not a concern, with the exception of some infrastructure projects that can traditionally be in remote locations. However, the pressure that these put on existing infrastructure and facilities, such as ports, airports, road networks and available accommodation, are not as extreme or pronounced as the potential pressures that some of the giga-projects currently planned will exert. In addition to this, the giga-projects will have a pronounced impact on the available labour market as well. As a result, care should be taken to understand these impacts in the context of the project, as there could be hidden consequences in terms of cost that should be considered within any estimate or bid.

As explained in the previous sections, the challenges thrown up by giga-projects are not new. It is simply that the location, scale and planned duration of these projects have a greater impact on the surrounding area and burden on existing facilities and infrastructure that demand closer examination than other smaller projects. With greater volumes of material, labour and plant required it would be imprudent not to study their impact more closely, with an example approach as outlined below.

Initially, the outline programme should be reviewed alongside the proposed design, in order to understand the types of construction to be adopted, the types of goods, plant and materials that are to be brought to site, as well as the levels of staff and labour required at each stage over the project duration. Studies should then be undertaken to categorise materials, plant and labour into those available locally, nationally and those that have to be sourced from abroad, and the timing and cost impact of such.

As a further consideration, it should be established what other projects of a similar scale are planned in the region of the project, as well as the forecasted commencement and completion dates. These other developments may put added pressure on the ports, airports, towns and other facilities required to service this project, putting further demand on the municipal and statutory authorities that are required to be engaged. With this, if there is an overall 'Programme Development Schedule' for the region, it may be worth making the necessary enquiries and getting a copy, if at all possible.

### Impact of supply of materials and plant

Once the above reviews have been completed, the team would then be required to avail themselves of the possible supply routes available for materials and plant. For those materials and items of plant to be imported nearby, ports and airports should be reviewed in terms of their current workload and handling capacity. It could be that these will not be sufficient to handle the types and volumes of imported components required. This would result in more distant facilities having to be considered (or new temporary or permanent facilities constructed), not to mention the greater risk of loss or damage through their exposure to greater haulage distances on roads that may already be unsuitable for use as major transport routes. With respect to locally or nationally supplied materials, these can also throw up issues as the main manufacturing centres could be a significant distance from the site, and in some cases, could require to be shipped or airfreighted, in addition to those sourced internationally.
An added complication is that in the case of modular or pre-assembled units where damage occurs in transportation or there are issues with incompatibilities between the module size and site dimensions, there may be no manufacturing facilities nearby or nationally where these can be rectified. This could result in the units having to be shipped back to the manufacturer or scrapped entirely with a long wait required for any replacement.

Jeddah, KSA

A further consideration would be the availability of government services in the region, not least statutory undertakers, municipality inspectors, as well as customs and excise. Should new or temporary air or sea ports be required, these official services also need to be considered and their availability determined.

In the case of plant, it may well be that certain specialist items are not available in the local market or even nationally. This could result in these having to be sourced internationally. It could also be that the local and national markets do not have the capacity to service the project requirements, resulting in additional plant also being brought in from overseas. Again, these items will have to be transported to site and assembled as well, adding more pressure to the existing transportation networks.

It may be that the construction of new infrastructure has already been considered and could already be underway, however, if this is not the case, due allowance should be made in any bid or estimate.

**Impact of labour supply**

Due to the remoteness of many giga-projects, the provision of staff and labour presents its own issues. There may be a shortage of available housing near the location of the works, with the nearest towns and cities having insufficient hotels or lodgings to cater for the numbers of people required.

In addition, these could be several hours drive away from the site, which is not desirable and can add to already long working days in remote locations. There could be additional complications as well, especially in the case of where the works are located offshore. It poses questions such as; can these camps be installed on the island or would transportation of staff and labour from the mainland have to be considered? In these instances, the chartering of accommodation platforms or cruise ships might be an economic alternative to having facilities on the mainland. This then results in the requirement for more, and much larger, labour camps to provide housing, messing and recreational facilities for the site.

Another added pressure would be the availability of suitable land to construct these facilities near the site. It may be that the employer has such facilities that could be used by the contractor, however, this should be thoroughly researched, and the cost impact considered within the estimate or bid.

**Proximity of industrial centres and facilities**

Another consideration for the more remote giga-projects will be the availability of manufacturing facilities and industrial areas. Most of these will not be in close proximity to the site and those that are will likely not have the capacity or range of technical services required. Even those located within urban areas may still face some issues with the capacity available of these facilities and not being able to cope with the additional demands of such projects.

In all instances, the availability, range of available services and capacity should be investigated and due allowance made for providing temporary factories, workshops and batching plants to make up the shortfall in available capacity.

Other consideration should also be given to the site and project power, water, waste and sewage demand loads, as mentioned in the previous sections.The sufficiency and availability of these utilities should be assessed and temporary provision made to address any shortfall in available capacity.

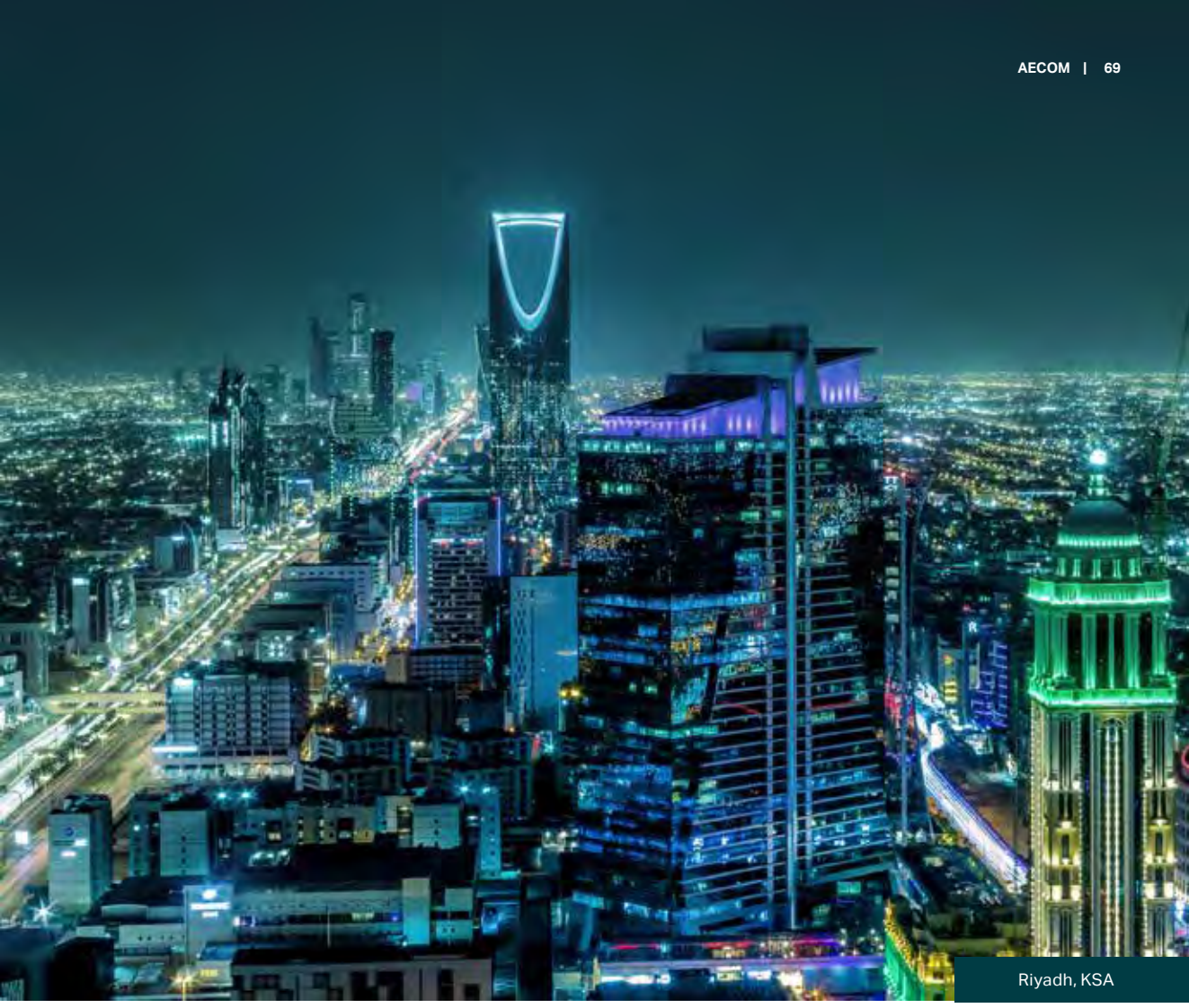
**Site topography and geographical constraints**

In the previous sections, the surrounding environment has been a main focus, with this topic being touched upon in a broader sense, however, the prevalent and existing conditions within the confines of the actual site, as in all projects, have their influence as well. The existing site conditions may restrict the possible locations available for the installation of site offices, welfare, stores, workshops, batching plants, laydown/storage and waste storage areas, generator farms, water storage and treatment plants, as well as introduce difficulties in the citing and transportation of plant and materials from place of storage to the work fronts where these are required. Labour is required to be housed and transported to and from work fronts. There may also be strict environmental concerns that limit the use of any temporary excavation of the site. In addition to these issues, the sequencing and execution of the works themselves may also restrict the plausible areas available for these temporary facilities.

These constraints may require some facilities to be located outside the site, in adjacent plots or areas, if these are available. Failing that, other solutions may have to be investigated. In the case of off-shore developments the use of barges or floating platforms could be considered, albeit assuming that there are no stringent environmental restrictions on the use of these in proximity to corals or areas of particular marine flora and fauna.

Transportation around site may also be an issue, either due to the location, number and/or magnitude of open work fronts, as well as the complexity of the design. For example, there may be a series of large excavations which prevent the installation of more direct haul roads to a work front, which may then mean that the concrete may go off if delivered by truck. Equally, the removal of spoil from excavations may prove difficult or impossible using conventional methods, hence, the consideration of use of conveyors or overhead cable bucket lifts may be required to facilitate this. In addition, the final structure or asset may also be in a hard to reach location, such as the base of a cliff below the main site. Such instances again require careful consideration.

Again, these considerations may all have an impact on the final estimate or bid. As guidance, we can look to the civil engineering and infrastructure sectors. They may be more familiar with these challenges than traditional building works, as they acknowledge that the scale and complexity of some projects will require non-standard solutions to both manufacture and then place the finished works in the required location.



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### Impact on the global construction economy and supply chain

The impact of the giga-projects planned as part of the Saudi Arabia 2030 Vision is already being felt within the construction economy. The vast scale and complexity of these developments, coupled with their ambitious delivery timelines, has already started to exert pressure on the global construction market. An example of this is the current sharp escalations in the prices of basic materials, such as steel and cement. The demand for suitably skilled and experienced professionals and labour has exerted its own pressures. As more of the giga-projects leave the planning and design phases and move into the delivery phase, there will be more inflationary pressures exerted on the global market until the supply chain can react to meet the increasing global demand, which includes the giga-project demand. The effect of the Saudi Arabian giga-projects will be felt in other geographies, as a high demand for materials may lead to material shortages, which in turn will lead to increased prices and inflation in other regions.

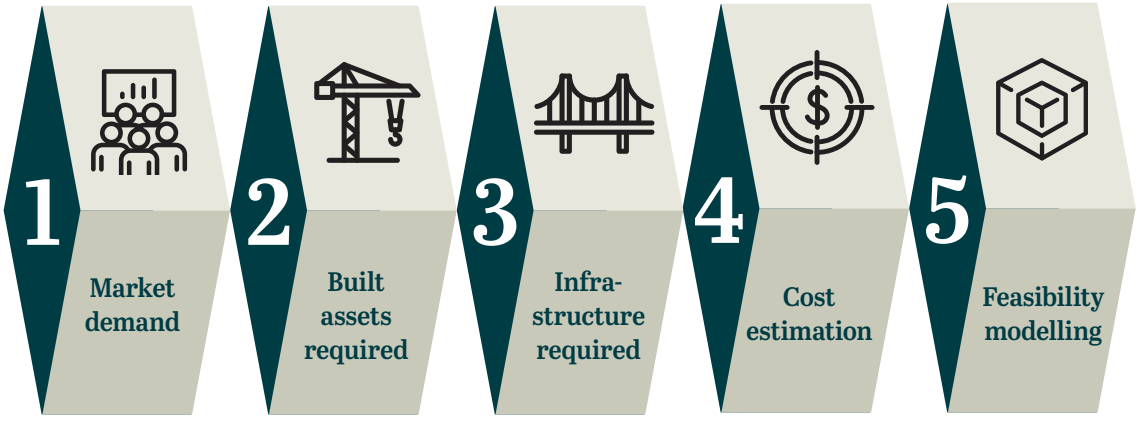
Until the supply chain can adapt, lead times will increase for long lead items and there may be shortages of plant and labour as well. This will again lead to increased costs in terms of hire rates and salaries. To allow for this the early procurement of long lead items will have to be considered, along with the possibility of the bulk buying of materials such as cement, steel, timber and electrical cable, however, the giga-project strategy for such options remains to be seen.

# Balancing the cost of infrastructure - masterplan cost estimation

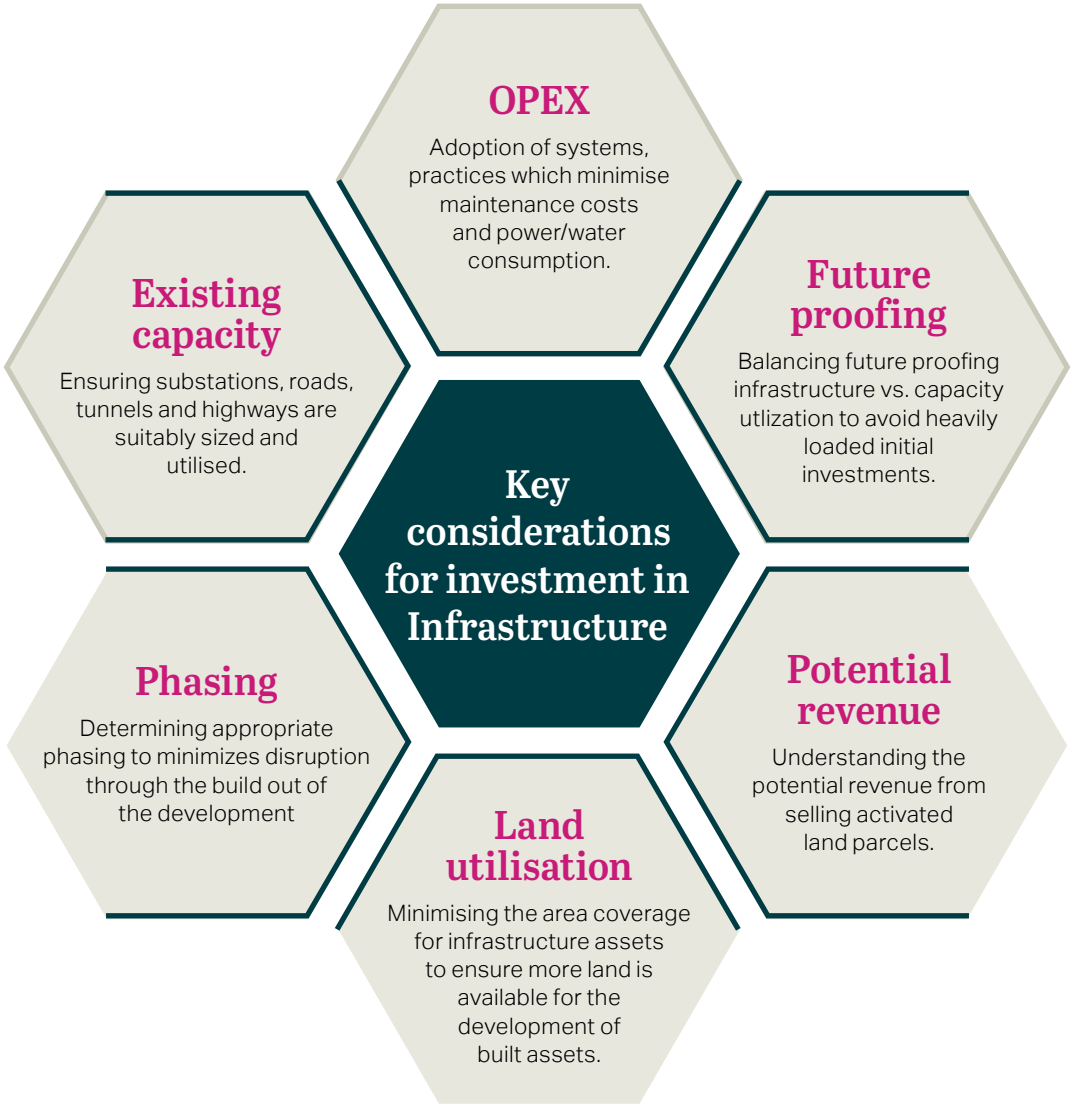
## The need for consolidated masterplan cost estimation

The Middle East region has seen a significant increase in investment toward major masterplan developments. In most cases, financial viability plays a key role in deciding whether a masterplan development moves from the design stage to construction.

Before a masterplan can progress beyond the vision stage, an iterative process begins of identifying market demands, analysing what built assets are required to meet such demand, evaluating what infrastructure is required to meet the needs of the assets, and then the overall development cost and feasibility modelling.



A key element in ensuring masterplan development is financially viable is minimizing unnecessary spending on infrastructure. A need to activate a site for development, however, not to overburden the feasibility model, is a balance that requires engineering led commercial expertise and extensive coordination between masterplan, engineering and cost consultancy teams.




The accuracy of the masterplan cost estimate is of utmost importance; it involves capturing all necessary elements from a comprehensive review. A precise estimate not only serves as a financial compass, but also contributes significantly to the overall success of the project. It is critical to the viability of the masterplan, paving the way for its seamless progression into the construction phase.

# Overview of the masterplan cost estimation process

Masterplan development costs are largely driven by a combination of land area, built-up area, building typology and population. The cost estimation process is an iterative one, requiring ongoing adjustments to achieve the optimum balance of meeting the client need or vision and minimising cost and programme impacts. The masterplan cost estimate should be accompanied by corresponding land use schedules and engineering assumptions to ensure consistency between design and cost.

Once the masterplan is in place, attention turns to the estimation of the capital expenditure (CAPEX). Understanding the financial scope of the project is paramount as it allows stakeholders to gauge the feasibility of bringing the masterplan to fruition. This careful analysis serves as a litmus test, determining whether the project aligns with the available resources and budgetary constraints.

Depending on the outcome of the financial model, the above process may recommence with adjustments being made to land use and density to improve the overall development viability.

## Cost estimation process:

**Client's brief**

Informed by market need or vision.

**Spatial framework plan**

Preparation of spatial framework plan, including land use schedule, which defines asset mix, building areas, land areas and populations.

**Initial engineering input**

Using land use schedules and a framework plan to understand approximate utility demands, traffic impact and road allocations.

**Cost estimation**

Preparation of overall masterplan development cost estimate.

**Viability evaluation**

Development costs inputted into feasibility model to determine financial viability.

# Key considerations in development viability

## Cost efficiencies

Identifying areas to reduce unnecessary cost without impacting on the masterplan vision or potential revenue.

## Asset mixes

Adjusting asset mixes and densities to focus on assets which provide better financial returns.

## Asset areas

Understand commercial tipping points and adjust building areas or typologies to fall below such.

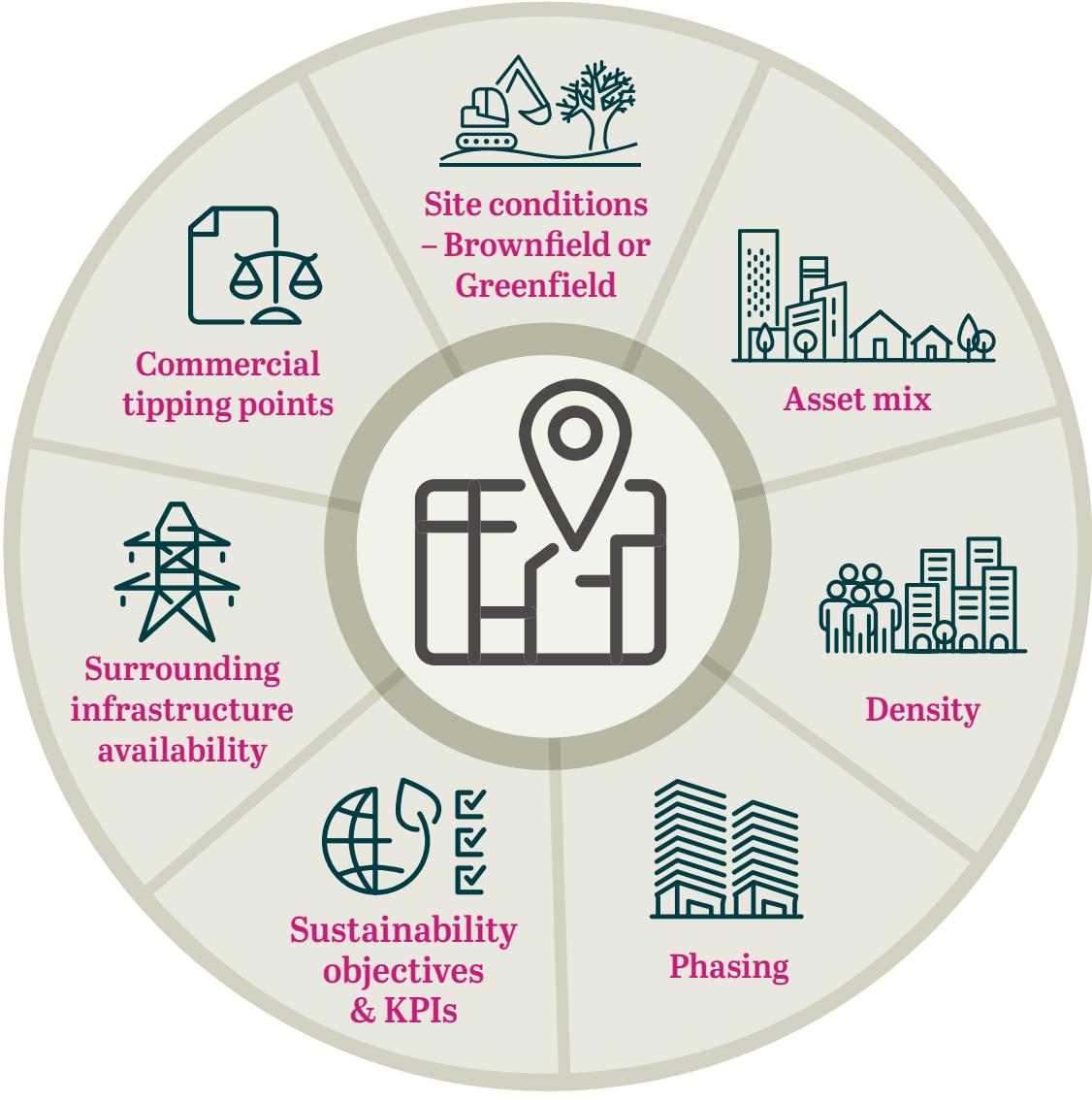
## Funding

Understand elements which can be funded separately through private investment or shared contribution from stakeholders that may benefit from the masterplan.

Zayed International Airport — Terminal A, Abu Dhabi, UAE
Image courtesy: Abu Dhabi Airports

# Key cost drivers for infrastructure

No masterplan is the same. Each has varying degrees of complexity with several key factors that influence infrastructure cost. These include:



# Site conditions - Brownfield vs. Greenfield

The ideal site requires minimal investment to enable its activation for full construction. Both Greenfield and Brownfield sites have their potential opportunities and challenges which may impact on financial viability.

| Greenfield | |
|---|---|
| Opportunities | Challenges |
| Provides flexibility for varying asset mixes and density. | Surrounding infrastructure may not yet be established. |
| No need for demolitions or diversions. | May require extensive site preparation, soil stabilization, cut and fill etc. |
| Greater space for logistical planning. | Lack of existing population and demand in surrounding area to support development viability. |

| Brownfield | |
|---|---|
| Opportunities | Challenges |
| May benefit from existing population and demand in surrounding area. | May require extensive demolition, diversion works and logistical challenges associated with confined spaces. |
| Potential re-use of existing assets with associated sustainability benefits. | Potential limitations on changing land use or development density. |
| Likely an extent of surrounding existing infrastructure and utility provisions. | Surrounding infrastructure may cause issues with restricted corridors and capacities. |

In each masterplan, a cost estimate of the required enabling works is calculated first. This is often a construction package that is tendered prior to completing the remaining infrastructure design, and often therefore the first cost that will be market tested.

Whilst Brownfield sites can add cost premiums for demolitions, diversions and logistical challenges, they may provide benefits in having established infrastructure beyond the development boundary. This may include utilities plant and equipment being present that can be tapped into.

# Asset mix

Asset mix heavily influences utility, traffic demands and resulting infrastructure costs. Understanding these demands can support in the early sizing of infrastructure components and associated cost in the absence of a developed design.

| Asset class | Potable water demand | Electrical power demand | Road peak hour trips |
|---|---|---|---|
| Residential | High | Medium | High |
| Commercial | Medium | High | High |
| Retail | High | High | Medium |
| Warehouses | Low | Medium | Medium |
| Light Duty Industrial | Low | Medium | Low |
| Heavy Duty Industrial | High | High | Low |
| Data Centers | High | Low | Low |
| Hospitality | High | High | Medium |
| Car Parks | Low | Low | Low |

Load demands according to m2 GFA

| Demand | Potable water | Power | Road peak hour trips (per lane) |
|---|---|---|---|
| Low | 1-3 liters/m2 | 80-120 w/m2 | 200-500 |
| Medium | 4-6 liters/m2 | 151-200 w/m2 | 500 - 2,000 |
| High | 6-10 liters/m2 | 201-250 w/m2 | > 2,000 |

*Caveats units of measure

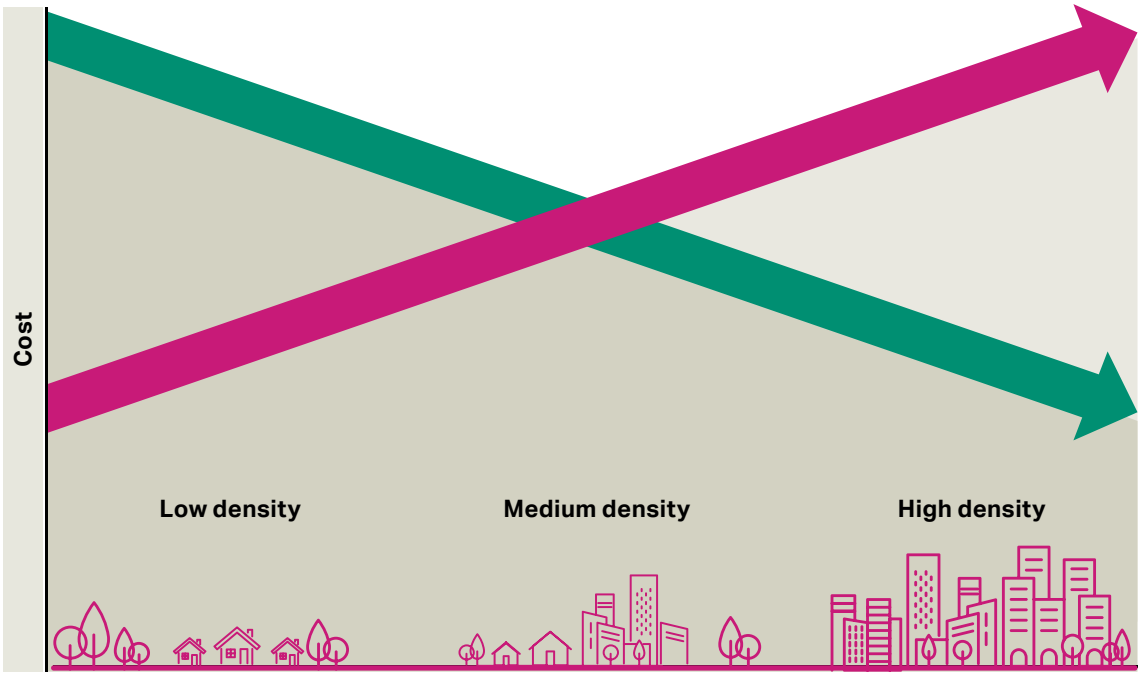
# Development density

Development density plays a role in maximising development plots and justifying the cost of infrastructure.

Whilst increasing density results in greater load demands on utilities and roads, these are concentrated and increase development efficiency - reducing the need for long road and utility networks.

The greater the development density the more assets there are to spread the burden of infrastructure cost, resulting in a lower cost per $m^2$ of GFA as a contribution to infrastructure.

**Density impact on infrastructure cost contribution**



## Development phasing

Development phasing is necessary to ensure alignment with both market demands, contractor capacity and/or potential budget constraints. Phasing may also be influenced by the extent of which a masterplan lead developer wishes to construct and retain assets, against that they may want to sell to third party developers.

Under a scenario where a master developer is responsible for undertaking primary infrastructure with the intention of selling land parcels, development phasing should consider limiting the master developer's exposure by ensuring the spend on land activation is quickly recovered with land sales.

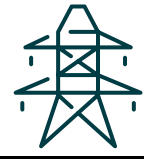
When phasing is considered for a development, it is important that the infrastructure required to be developed in the early phases is carefully assessed, as these early phases will often require a greater percentage CAPEX contribution to the overall infrastructure cost than later phases of the development.

## Sustainability objectives

With a drive to more sustainable development, many masterplans now include specific targets or KPIs relating to specific infrastructure assets. Examples of these KPIs include:

- Onsite renewable generation targets – defining a specific percentage of which power needs are served onsite by renewable technologies.
- Water balancing targets – ensuring sewage generation and the resulting treated sewage effluent is in line with the irrigation demands of the development.
- Sufficient public realm – ensuring a minimum target for green space per person.
- 15-minute cities – ensuring residents have accessibility to all needs within a given distance.
- Carbon reduction initiatives.
- 'Green certification' such as LEED.
- Compliance with local sustainability legislation or goals.

## Surrounding infrastructure availability



The scale and phasing of masterplan developments are often determined by the availability of surrounding infrastructure. Limitations on such can result in the requirement for significant investment in roads, connectivity and utilities to service the masterplan development. Wherever possible, major interventions should be avoided as they both can influence development viability and delay construction activity.

# Commercial tipping points

Consideration needs to be given to key commercial tipping points. Triggering these tipping points can result in a sudden spike in cost. For infrastructure the three main areas in which tipping points exist are as follows:

**Substation capacities and electrical connection contributions**
Primary substations tend to have standard loads and capacities in line with authority standards. Restrictions exist on compartmentalisation.

A primary 132Kv substation in the Middle East will vary between USD 30m to USD 40m. If a masterplan is of a scale that requires one or more primary substations, it may be worth considering adjusting the building built areas and usages to either reduce or increase load demands and ensure primary substations are effectively utilized. Staying below the threshold of requiring a new substation could save significant cost and free up more land for development (approximately 100m x 50m).

**Centralised versus localised cooling**
If a number of built assets are concentrated in a given area, the cooling strategy may lean towards centralized or district cooling. A high density development requires relatively short pipework distribution with high cooling loads. In contrast, low density developments, which are spread across a development site, may lend themselves to a more localized cooling solution. Further consideration should be given to the cooling medium, water cooled technologies are known to require less power than air cooled technology, but result in increased water requirements.

**Traffic impact**
Land use typologies have different traffic demands. Traffic trip rates determine the size and number of road lanes required. Understanding trip rate impacts can ensure that additional road lanes are not required, which again can provide more land for asset parcels.

# How can AECOM's Program Cost Consultancy help?

The feasibility of a masterplan is inherently tied to its financial viability. Infrastructure costs play a pivotal role in this equation, acting as an early test for the project's feasibility. By conducting a thorough cost analysis, stakeholders can assess whether the envisioned infrastructure aligns with the available budget and resources. This process mitigates the risk of embarking on projects that may prove economically unsustainable in the long run.

AECOM has a team of dedicated masterplan infrastructure cost consultants who are engaged from visioning/pre-concept stage through to detailed design and construction.

The team often act as coordinators between masterplan, infrastructure engineering and feasibility teams to ensure alignment. The team specialises in providing commercial expertise and this allows developers to make key informed decisions on infrastructure investment.

# Luxury residential market analysis and outlook

## Luxury residential cost models - an urban tall tower and a mid-rise apartment development

Make hay while the sun shines. The demand for luxury property in the United Arab Emirates (UAE) continues with Dubai topping the list as the preferred location amongst the Emirates. Property developers continue to set records for 'off-plan' sales, with many developments being sold out quickly, sometimes within minutes.

In the first part of this article, AECOM's Andrew Thompson, Director and Head of Assets, and Minesh Ratnadurai, Associate Director, Assets Team, analyse recent data and trends for luxury residential properties. In the second part of the article, they delve deeper into what it costs to build such luxury residential developments with a focused 'cost model' approach.

Dubai is an established location for all things luxury and ultra luxury, a magnet for the wealthy and it is fast becoming one of the global destinations to own property. The UAE boasts many world-class developments, such as the Burj Khalifa – the tallest building in the world, the Burj Al Arab – Dubai's iconic hotel and global landmark of Arabian luxury, the Museum of the Future – considered by many to be one of the most beautiful buildings in the world and many other similar landmark developments.

In the midst of its growth into a famous tourist destination and a transitional hub for business, the Emirate has also become home to many expatriates that have travelled to live and develop their careers in the city of Dubai. It is estimated that around an additional 300,000 people have relocated to the UAE in the last two to three years, and a number of these people have sought to purchase high-end, luxury property.

Based on property sales records during 2022 and according to Knight Frank's research, with 219 no. USD $10m + home sales during the same period, Dubai ranks fourth, just behind New York (244 sales), Los Angeles (225 sales) and London (223 sales. The city's stellar rise is further evidenced by the fact that Dubai is now the fifth most active city of USD $25m + home sales also, with 26 no. in 2022, where only London (43 no.), New York (43 no.), Los Angeles (39 no.) and Hong Kong (28 no.) rank higher (Knight Frank, 2023, Wealth Report).

As of Q2 2023, Dubai led the highest rate of property sales increase globally, i.e., 48 per cent in 12 months, for luxury homes (Knight Frank – Prime Global Cities Index Q2 2023). In addition, the average sales price increased by 20 per cent year-on-year, and average rental rates increased by 22 per cent in the same period as of August 2023 (JLL Q3 2023 UAE Real Estate Market Overview).

Based on Knight Frank's Worldwide Index Report 2023, Dubai's real estate had improved by 70.3 per cent in September 2022, with the major concentration being on luxury properties, which were regularly in the top five market values. This is far higher than the same index rises of 2.5 per cent for London, 8.9 per cent for Paris and 7.3 per cent for New York.

Aside from sales numbers, it also needs to be understood how 'relative value' plays into the current global demand for luxury and ultra luxury residential developments. The city of Dubai stands as the fifth most attractive area in terms of USD /sq. ft that can be purchased with an average size of c. 1,130 sq. ft. for every USD$ 1m spent - only outdone by the likes of Sao Paulo, Cape Town, Mumbai, and Madrid (Knight Frank, 2023, Private Capitol Outlook).

In comparison to other locations, the cost of building residential developments in the UAE also remains relatively low (refer to page 112 of this publication for the average building cost of residential mid-rise and high-rise developments around the world). The cost of building residential developments in other regions is lower only in the Asian and Africa geographies, such as China, Thailand and South Africa etc. This is mainly due to lower local labor costs and the fact that the UAE has a well-established geographically located infrastructure in the Middle East to source high-end materials from various parts of the world.

With this boost in demand for luxury residential developments, a property developers' key goals in the early stages of a project is 'speed to market'; how quickly can they launch the product on the market and how they can design and build the product and get it into the hands of the owners.

The next part of this article looks in detail at some of the key cost drivers for two types of luxury residential developments; the first a tall luxury residential tower, in excess of G+70 stories, placed in an urban/city centre environment, and the second is a mid-rise, G+ 8 to G+ 10 luxury residential apartment development placed in either an urban environment or beside the sea.

In addition to looking at some of these key cost drivers, we will also look to breakdown the overall indicative costs for both building typologies across the building elements themselves.

## Key cost drivers

Many building typologies carry common key cost drivers that can be derived from the building itself, regardless of its use. These common key cost drivers are typically as follows:

Structure – What type of structural frame is being adopted in order to achieve the architectural intent? What is its shape and form? Is it thin or thick? Is it concrete or steel (or a mix of both)? Is it tall or small? Are the site constraints and ground conditions affecting the structural design? How are the apartment layouts and floor plans affecting the structural grid layout? Are there wind loadings at certain heights and locations? What are the current seismic design requirements for this location? Etc.

Façade – How is the above structure intended to be enclosed? What is the transparent (i.e., glass) to solid (i.e., rendered blockwork, aluminium panels, GRC etc.) ratio? What is the specification and design of the frames and glass itself? How tall are the floor to ceiling heights? Are there many openable sections (i.e., sliding doors and windows etc.)? Is there any sun shading treatment required? Etc.

MEP – What type of systems are being adopted? What is the specification and design of these systems? Are there many 'controllable' and/or 'automated' parts to these systems? Are there many sustainable initiatives being designed into these systems? Are any of my systems 'smart' enabled? What is the intended designed life of these systems? Where is my major plant and equipment being specified to be sourced from? Etc.

Procurement and contract – What form of procurement is to be adopted? What is the preferred form of contract and

how is the risk allocation shared within this contract?
Is the programme aggressive or is it achievable? Can we get an 'enabling works' (i.e., excavation, de-watering, piling & shoring) package on site whilst procuring a 'main works' package? How does contractor selection play into all of this? What is the current appetite in the market for this type of work?

With luxury residential design, developers tend to maintain strong control of the design element choosing to use a 'traditional' procurement route, in most cases having renowned architectural firms attached with many rounds of design iterations. Contracts are usually tendered on a 'fixed price, lump sum' (FPLS) basis, however, provisional sums and PC rates are often maintained to allow for the design to be developed and refined prior to the specific award of key components, such as finishes and interior fit-out works.

## Special focus area

Finishes and interior fitout – Throughout our experience of delivering luxury and super luxury developments, one of the single biggest cost drivers which sets them apart from other developments is obviously the finishes and interior fitout. The specification and design of these components can in some instances drive costs to other levels. Furthermore, the range of costs within this component itself can also vary hugely and the control of these costs needs to be heavily monitored at the early stages of the design in order to achieve desired budgetary outcomes.

Important questions such as: How much natural stone is being used? Where is this natural stone being specified to be sourced from? How much joinery is being specified and designed? How much solid wood, veneers,

metal inlays, intricate designs, etc. are required? These are all relevant questions to be asked.

As part of the luxury offering from many developers, there is defined intention to provide certain affluent features that enable the product to stand out and be considered 'luxury' and 'well or best positioned' in its luxury class.

### Floor, wall, and ceiling finishes

In general, the apartments' internal floor, wall and ceiling finishes for luxury residential developments are typically of a more illustrious, high-end nature, and the material selection, as well as the quantity of the same, is as important as the design itself. Simply put, there is generally more physical quantity of the expensive finishes in luxury residential apartments as opposed to the same found in mid to high-end apartments.

The UAE, due to its location as a central geographical hub, has made the importation of goods from other regions more accessible and in a lot of cases, more feasible. European originated luxury finishes such as natural stones and marble, tend to be around four times (or more) the cost of traditional selections for a residential asset falling into a mid-spec category. Developers typically choose to plan the procurement of these items using a Prime Cost (PC) rate at main contractor appointment and thereafter spending time on developing these designs and selections to, hopefully, fall within that PC rate. It is also common practice to have contractors build mock-ups that go through several inspections giving great care and attention to quality. These mock-ups can be subject to onerous approval processes to ensure the right level of detailing, aesthetic, finish, and workmanship is achieved. Great attention is given to small details, such as edge treatments, stone pattern 'book-matching' and stone patterns/markings. For natural stone, this type of selection process can also drive up costs due to increased wastage in order to achieve the specified stone 'book-matching' or 'pattern' requirements. Developers may also require designer 'wallpaper' on certain 'feature walls' within the apartment and from our experience, these costs can be enormous as certain designer wallpapers can be classified as 'artwork' in itself.

Joinery (kitchens, wardrobes, cabinetry etc.) In many luxury residential developments, the specification and design of the wood used in joinery is key to determining the standard of quality expected. Where the wood is sourced from also plays its part. In some cases, the detailing to be achieved for doors, door frames, skirtings, library bookshelf cabinetry, office cabinetry, walk-in wardrobes etc., requires highly skilled joiners, sometimes sourced from other countries. The design and layout of the apartment itself, as well as the quantity of joinery items required, also have a cost impact. As an example, it is becoming pretty much a given in luxury apartments to have a front of house 'show kitchen' - which would be an additional open area kitchen, close to, or part of, the main open plan living and/or dining area. This would be a fully functional kitchen with extremely high-end specifications not only for the kitchen worktops, cabinetry, finishes etc. but also the functional kitchen equipment and white goods, and in some cases, industrial restaurant standard cooking equipment. This 'show kitchen' is of course in addition to the fully functional 'back of house' closed area kitchen where most of the physical prepping and cooking takes place. The cost of 'show kitchens' range greatly depending on their physical composition, size and specification. AECOM has encountered ranges of between AED 300,000 to AED 600,000 per unit, however, this can be even higher depending on the identified brand and design features. For bedroom joinery, again the costs can vary hugely depending on the design and specification requirements. Factors such as: specific types of woods and/or joinery veneers that need to be sourced internationally, does the joinery design have any metal in-lay design features and if so, what type of metal is required? Is it a precious metal like gold or silver? In some instances, we have seen clients specify 'luxury yacht' joinery companies to undertake the bedroom joinery works.

Amenities – As an overall product offering, developers look to ensure that occupants receive the highest level of amenities available. For example, where a standard mid to high-end residential development will house a resident swimming

pool(s) and basic gym facilities for common use, a luxury residential development will look to turn the dial up in terms of both the level of specification of these facilities, as well as the 'individual apartment unit offering'. This 'individual apartment unit offering' can include, the provision of luxury amenities, such as private lap swimming pools on balconies and terraces, private saunas and jaccuzzis within the apartments themselves. For the overall development, this can also include larger residents' 'infinity' swimming pools and mainstream gym and spa facilities that will house the highest standard of equipment with increased sized spaces for multi-use training functions, such as dedicated weight training, cardiovascular training, yoga, reformer pilates and dance, etc. For luxury residential projects, there is also an appetite to provide the community it serves with amenities that are not typically standard offerings. These can include mini movie theatres, indoor golf simulator rooms, private members clubs and cigar lounges, etc.

## Other cost factors

When it comes to providing a luxury residential apartment development, location plays a key part in the overall equation, as far as saleability is concerned. In many cases, luxury residential apartment developments tend to be placed in more densely occupied areas close to many of Dubai's world-class facilities and amenities, such as Downtown Dubai, Dubai Marina or the Palm Jumeriah. These locations can sometimes place further cost constraints on the construction budget when it comes to considering construction working space, restricted laydown areas, staff parking, noise level requirements, logistics, etc. The additional downtime for traffic or transporting time for off-site laydown areas can also add to the construction costs as contractors try to accommodate for these restrictions.

## Cost models

The following are two cost models derived for two types of luxury residential developments; the first is a tall luxury residential tower, in excess of G+70 stories, placed in an urban/city centre environment, and the second is a mid-rise, G+ 8 to G+ 10, luxury residential apartment development placed in either an urban environment or beside the sea.

There is a wide range of costs for luxury residential developments. This range is primarily influenced by the above aforementioned key cost drivers, as well as the architectural response to a site with the required structural solution, followed by overall specification standard levels and then building height. We have broken down the overall indicative costs for both building typologies across the building elements themselves using the RICS NRM. The models reflect a summarised elemental cost breakdown obtained from a competitive tender through a traditional single stage, fixed price lump sum arrangement using FIDIC Red Book contract.

The cost models include for all main contractor preliminaries and risk allowances to complete the buildings to a high standard. Demolition, enabling works, external works, external infrastructure and utilities services, loose FF&E, professional fees and VAT are all excluded.

## Luxury residential apartments – Tall tower project; G+ P+70

| Group element | AED/m2 | Cost (AED) | % |
|---|---|---|---|
| Substructure | 430 | 48,000,000 | 3.42% |
| Superstructure | 2,573 | 287,400,000 | 20.46% |
| Building external envelope | 1,854 | 207,100,000 | 14.74% |
| Internal walls and doors | 633 | 70,700,000 | 5.03% |
| Internal finishes | 2,462 | 275,000,000 | 19.57% |
| Fittings, furnishings and equipment | 336 | 37,500,000 | 2.67% |
| Sanitary fittings | 140 | 15,600,000 | 1.11% |
| Services equipment | 71 | 7,900,000 | 0.56% |
| Mechanical services | 914 | 102,100,000 | 7.27% |
| Electrical services | 1,187 | 132,600,000 | 9.44% |
| Conveying systems | 385 | 43,000,000 | 3.06% |
| Contractor's general requirements | 1,593 | 178,000,000 | 12.67% |
| **TOTAL - AED** | **12,576** | **1,404,900,000** | **100.00%** |

## Luxury residential apartments – Mid-rise project; G+8 to G+10

| Group Element | AED/m2 | Cost (AED) | % |
|---|---|---|---|
| Substructure | 585 | 1,700,000 | 4.94% |
| Superstructure | 1,430 | 28,600,000 | 12.08% |
| Building external envelope | 2,050 | 41,000,000 | 17.31% |
| Internal walls and doors | 750 | 15,000,000 | 6.33% |
| Internal finishes | 2,085 | 41,700,000 | 17.61% |
| Fittings, furnishings and equipment | 870 | 17,400,000 | 7.35% |
| Sanitary fittings | 170 | 3,400,000 | 1.44% |
| Services equipment | 50 | 1,000,000 | 0.42% |
| Mechanical services | 990 | 19,800,000 | 8.36% |
| Electrical services | 1,100 | 22,000,000 | 9.29% |
| Conveying systems | 285 | 5,700,000 | 2.41% |
| Contractor's general requirements | 1,475 | 29,500,000 | 12.46% |
| **TOTAL - AED** | **11,840** | **236,800,000** | **100.00%** |

# Sustainable Legacies

## Together, we can deliver a better world

**We all leave a legacy. What will yours be?**

**With ESG principles embedded into everything we do, the goal of our Sustainable Legacies strategy is straightforward: To ensure that the way we run our business, and the work we do in partnership with our clients, leaves a positive, lasting impact for communities and our planet.**

**#2**

In Engineering News Record's 2023 top environmental firms

# Sustainable Legacies is built on four pillars

## Sustainable development and resilience across our work

Embedding sustainable development and resilience across our teams and work means investing in know-how, skills and tools and measuring progress. We've made ESG training mandatory for all employees, are leading a taskforce on ESG measurement and transparency for the Sustainable Markets Initiative taskforce and invested in developing new approaches, such as ScopeX™, designed to reduce carbon impacts by at least 50 per cent on major projects — from urban planning to asset management. To help clients navigate the urgent and changing demands in this space, we've launched our global ESG advisory offering. This offers support and guidance through the entire lifecycle from organizational-wide strategy, through to the detail of the project-level technical ESG services required to deliver on their ambitious visions.

## Improve social outcomes

To deliver social value through our business, our teams must reflect the diversity of the clients and communities we serve. We set a target to ensure women comprise at least 20 per cent of senior leadership roles and at least 35 per cent of the overall workforce, which we are making progress towards with 18 per cent women in leadership roles and 33 per cent of our overall workforce being women. We've also set a number of non-gender diversity goals this year, as relevant to their specific regions and countries. To make sure we're meeting our ambitions, we've set up a global social value group to support best practice and ensure that each region of our business is aligned on these practices.

## Achieve net zero carbon emissions


Following our achievement of operational net zero in 2021, we will continue to remain operationally net zero. It's important for us to follow the science, and we've therefore had our more ambitious emissions reduction targets approved by the Science-Based Targets initiative to reach science-based net zero by 2040. This includes a 60 per cent reduction in Scope 1 and 2 emissions and 50 per cent reduction of Scope 3 emissions by 2030, as well as 90 per cent reduction in total emissions by 2040. We're also developing carbon reduction targets in partnership with our supply chain, working with over 7,000 suppliers and trade contractors who make up over 80 per cent of our total Scope 3 emissions.

## Enhance governance

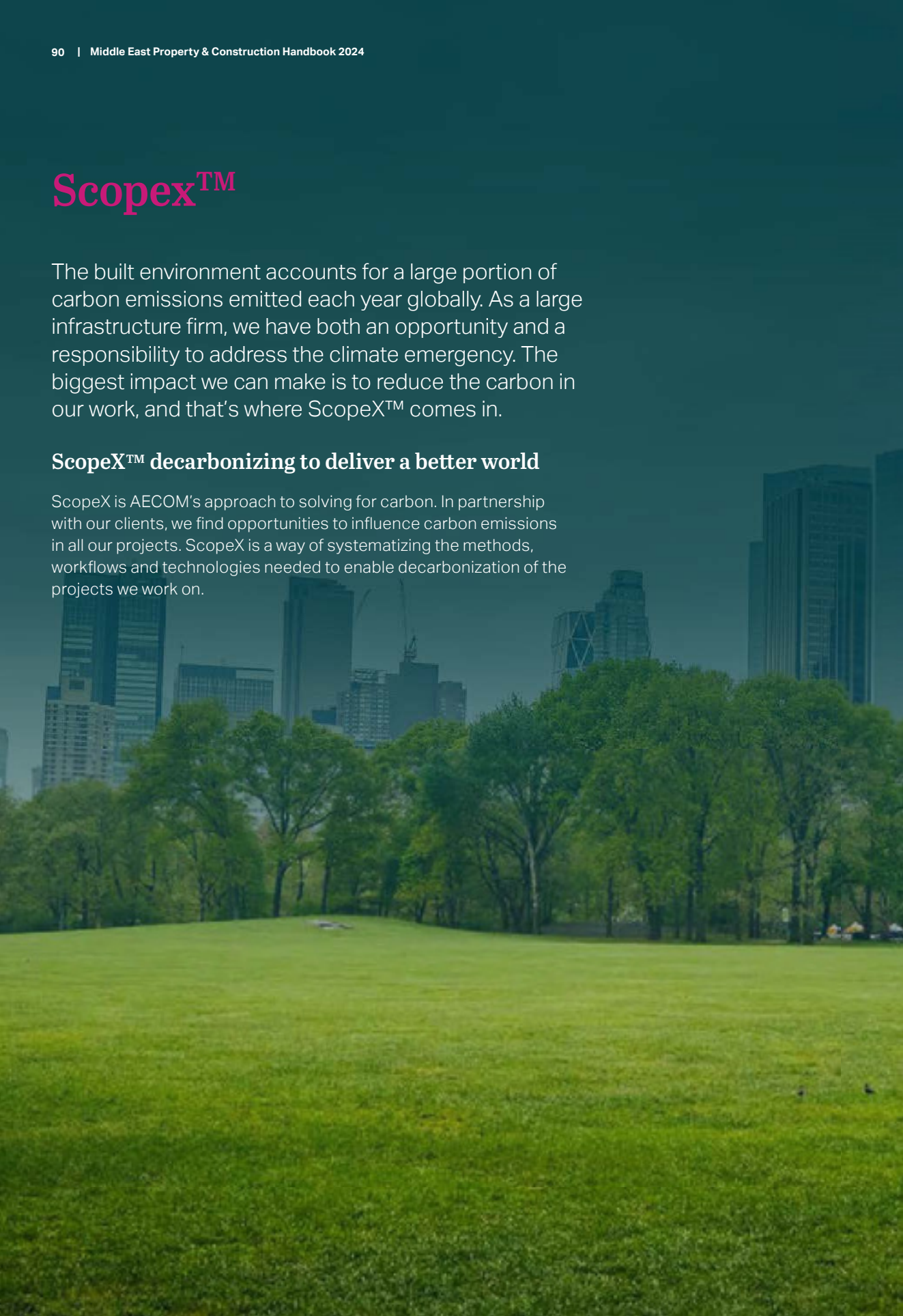
Governance is the foundation for effective corporate and business ESG management. To this end, we've incorporated ESG-related KPIs into our CEO and officer compensation and built sustainability performance into our financial metrics. Our global ESG reports are published annually, incorporating TCFD and SASB disclosure standards. We are also reviewing our ESG-related risk framework annually (implemented in 2021), and developing recommendations for respective updates, including how we can better support clients navigate the global clean energy transition equitably and efficiently.

# Scopex™

The built environment accounts for a large portion of carbon emissions emitted each year globally. As a large infrastructure firm, we have both an opportunity and a responsibility to address the climate emergency. The biggest impact we can make is to reduce the carbon in our work, and that's where ScopeX™ comes in.

## ScopeX™ decarbonizing to deliver a better world

ScopeX is AECOM's approach to solving for carbon. In partnership with our clients, we find opportunities to influence carbon emissions in all our projects. ScopeX is a way of systematizing the methods, workflows and technologies needed to enable decarbonization of the projects we work on.



**Using the Scopex™ framework, we bring our skills and experience with carbon reduction, together with digital tools and data to reduce emissions in each phase of an asset's lifecycle — from planning to asset management and decommissioning.**

## Step 1: Conversations with our clients

The foundation of ScopeX™ is understanding your carbon reduction commitments, challenges, and aspirations. We are ready to meet you wherever you are on your decarbonization journey and design solutions around your project needs.


## Step 2: Identifying carbon reduction opportunities and methods

After initial engagement, our team will work with you to understand the baseline carbon footprint of the project. Once we understand where the opportunities are, our teams will review methods that best reach your goals, such as carbon modelling and analysis, alternative design methods, low carbon material specification and efficient and renewable energy sources.


## Step 3: Leverage data and technology

We leverage data from external and internal sources to support the solution development. This includes industry-leading global emissions data from verified sources as well as a proven decarbonization strategies across a wide variety of assets and geographic locations collected from our projects. We use technology to enable decarbonization methods and connect with data. These include industry standard carbon accounting tools and custom carbon modelling and planning tools developed by AECOM.

## Step 4: Implement decarbonization solution

ScopeX™ is client focused, process driven and enabled by digital tools. Pairing our technical expertise and data sources with appropriate digital solutions, we confirm the right decarbonization approach and execute the project. Once the project is complete, we record the knowledge and results back into our internal global ScopeX platform to continuously improve and expand our service delivery.

# COP28 – broadening ambition; accelerating action and where the built environment goes next

**As COP28's official sustainability advisor, AECOM had a unique view of this year's conference, as we sought to integrate sustainability into every touch point of the delegate and visitor experience.**

Whether via our carbon tracking tool used throughout the conference, or through our participation in numerous bilateral meetings, industry debates and panel discussions, our team on the ground demonstrated our commitment to addressing the climate emergency, and our capability to drive positive change.

**Lara Poloni**
President, AECOM

"Practical, profitable, predictable and people-centric strategies exist to achieve net zero."

**Now, as post-conference discussion focuses on what must happen next to realize the potential of the final agreement, there is cause to be optimistic for what lies ahead.**

At a time marked by both significant challenge and opportunity, we believe climate ambition is translating into sustainable, meaningful, collective climate action – and that the last few weeks in Dubai have demonstrated that progress is accelerating, particularly across the infrastructure and built environment space.

The COP28 agreement by nearly 200 countries to 'transition away from fossil fuels' is significant after looking improbable early on, and the COP28 pledge to triple renewable energy investment and production is a landmark moment.

When both agreements are framed in the context of International Energy Agency (IEA) research that predicts global spending on clean energy is to reach US$1.8trillion in 2023 – outpacing the US$1.1 trillion allocated to fossil fuels – it's clear this 'transition away' via investment in offshore wind, solar and hydrogen is already well underway.


We see investment in renewable energy – and in the global energy transition – as one of several secular trends alongside broader infrastructure investment, and investment specifically focused on sustainability and resilience, that reinforce the 'glass half full' view of many at COP28.

In the U.S., the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) have sharpened private-sector focus around clean energy investment, and elsewhere around the world we are seeing significant growth in green investment and technologies. The global 'infrastructure renaissance' we're helping deliver is increasingly being approached through a sustainability and resilience lens, a marked departure from even a few years ago.

Our recent Future of Infrastructure report – **Lost in transition?** – finds there is increasing momentum propelling the global energy transition forward, with 74 per cent of the organizations we surveyed reporting significant acceleration in their adaptation efforts. While cost and inflationary pressures, skills shortages and competing priorities remain, they are not insurmountable. Practical, profitable, predictable and people-centric strategies exist to achieve net zero.

Knowledge, compromise and collaboration are critical, and COP28 has been an important and constructive opportunity to build understanding, challenge convention, engage in difficult conversations, bolster collaboration and, as much as


is possible, drive consensus on the actions that matter, like decarbonizing supply chains and ensuring the hard work within communities provides tangible social value in the longer term.

Outside the Green and Blue Zones of COP28, we know our clients around the world are eager to progress the decarbonization of their own operations, as well as learn how to implement ambitious sustainability, resilience and net zero agendas.

That's where we see a massive opportunity for us to play our part, aligned with our Sustainable Legacies strategy. The investments we continue to make to attract the industry's best to AECOM, and to shape our business to deliver impactful work aligned with our purpose of delivering a better world – from day one advisory services to industry-leading technical delivery anchored in digital innovation – is helping transform a desire to change to a demand – truly pivoting from ambition to action.

digital AECOM pipe·insights plan·engage

# Our digital transformation

## Digital AECOM

Digital AECOM brings together the potential of AECOM's digital technologies to deliver a better world. Working across the program and project lifecycle, Digital AECOM combines our leading industry knowledge with digital consulting services and products to define, develop and implement personalized – and even disruptive – solutions that accelerate our clients' digital journey and achieve better outcomes. We exist within AECOM's sphere of innovation, and expanding ecosystem of tools, systems and processes – with a team of over 2,500 digital practitioners who understand both the urgency of the challenges facing the infrastructure industry, and our responsibility to respond in an impactful and enduring way.

As one of our core values, innovation drives our embrace and development of digital technologies. We have developed user-friendly Software as a Service (SaaS) products that provide greater connectivity between data, projects and communities.

PlanEngage™ is an interactive online platform that can be used throughout the planning and reporting process of any infrastructure or environmental project to improve decision making and streamline the communication of complex information. This helps to eliminate unnecessary delays and ensure project milestones are met on time and on budget, while supporting better social, economic and environmental outcomes.

Easily accessible and simple to use, PlanEngage™ enables teams to collaboratively create, edit, and publish highly visual and interactive information throughout the lifecycle of a project. Documents are easy to navigate and can include visualizations like maps, multimedia, 3D modeling, and before & after sliders to provide robust insights and enhance project understanding – simplifying even the most complex technical topics – and bringing them to life.

PipeInsights™ empowers asset managers globally with more cost-effective sewer rehabilitation strategies. Using the power of AI, PipeInsights™ enables rapid responses with automated defect recognition to diagnose problems and significantly increase the efficiency of QA/QC processes.

The platform employs advanced machine learning algorithms to flag and classify potential defects and is trained on hundreds of thousands of sewer inspections. Built on decades of AECOM's extensive sewer management expertise, PipeInsights™ provides data-driven rehabilitation recommendations to improve decision-making and maximize asset lifespans.

We constantly invest in our digital capabilities to deliver faster, smarter and better. Working with agile specialists, as well as some of the world's largest software providers, our extensive technology alliances allow us to select the right options to meet our clients' needs.

Budgets and timescales involved in infrastructure projects mean few can afford to gamble when it comes to digital adoption. Achieving net zero carbon targets and circular economy ambitions add further impetus and complexity.As digital experts and trusted advisers to the

architecture, engineering and construction industries, Digital AECOM is the bridge between the digital and infrastructure worlds, equipped to create a more sustainable and equitable future.

Through our digital consulting service offerings, we specialize in crafting adaptive digital strategies that accelerate business operations, leveraging leading advancements in data science and AI. Our expertise extends to developing purpose-built solutions designed for scalability and creating a connected ecosystem based on the way work processes actually get done.

In an ever-changing industry and technology landscape, we partner with our clients to define a future that aligns with their goals, achieving positive results along the way. Embracing a nimble approach, we tactically progress towards this envisioned future, ready to adapt as necessary. We create momentum by attaining a series of ambitious wins, guaranteeing a forward-moving journey that delivers tangible business outcomes. To learn more about Digital AECOM please visit: digital.aecom.com

## Spotlight on solutions

Selected digital solutions we've developed to solve today's pressing challenges:

Digital Twin - There's never been a better time for asset owners to adopt digital twins to unlock significant value and provide benefits for themselves, their customers and safeguard their staff.

SWIFT (Sustainable Ways of Integrating Future Transportation) – This examines future scenarios for regional development considering transportation's role in sustainable development patterns and the role of emerging transportation technologies, such as automated vehicles and Mobility as a Service (MaaS).

OCEAN (Operational Carbon & Energy Analysis) – gathers data for holders of large asset portfolios to understand their portfolio level performance and compare building performance against industry norms.

## Transforming project delivery

Our clients count on us to think without limits. By harnessing the power of digital technology and innovation and connecting our technical experts and visionaries around the world, we deliver tailored solutions and transformative outcomes for our clients and the communities they serve.

Using a bespoke AECOM-developed Reality Capture tool, comprising a mobile phone, 360-degree camera and cloud application, we're able to take 360-degree images of projects that are automatically uploaded and stored on a secure cloud server quickly and easily, visually documenting construction-site progress throughout a project's lifecycle.

The tool allows us to document site progress faster, with stakeholders able to view and assess the information at any time and from anywhere. The images can be easily retrieved as the application logs their location and capture times, which is in stark contrast to traditional photograph repositories that either rely on extensive tagging or renaming.

The 360-degree images provide a more ubiquitous view of projects, which would traditionally involve taking dozens of photographs at multiple locations.

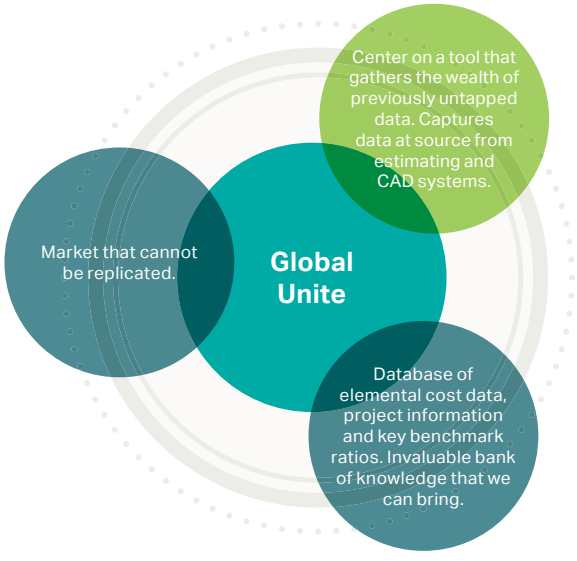
Benefits include:

- Project stakeholders to assess site progress remotely anytime and from anywhere by taking a virtual walkthrough.
- Dedicated microsite for stakeholder access to an immersive virtual site walkthrough.
- Visually documenting construction site progress through the use of 360-degree images.
- Promoting transparency across projects and enhancing trust.
- Quicker documentation of site progress.
- All information is stored on one platform, in one place.
- Health and safety concerns can be picked up and shared with the SH&E team.
- Efficient claims handling due to the ability to view an archive of project images tagged with the same GIS data.

# Global Unite

AECOM's Global Unite is a data warehouse for our international data capture, benchmarking and project performance indicators. This data, which we have gathered from our involvement in thousands of projects, helps us to efficiently benchmark project costs and establish project cost plans.

In this era of data, we are facing a growing number of requests that require rapid solutions based on evidence and data. Instead of relying on locally stored and constrained sources of cost and benchmarking data, our cost managers can now access a vast and growing pool of data generated from real projects.

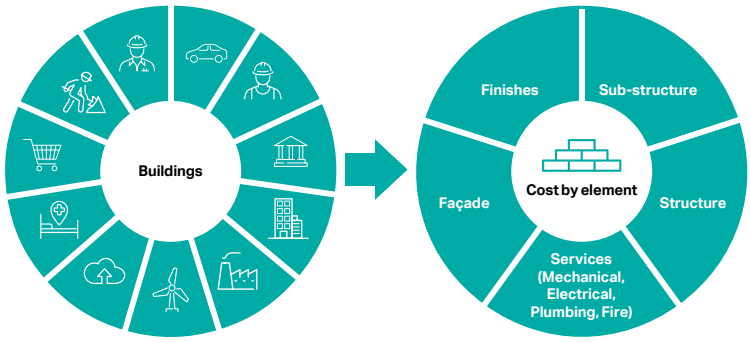


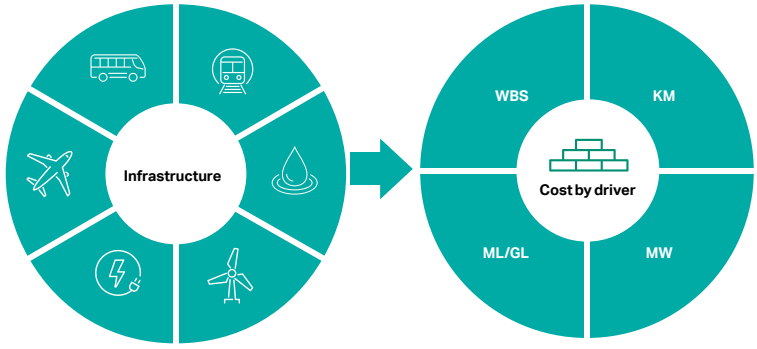

Using GUIDE – our mobile version of Global Unite – we can now instantly analyse parameters that define how effective or efficient a building is (or is not) against local or global standards for all buildings types, and produce indicative cost estimates in the early phases of a project.

Global Unite can help our approach to deliver projects in the following ways:

- It gives our clients unparalleled access to quality global and local knowledge that adds value to their project.
- Through direct comparison of our clients' project with global data, we can show clients what best practice is and how their project compares.
- It gives us the ability to collect and share project performance data from across the whole of AECOM.
- It centrally gathers the wealth of untapped data that we generate as we do our daily quantity surveying/cost consultancy work within our individual geographies.
- It takes knowledge from our cost planning and measurement systems, and applies data mapping rules to manage differences in geographic definitions.
- It captures data at its source and allows us to deliver local and global knowledge in a consistent way.

## What information can Global Unite hold?






The system works by drawing on our personal experiences and the benchmarking data to generate an initial view of the likely project cost and update the cost plan moving through the design stages. Building on the available design information, while leaving room for potential site or project specific elements, Global Unite produces a cost plan that accurately reflects project requirements.

Our key global clients see the value of the tool too. We recently used GUIDE to complete a benchmarking study for a global healthcare provider. Using data from over 500 healthcare/ healthcare-allied schemes around the world, we identified high level costs per $m^2$ for several project typologies similar in scale and complexity to the schemes undertaken by the client. A major manufacturer is also now using GUIDE to manage their own project cost data around the world, in their own format, by using the benchmark reports and generating indicative costs from their historical and current data across any geography. Several USA State Education Departments are utilising GUIDE to forecast costs on proposed new projects similar in nature to others, and have converted their Excel benchmarking worksheets into Global Unite.

# 5D Building Information Modelling

Building Information Modelling (BIM) is used to describe the process of designing, constructing and managing a building (or other design asset) in collaboration with the entire team. BIM develops throughout the asset's lifecycle and represents a single source of truth by using the same system or model as compared to using separate packs of conventional drawings and information sets. BIM is used to plan, design, construct, operate and maintain diverse physical infrastructures.

Whether designing or constructing bridges and roads, office towers and apartment blocks, pipelines, factories or schools, an information model or a database can be created that contains information about what will be built, how it will be built and how it will perform. Enabled by technology, we can create a synchronised, collaborative, digital representation of assets to virtually construct and test a project before we do so in reality.

A BIM model usually includes the 3D shape of the objects, but it can also include their cost, installation date, or operating parameters.

We can attach practically infinite additional data to any object or category of objects in a BIM database, and then use that data to manage information flow across multiple lifecycle phases and between multiple parties.

By creating a single source of project information, and by making this available across the design, construction and operation teams, we can increase our accuracy and efficiency. We can also realise significant savings on the lifecycle cost of operating an asset.

**The 5D BIM process**

For the cost management team, our focus is on 5D BIM. This refers to the linking of cost information to a 3D model. The number "3, 4 or 5", in connection with BIM, relates to the type of information associated with the model. It refers to other dimensions, such as time (4D) or cost (5D). 2D and 3D essentially refer to CAD 2D plans and 3D models, while 5D BIM entails the intelligent linking of individual 3D CAD components to cost-related information.

**Understanding the process**

Moving over to the 5D BIM process is an enhancement to our current systems and implementation. The process aims to automate much of the measuring, estimating and bill production stages. The value lies in the fact that it will enable cost managers to be more proactive and to spend more time on cost engineering and management, as compared to measurement and cost reporting only.

In brief, shifting our focus towards the 5D BIM process requires the following:

- Cost manager contribution and buy-in to the development of the BIM execution plan.
- Involvement with the design team prior to the start of



design work to communicate our cost extraction design requirements.
- The application of a cost database as a parameter to the objects contained in the 3D model.
- Base our measures primarily on 3D design information.
- Creating a unified link between the design information, our measures and our costs.

The possible benefits of BIM from a cost management perspective are:

- Fast, reliable, and accurate quantity take-off and cost estimation.
- Auto computation of calculations, hence reduced calculation mistakes.
- Categorized cost reporting and estimation via the use of zones/locations.
- Improved visualization of the elements for measurement and costing purposes.
- Enhanced communication and collaboration amongst the professional and project team.

Our PCC team have developed a thought leadership document that is an essential guide for quantity surveyors, cost managers and cost estimators looking to be involved within a project utilising BIM.

The document further acts as guidance notes to the design team about modelling best practices and requirements for the quantity surveyor to be able to rely on the object data within the 3D model. The document makes recommendations based upon 5D-friendly modelling practice to standardise the output of 3D models in a format that is 5D compatible.

By applying the guidance within the document, the need for manual take-off will be greatly reduced. The ultimate goal is that the development of consistent modelling best practice improves the quality and usability of model data.

The ultimate goal is that the development of consistent modelling best practice improves the quality and usability of model data.

# Digital Project Delivery (DPD) and research support

AECOM promotes a collaborative working environment underpinned by digital technologies. Our focus is on implementing more efficient methods to design, procure, construct, operate and maintain built assets and infrastructure.

Our cost managers and consultants are fully aligned to standard DPD protocols and procedures. This ensures consistency and successful outcomes in our daily working practices. Our teams are committed to the development of 5D BIM through a collaborative workflow that aims to improve BIM data quality and facilitate improved digital outcomes.

These include the ongoing development of the following:

- BIM execution plan.
- Design and measurement coordination.
- Risk/change management.
- E-tendering.
- Global collaborative tools.
- Construction progress reporting.
- 5D BIM.
- Mobile connectivity to monitor site progress.
- Paperless communications.

Research is a key part of AECOM's aspirations to embrace complex challenges and deliver innovative outcomes.

Through our research and knowledge creation activities, we aim to stimulate beneficial cultural and business changes, resolve industry-specific problems, support our knowledge database and deliver cost-effective, high-quality and relevant services.

We also undertake contract research on assignment for clients.

Globally, we have a tradition of supporting research collaborations, and we are currently pursuing a wide range of research studies with academic and research institutions, professional bodies and governments.

Diriyah Square, KSA
Image courtesy Diriyah Gate

Current research nationally and internationally centers around:

- Local, regional and international influences on construction costs and prices.
- BIM cost models.
- Sustainability and green buildings - drivers of green design, construction, and operations within different building types.
- Improving infrastructure project delivery in the Middle East.
- Tall, large and complex buildings - efficiencies in construction and lifecycle costing.
- The triple bottom line in construction and property development.
- The soft landings process for buildings.

We have ongoing collaborations across our international offices with specific regards to global infrastructure sentiment surveys, sector-specific research and developing global project-cost databases.

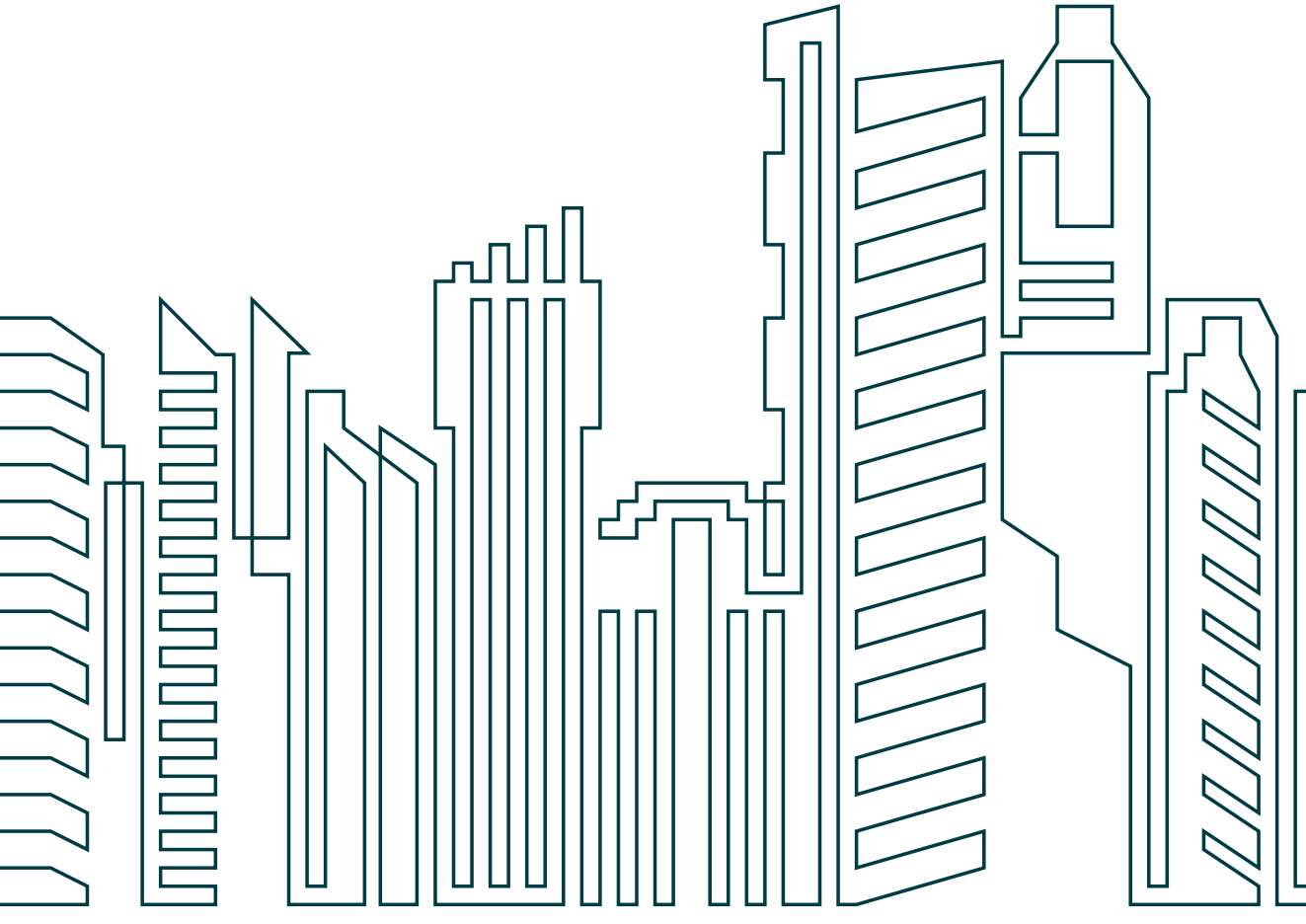
**“Research is a key part of AECOM’s aspirations to embrace complex challenges and deliver innovative outcomes.”**

Finally, we aim to work closely with the industry on continuing educational workshops and in developing relevant industry reports and publications.

# 04 Reference data

## IN BRIEF





# Global building cost comparison

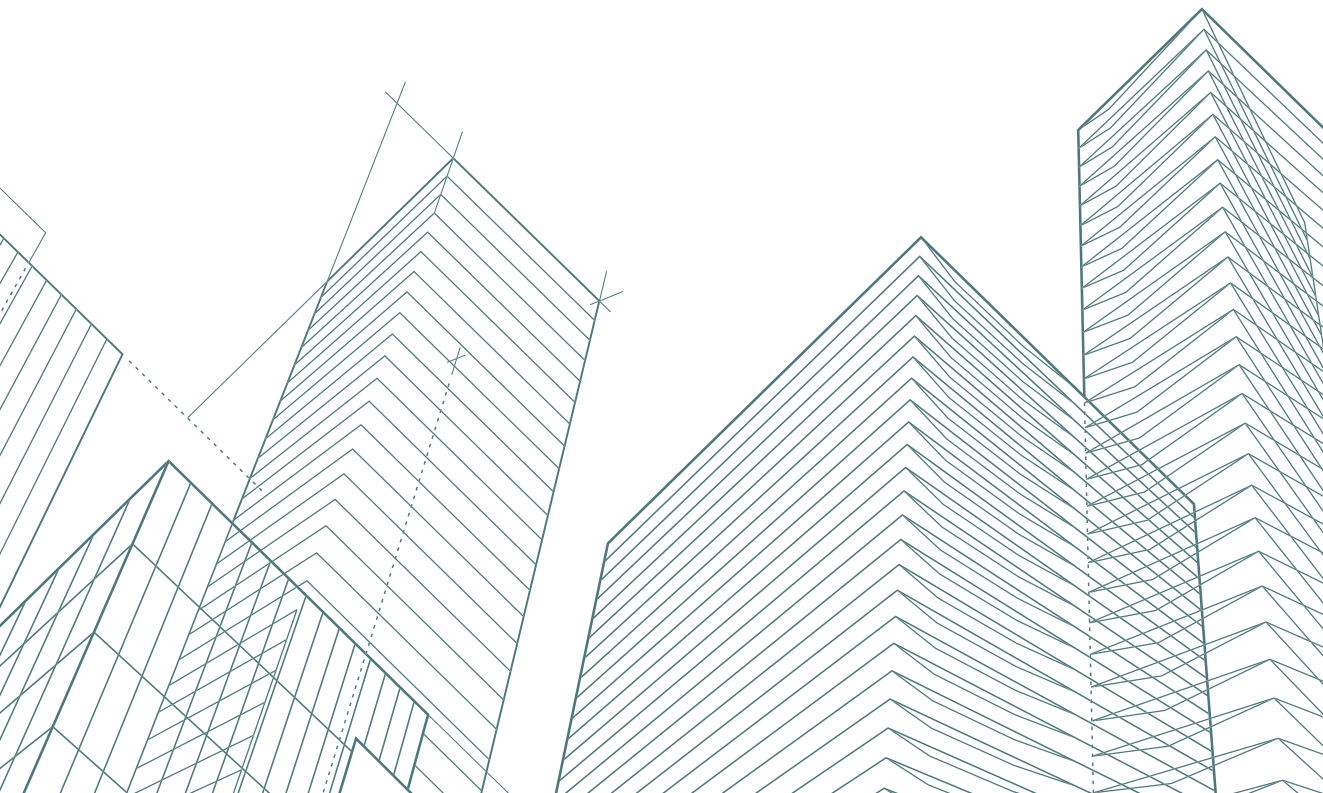
## The international cost data shown is converted to US Dollars to enable comparison.

The building costs, for their respective asset types, are averages based on local specifications. The actual cost of a building will depend on among other things, unique site conditions, design attributes and applicable tariffs.

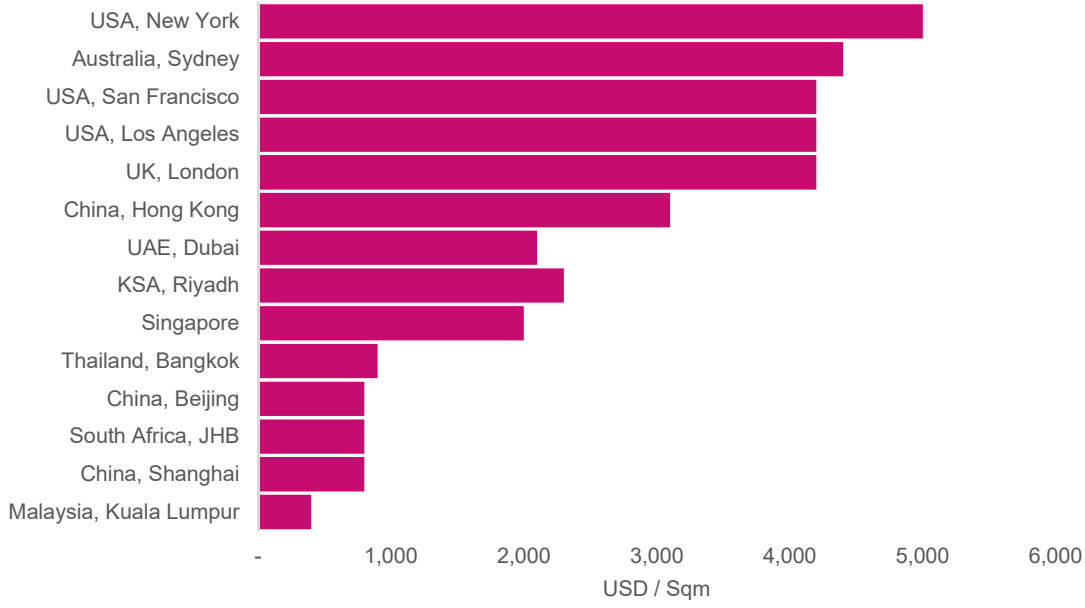
In addition, the standard for each building varies from region to region, which may have a significant impact on cost.

Costs are subject to considerable variations due to factors such as:

- Local market conditions.
- Complexity of project.
- Commodity price movements.
- Building specifications.
- Exchange rates.
- Contractors appetite for securing work.
- Contractual risk apportionment.



# Residential
## Average building cost for a standard residential high-rise




Source: AECOM

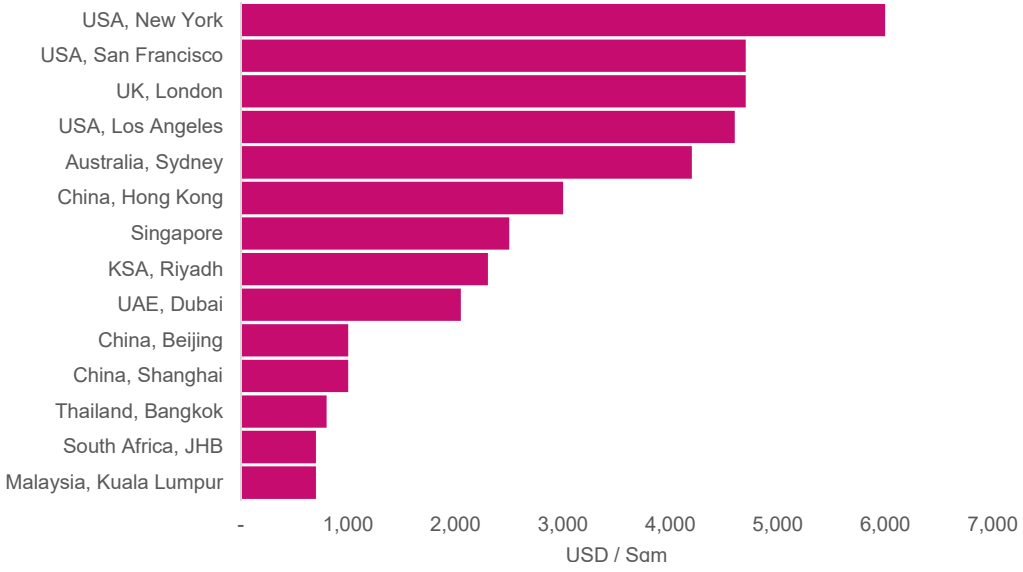
**Average building costs (USD/sqm)**

| Building type | **Sydney** Australia | **Hong Kong** China | **Beijing** China | **Shanghai** China | **Kuala Lumpur** Malaysia | **Singapore** Singapore | **Johannesburg** South Africa | **Bangkok** Thailand | **Dubai** UAE | **Los Angeles** USA | **San Francisco** USA | **New York** USA | **London** UK | **Riyadh** KSA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average multi unit high-rise** | 4,400 | 3,100 | 800 | 800 | 400 | 2,000 | 800 | 900 | 2,100 | 4,200 | 4,200 | 5,000 | 4,200 | 2,300 |
| **Luxury unit high-rise** | 6,000 | 4,300 | 1,500 | 1,500 | 800 | 3,500 | 1,000 | 1,300 | 3,380 | 5,400 | 5,300 | 6,300 | 5,900 | 2,800 |
| **Individual prestige houses** | 6,300 | 5,900 | 900 | 900 | 1,000 | 3,300 | 1,000 | 1,400 | 3,000 | 5,100 | 5,400 | 5,900 | 5,800 | - |
| **(Ave H1 2023)** | **AUD** | **HKD** | **CNY** | **CNY** | **MYR** | **SGD** | **ZAR** | **THB** | **AED** | **USD** | **USD** | **USD** | **GBP** | **SAR** |
| **1 USD =** | 1.51 | 7.84 | 7.27 | 7.27 | 4.67 | 1.36 | 18.94 | 35.42 | 3.67 | 1.00 | 1.00 | 1.00 | 0.79 | 3.75 |

**Note:** Prices exclude land, site works, professional fees, tenant fitout and equipment. Rates exclude GST/VAT.
International costs based on Q3 2021 and exchange rates to USD as of H1 2023.
UAE / KSA costs based on Q3 2023 and exchange rate to USD as of Q3 2023.

Source: AECOM

# Commercial
## Average building cost for a standard office high-rise




Source: AECOM

**Average building costs (USD/sqm)**

| Building type | **Australia** Sydney | **China** Hong Kong | **China** Beijing | **China** Shanghai | **Malaysia** Kuala Lumpur | **Singapore** Singapore | **South Africa** Johannesburg | **Thailand** Bangkok | **UAE** Dubai | **USA** Los Angeles | **USA** San Francisco | **New York** USA | **UK** London | **KSA** Riyadh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average standard offices high-rise** | 4,200 | 3,000 | 1,000 | 1,000 | 700 | 2,500 | 700 | 800 | 2,050 | 4,600 | 4,700 | 6,000 | 4,700 | 2,300 |
| **Prestige offices high-rise** | 6,000 | 3,700 | 1,400 | 1,600 | 1,100 | 3,100 | 900 | 900 | 2,500 | 5,100 | 5,000 | 6,500 | 5,800 | 3,000 |
| **Major shopping centre (CBD)** | 4,200 | 4,300 | 1,300 | - | 700 | 3,400 | 700 | 800 | 1,850 | 3,800 | 4,000 | 4,400 | 5,100 | 2,150 |
| **(Ave H1 2023)** | **AUD** | **HKD** | **CNY** | **CNY** | **MYR** | **SGD** | **ZAR** | **THB** | **AED** | **USD** | **USD** | **USD** | **GBP** | **SAR** |
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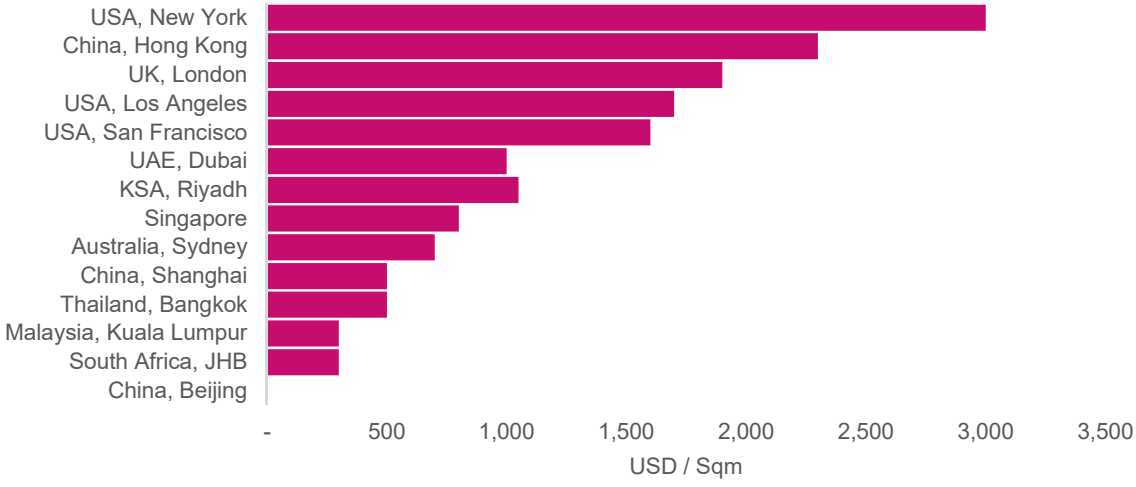
International costs based on Q3 2021 and exchange rates to USD as of H1 2023.
UAE and KSA costs based on Q3 2023 and exchange rate to USD as of Q3 2023.

Source: AECOM

# Industrial and other
# Average building cost for a light duty factory




Source: AECOM

**Average building costs (USD/sqm)**

| Building type | Australia Sydney | China Hong Kong | China Beijing | China Shanghai | Malaysia Kuala Lumpur | Singapore Singapore | South Africa Johannesburg | Thailand Bangkok | UAE Dubai | USA Los Angeles | USA San Francisco | New York USA | UK London | KSA Riyadh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Light duty factory** | 700 | 2,300 | - | 500 | 300 | 800 | 300 | 500 | 1,000 | 1,700 | 1,600 | 3,000 | 1,900 | 1,050 |
| **Heavy duty factory** | - | - | - | - | 500 | 1,000 | 300 | 700 | 1,600 | 2,100 | 2,100 | 3,900 | 3,300 | 1,450 |
| **Multi-storey car park** | 1,000 | 1,600 | - | 400 | 300 | - | 200 | 500 | 750 | 1,700 | 1,600 | 1,600 | 900 | - |
| **District hospital** | 6,700 | 5,400 | - | 1,400 | 800 | - | 1,500 | - | 3,250 | 7,800 | 7,500 | 9,100 | 4,700 | 2,600 |
| **Primary and Secondary schools** | 2,600 | 2,600 | - | 1,000 | 300 | - | 400 | - | 1,900 | 4,800 | 4,700 | 4,900 | 3,000 | - |
| **(Ave H1 2023)** | **AUD** | **HKD** | **CNY** | **CNY** | **MYR** | **SGD** | **ZAR** | **THB** | **AED** | **USD** | **USD** | **USD** | **GBP** | **SAR** |
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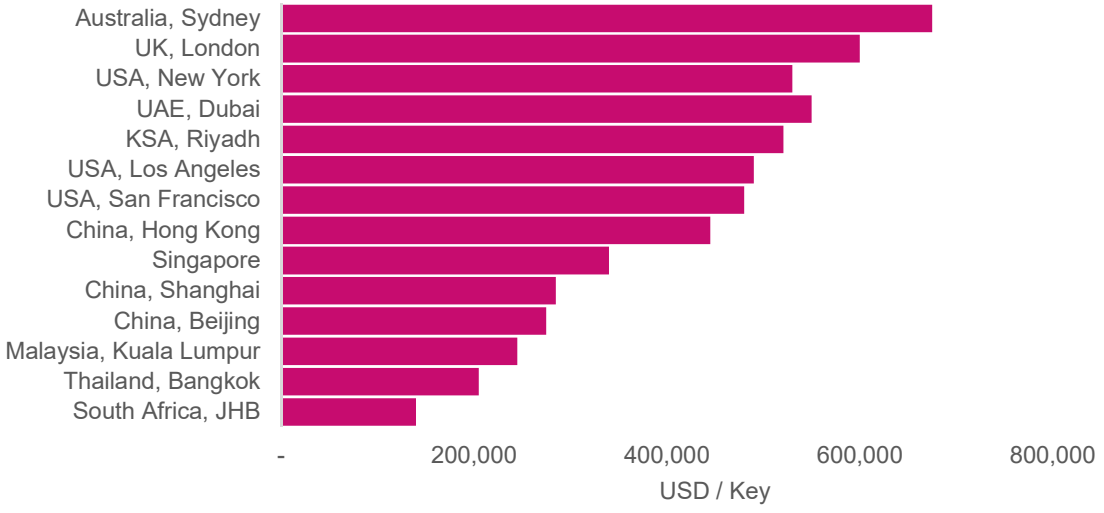
International costs based on Q3 2021 and exchange rates to USD as of H1 2023.
UAE/KSA costs based on Q3 2023 and exchange rate to USD as of Q3 2023.

Source: AECOM

# Tourism
## Average building cost for a five-star luxury hotel




Source: AECOM

### Average building costs (USD/key)

| Building type | **Australia** Sydney | **China** Hong Kong | **China** Beijing | **China** Shanghai | **Malaysia** Kuala Lumpur | **Singapore** Singapore | **South Africa** Johannesburg | **Thailand** Bangkok | **UAE** Dubai | **USA** Los Angeles | **USA** San Francisco | **New York** USA | **UK** London | **KSA** Riyadh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3-star budget** | 345,000 | 210,000 | - | - | 135,000 | 60,000 | 70,000 | 55,000 | 120,000 | 85,000 | 85,000 | 85,000 | 100,000 | 118,000 |
| **5-star luxury** | 675,000 | 445,000 | 275,000 | 285,000 | 245,000 | 340,000 | 140,000 | 205,000 | 550,000 | 490,000 | 480,000 | 530,000 | 600,000 | 521,000 |
| **Resort style** | - | - | 450,000 | - | 190,000 | 225,000 | - | 250,000 | 670,000 | 305,000 | 300,000 | 300,000 | 370,000 | 668,000 |
| **(Ave H1 2023)** | **AUD** | **HKD** | **CNY** | **CNY** | **MYR** | **SGD** | **ZAR** | **THB** | **AED** | **USD** | **USD** | **USD** | **GBP** | **SAR** |
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International costs based on Q3 2021 and exchange rates to USD as of H1 2023.
UAE and KSA costs based on Q3 2023 and exchange rate to USD as of Q3 2023.

Source: AECOM

# International exchange rate trends

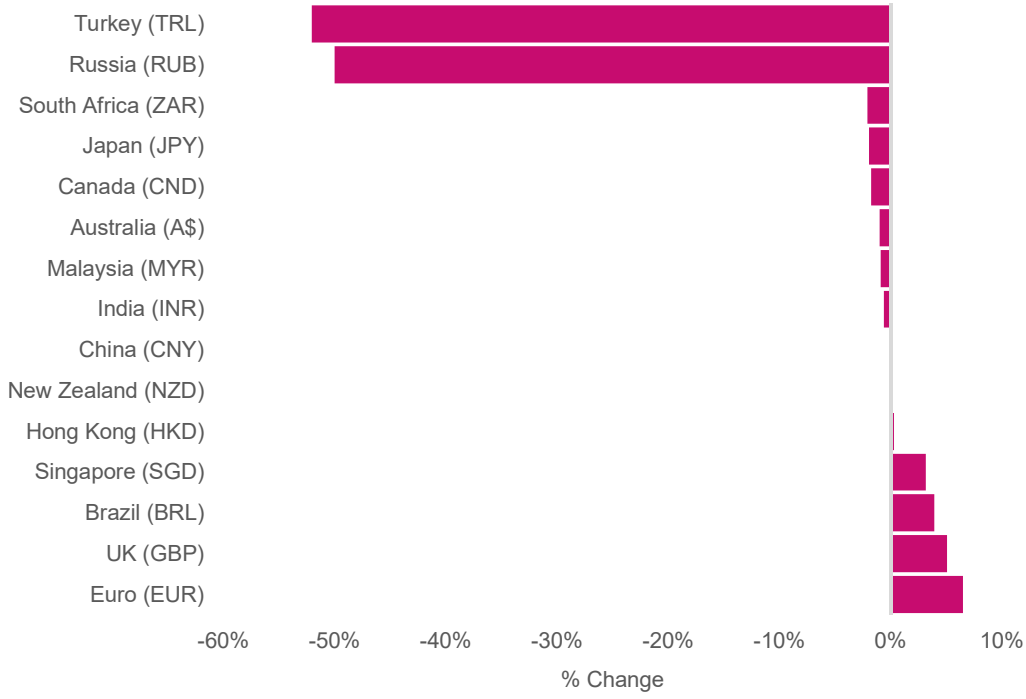
In recent years, exchange rate movements have been significant as diverging economic performance has led to many major currencies experiencing significant shifts against the US Dollar. The Forex rate illustrates a country's economic stability with leading factors that can influence fluctuations and those that are constantly analyzed, including:

- Interest rates.
- A country's current account balance.
- Government debt.
- Political stability (Brexit, trade uncertainty and shifts, elections).
- Recessions.
- Commodity markets.
- International trade.
- Geopolitical conflict.

Currency depreciation against the US Dollar translates into a relative drop in building costs when expressed in US Dollars, making these locations/regions relatively cheaper in US Dollar terms.

**Exchange rate trends**

Currency movements of the US Dollar against major currencies Q3 2023 compared to Q3 2022.




Source: www.xe.com

# GCC building cost comparison

## The Middle East cost data shown is converted to US Dollars to enable comparison.

The building costs, for their respective asset types, are averages based on local specifications. The actual cost of a building will depend on among other things, unique site conditions, design attributes and applicable tariffs.

In addition, the standard for each building varies from region to region, which may have a significant impact on costs.

Costs are subject to considerable variations due to factors such as:

- Local market conditions.
- Complexity of project.
- Commodity price movements.
- Building specifications.
- Exchange rates.
- Contractors appetite for securing work.
- Contractual risk apportionment.

**Habitas AlUla, KSA**
Image courtesy Royal Commission for AlUla

# Average building cost by asset type

| Building Cost (USD / sqm) | UAE (Dubai) | | KSA (Riyadh) | | Qatar (Doha) | | Bahrain (Manama) | |
|---|---|---|---|---|---|---|---|---|
| **Typology** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** |
| **Residential** | | | | | | | | |
| **Low-rise** | 1,100 | 1,600 | 900 | 1,400 | 1,100 | 1,600 | 800 | 1,400 |
| **Medium-rise** | 1,200 | 1,800 | 1,200 | 1,700 | 1,200 | 1,800 | 1,100 | 1,700 |
| **High-rise** | 1,900 | 3,000 | 1,800 | 2,800 | 1,800 | 2,500 | 1,500 | 2,100 |
| **Villas** | 1,200 | 1,900 | 1,100 | 2,400 | 1,300 | 2,500 | 700 | 1,400 |
| **Commercial** | | | | | | | | |
| **Low-rise office (shell and core)** | 1,200 | 1,600 | 1,000 | 1,400 | 1,300 | 1,600 | 1,100 | 1,500 |
| **Mid-rise office (shell and core)** | 1,400 | 2,200 | 1,200 | 1,700 | 1,500 | 1,900 | 1,300 | 1,700 |
| **High-rise office (shell and core)** | 1,600 | 2,500 | 1,600 | 3,000 | 1,700 | 2,500 | 1,500 | 2,200 |
| **Fit-out - basic** | 1,000 | 1,700 | 900 | 1,400 | 1,200 | 1,800 | 700 | 1,000 |
| **Fit-out - medium** | 1,600 | 2,100 | 1,400 | 2,200 | 1,700 | 2,200 | 1,000 | 1,300 |
| **Fit-out - high** | 2,100 | 2,800 | 2,100 | 2,800 | 2,300 | 2,900 | 1,300 | 1,700 |
| **Retail** | | | | | | | | |
| **Community** | 1,400 | 1,800 | 1,300 | 1,700 | 1,500 | 1,800 | 1,100 | 1,400 |
| **Regional mall** | 1,500 | 1,800 | 1,400 | 2,000 | 1,500 | 1,900 | 1,300 | 1,700 |
| **Super regional mall** | 1,600 | 2,100 | 1,700 | 2,600 | 1,700 | 2,100 | 1,500 | 1,900 |
| **Industrial** | | | | | | | | |
| **Light duty factory** | 800 | 1,200 | 900 | 1,200 | 900 | 1,000 | 800 | 1,100 |
| **Heavy duty factory** | 1,200 | 2,000 | 1,200 | 1,700 | 1,300 | 1,900 | 1,000 | 1,300 |
| **Light industrial unit** | 600 | 900 | 800 | 1,000 | 700 | 900 | 700 | 1,000 |
| **Data centers** | | | | | | | | |
| **<10Mw Tier 3 (*based on $/KW(IT)** | 9,500 | 13,000 | 11,000 | 15,000 | 10,600 | 14,400 | 9,500 | 13,000 |
| **>10Mw Tier 3 (*based on $/KW(IT)** | 7,500 | 10,500 | 9,700 | 12,500 | 8,300 | 11,600 | 7,500 | 12,500 |
| **Hotel** | | | | | | | | |
| **Budget** | 1,900 | 2,100 | 1,700 | 1,900 | 1,900 | 2,200 | 1,600 | 1,900 |
| **Mid-market** | 2,200 | 2,900 | 2,100 | 2,700 | 2,400 | 3,200 | 1,700 | 2,400 |
| **Up-market** | 3,100 | 4,100 | 2,800 | 4,700 | 3,300 | 4,300 | 2,200 | 2,800 |
| **Resort** | 3,700 | 4,700 | 3,700 | 6,000 | 3,900 | 4,600 | 2,600 | 3,500 |
| **Car parks** | | | | | | | | |
| **Multi-storey** | 600 | 900 | 700 | 1,000 | 700 | 900 | 500 | 700 |
| **Basement** | 900 | 1,200 | 800 | 1,200 | 1,000 | 1,300 | 700 | 1,000 |
| **Other** | | | | | | | | |
| **Schools** - Primary, Secondary, Academy | 1,500 | 2,300 | 1,300 | 1,700 | 1,600 | 2,200 | 1,500 | 1,900 |
| **Healthcare - District hospital** | 2,400 | 4,100 | 2,200 | 3,000 | 2,600 | 4,100 | 2,600 | 3,200 |
| Exchange rate to 1 USD | AED | 3.67 | SAR | 3.75 | QAR | 3.64 | BHD | 0.37 |

**Note:**
1. All costs are based on Q3 2023.
2. Relative costs of construction are based on typical build costs in USD. Influence of exchange fluctuations, unique site conditions, design attributes and applicable tariffs must be considered when comparing actual projects.
3. Relative costs are based on an average across all sectors.
4. For typology definitions, inclusions and exclusions see page 85.
5. No investment or other business decision should incorporate the rates in the above table without first contacting AECOM for further information/clarification.
6. KSA (Riyadh) building costs are not representative of current or future assets associated with 'giga projects' under development.
7. Villas topology represent typical master plan community developments.
8. KSA Resort topology refers to coastal projects.

Source: AECOM

# Asset type: basis, inclusions and exclusions

| Asset class | Cost inclusions | Cost exclusions |
|---|---|---|
| Residential | – Fit out works<br>– MEP services installations<br>– Lift services installations | |
| Commercial offices | – Internal finishes — lobby and core areas only<br>– Fit out works — lobby and core areas only<br>– MEP services installations — lobby and core areas only<br>– Lift services installations | – Internal finishes to offices<br>– MEP services installations to offices<br>– Active IT and phone equipment |
| Fit out (commercial offices) | – Works to fit out area only<br>– Fit out works — architectural<br>– Fit out works — MEP services<br>– Specialist installations (AV, IT, security)<br>– FF&E | – Active IT and phone equipment |
| Retail | – Front of house fit out<br>– Kitchen and laundry equipment<br>– Active IT equipment | – Tenant fit out<br>– Strip retail developments |
| Industrial (light duty factory) | – Warehouse/distribution type factory<br>– Internal services<br>– FF&E | – Storage/racking systems<br>– IT and CCTV active equipment<br>– OS&E<br>– Production, process and laboratory equipment<br>– Waste water treatment plant, compressed air plant<br>– Process water and drainage systems<br>– N+1/2 redundancy<br>– Humidity/environmental control/conditioning other than standard air conditioning<br>– Ultra flat slabs |
| Data centers | | – Active equipment<br>– FF&E<br>– Utilities outside the building outline<br>– Modular construction (based on one complete data center) |
| Hotel | – Fit out<br>– Kitchen and laundry equipment<br>– Active IT equipment | – Pre-operating expenses<br>– Client soft costs<br>– OSE |
| Healthcare, education | – Fixed fit out works only | – All loose fit out and ICT<br>– All medical equipment |

**Note:** All costs are based on Q3 2023.

| General notes | General cost inclusions | General cost exclusions |
|---|---|---|
| – The building costs for the respective asset types are averages based on competitive tenders analysed by AECOM. It must be understood that the actual cost of a building will depend on the design and many other factors and may vary from the figures shown.<br>– Due to the volatile nature of the current market, it is possible that tenders will be received outside these ranges. Professional advice should be sought for specific projects.<br>– The standard for each building varies from region to region.<br>– General and specific cost inclusions and exclusions are listed below.<br>– Relative costs of construction are based on typical build costs in USD. Influence of foreign exchange fluctuations, unique site conditions, design attributes and applicable tariffs must be considered when comparing actual projects. | – Construction works.<br>– Main contractor preliminaries and OH&P. | – External works and landscaping.<br>– Site infrastructure.<br>– Enabling works.<br>– Swimming pools.<br>– Basements, podiums and carparks.<br>– Contingencies.<br>– Undefined provisional sums.<br>– Utility connection charges.<br>– Statutory fees and charges.<br>– Professional fees.<br>– Client direct costs.<br>– Land acquisition.<br>– Finance charges.<br>– LEED silver or above.<br>– Staff accommodation.<br>– Pre-opening expenses.<br>– Mock-ups.<br>– VAT. |

Source: AECOM

# Average MEP cost by asset type

| MEP Cost (USD / sqm) | UAE (Dubai) | | KSA (Riyadh) | | Qatar (Doha) | | Bahrain (Manama) | |
|---|---|---|---|---|---|---|---|---|
| **Typology** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** |
| **Residential** | | | | | | | | |
| **Low-rise** | 270 | 390 | 210 | 330 | 260 | 390 | 190 | 330 |
| **Medium-rise** | 290 | 460 | 290 | 430 | 290 | 450 | 260 | 430 |
| **High-rise** | 480 | 810 | 460 | 760 | 450 | 670 | 370 | 570 |
| **Villas** | 340 | 610 | 280 | 660 | 360 | 800 | 190 | 450 |
| **Commercial** | | | | | | | | |
| **Low-rise office (shell and core)** | 340 | 480 | 280 | 420 | 370 | 480 | 300 | 460 |
| **Mid-rise office (shell and core)** | 430 | 730 | 370 | 560 | 450 | 630 | 390 | 560 |
| **High-rise office (shell and core)** | 500 | 880 | 500 | 1,050 | 530 | 880 | 470 | 770 |
| **Fit-out - basic** | 310 | 550 | 270 | 440 | 370 | 570 | 220 | 320 |
| **Fit-out - medium** | 510 | 720 | 450 | 750 | 540 | 740 | 320 | 440 |
| **Fit-out - high** | 710 | 990 | 720 | 980 | 780 | 1,020 | 440 | 600 |
| **Retail** | | | | | | | | |
| **Community** | 390 | 630 | 360 | 600 | 420 | 630 | 300 | 490 |
| **Regional mall** | 420 | 640 | 400 | 700 | 420 | 660 | 370 | 600 |
| **Super regional mall** | 450 | 740 | 470 | 920 | 470 | 730 | 420 | 670 |
| **Industrial** | | | | | | | | |
| **Light duty factory** | 260 | 430 | 290 | 420 | 280 | 350 | 260 | 390 |
| **Heavy duty factory** | 430 | 800 | 430 | 680 | 460 | 760 | 350 | 520 |
| **Light industrial unit** | 180 | 270 | 240 | 310 | 210 | 270 | 220 | 310 |
| **Data centers** | | | | | | | | |
| **<10Mw Tier 3 (*based on $/KW(IT)** | 5,700 | 7,800 | 6,600 | 9,000 | 6,360 | 8,640 | 5,700 | 7,800 |
| **>10Mw Tier 3 (*based on $/KW(IT)** | 4,500 | 6,300 | 5,820 | 7,500 | 4,980 | 6,960 | 4,500 | 7,500 |
| **Hotel** | | | | | | | | |
| **Budget** | 540 | 630 | 480 | 580 | 530 | 660 | 440 | 570 |
| **Mid-market** | 660 | 910 | 640 | 840 | 720 | 1,000 | 520 | 750 |
| **Up market** | 930 | 1,320 | 850 | 1,500 | 990 | 1,380 | 660 | 900 |
| **Resort** | 1,110 | 1,550 | 1,120 | 1,990 | 1,170 | 1,510 | 780 | 1,160 |
| **Car parks** | | | | | | | | |
| **Multi-storey** | 130 | 220 | 150 | 250 | 160 | 210 | 110 | 170 |
| **Basement** | 240 | 330 | 220 | 330 | 270 | 350 | 190 | 280 |
| **Other** | | | | | | | | |
| **Schools** - Primary, Secondary, Academy | 480 | 740 | 420 | 540 | 510 | 700 | 480 | 610 |
| **Healthcare - District hospital** | 980 | 1,720 | 900 | 1,270 | 1,070 | 1,720 | 1,070 | 1,340 |
| **Exchange rate to 1 USD** | **AED** | **3.67** | **SAR** | **3.75** | **QAR** | **3.64** | **BHD** | **0.37** |

**Note:** All costs are based on Q3 2023.

Source: AECOM

# Typical building services standards for offices

| Subject | BCO (UK) specification 2014 | Bahrain specification | UAE specification | Qatar specification | Oman specification |
|---|---|---|---|---|---|
| **Net : Gross ratio - typical** | 80 - 85% | 70 - 80% | 75 - 80% | 70 - 80% | 70 - 80% |
| **Occupancy standards — typical** | 1:8 - 1:13/m² | 1:10 - 1:14/m² | 1:10 - 1:15/m² | 1:10 - 1:14/m² | 1:10 - 1:15/m² |
| **Occupancy standards — toilets** | Single sex one person to 10m² using 60/60 male/female ratio based on 120% ratio. | Single sex one person to 12m² using 50/50 male/female ratio based on 100% population. | Single sex one person to 12m² using 50/50 male/female ratio based on 100% population. | Single sex one person to 12m² using 50/50 male/female ratio based on 100% population. | Single sex one person to 12m² using 50/50 male/female ratio based on 100% population. |
| **Heating and air conditioning internal criteria** | 24°C, +/- 2°C (Summer) 20°C, +/- 2°C (Winter) | 24°C, +/- 2°C | 24°C, +/- 2°C | 24°C, +/- 2°C | 24°C, +/- 2°C |
| **Fresh air supplies** | 12 - 15 L/s per person | 8.5 - 10 L/s per person | 8.5 - 10 L/s per person | 8.5 - 10 L/s per person | 8.5 - 10 L/s per person |
| **Ventilation - WCs** (extract) | none stated | 10 Air changes per hour | 10 Air changes per hour | 10 Air changes per hour | 10 Air changes per hour |
| **Lighting load allowance** | 10 W/m² | 10 W/m² | 10 W/m² | 10 W/m² | 10 W/m² |
| **Small power load allowance** (based upon one workspace every 10m2) | 20-25 W/m² | 12 - 25 W/m² | 12 - 25 W/m² | 12 - 25 W/m² | 12 - 25 W/m² |
| **Acoustics - open plan** | NR 40 | NR 40 | NR 40 | NR 40 | NR 40 |
| **Acoustics - cellular offices** | NR 35 | NR 35 | NR 35 | NR 35 | NR 35 |
| **Lighting - VDU use** | 300 - 500 lux | 400 - 500 lux | 400 - 500 lux | 400 - 500 lux | 400 - 500 lux |
| **Passenger lifts - capacity** | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| **Passenger lifts - waiting time** (up-peak) | < 25 seconds | < 30 seconds | < 30 seconds | < 30 seconds | < 30 seconds |

Source: AECOM

# Asset type: basic specification

| Asset type | Residential | | |
|---|---|---|---|
| **Typology** | Low-rise | Mid-rise | High-rise |
| **Specification** | Basic, medium and high | Basic, medium and high | Basic, medium and high |
| **Key design characteristics** | | | |
| Building height | G+1 to G+3 | G+4/5 to G+20 | G+20 and above |
| GIA | 80,000 - 140,000 | 50,000 - 80,000 | 90.000 - 120,000 |
| BUA | 85,000 - 155,000 | 55,000 - 90,000 | 105,000 - 135,000 |
| Efficiency (%) | 85 - 100% | 80 - 85% | 70 - 80% |
| Units per core | 1 - 2 | 10 - 20 | 4 - 6 |
| Wall: floor ratio | 0.50 - 0.80 | 0.45 - 0.65 | 0.45 - 0.55 |
| Net to gross | 80 - 100% | 75 - 85% | 65 - 75% |
| GIA per unit | 200 - 450m² | 90 - 200m² | 145 - 165m² |

| Asset type | Offices | | |
|---|---|---|---|
| **Typology** | Low-rise (shell and core) | Mid-rise (shell and core) | High-rise (shell and core) |
| **Specification** | Basic, medium and high | Basic, medium and high | Basic, medium and high |
| **Key design characteristics** | | | |
| Building height | G+1 to G+5 | G+5 to G+20 | G+20 and above |
| GIA | 10,000 - 25,000 | 25,000 - 75,000 | 100,000 - 250,000 |
| BUA | 13,000 - 30,000 | 30,000 - 100,000 | 130,000 - 280,000 |
| Efficiency (%) | 70 - 85% | 70 - 85% | 70 - 85% |
| Wall: floor ratio | 0.40 - 0.70 | 0.40 - 0.60 | 0.40 - 0.50 |
| Net to gross | 50 - 60% | 50 - 60% | 50 - 70% |
| Slab to slab height | 4.0 - 5.0m | 4.0 - 4.5m | 4.0 - 4.5m |
| Grid spans | 7 - 12m | 9 - 12m | 9 - 12m |

| Asset type | Retail | | |
|---|---|---|---|
| **Typology** | Community | Regional | Super regional |
| **Key design characteristics** | | | |
| Finishes | Mid range | High | High |
| GFA (m²) | Not exceeding 30,000 | 30,000 - 100,000 | > 100,000 |

Source: AECOM

| Asset type | Industrial | | | |
|---|---|---|---|---|
| **Typology** | Light duty factory | Heavy duty factory | Light industrial unit | Data center — Tier 3 |
| **Specification** | Basic | Basic | Basic | Basic |
| **Key design characteristics** | | | | |
| Building height (m) | 8 | 10 | 6 | 6 |
| GIA | 10,000 | 20,000 | 6,000 | 4,000 |
| Wall : floor ratio | 0.33 | 0.30 | 0.38 | 0.35 |

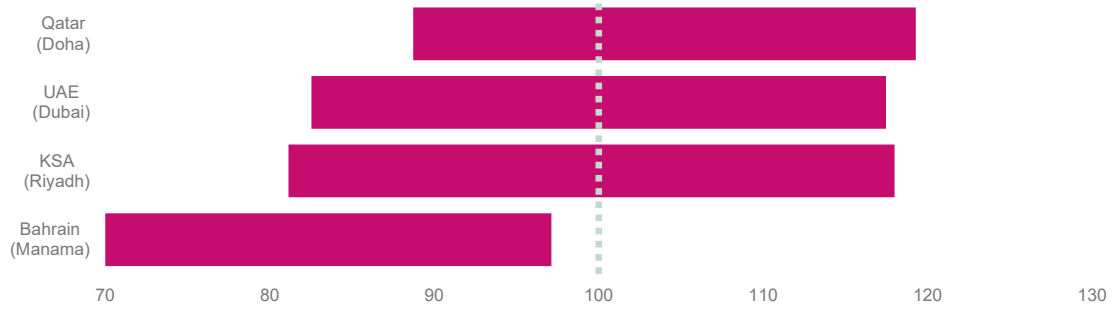
| Asset type | Hotel | | | |
|---|---|---|---|---|
| **Typology** | Budget | Mid-market | Up-market | Resort |
| **Specification** | Basic | Mid range | Luxury | High end |
| **Key design characteristics** | | | | |
| Building height | G+10 | G+10 | G+15 | G+6 |
| GIA | 16,000 - 18,000 | 13,500 - 15,500 | 56,000 - 60,000 | 39,000 - 41,000 |
| Wall: floor ratio | 70% | 75% | 75% | 55% |
| Functional units | 350 | 200 | 350 | 200 |

| Asset type | School | Healthcare |
|---|---|---|
| **Typology** | Primary/secondary academy | District hospital |
| **Specification** | Mid-range | Mid-range |
| **Key design characteristics** | | |
| Building height (m) | 10 | 24 |
| GIA (m²) | 21,000 - 22,000 | 50,000 |
| No. of lift core | 1 | 4 |
| No. of stair core | 9 | 6 |

# Middle East relative cost of construction

The relative cost of construction is based on typical building costs in US Dollars. The influence of foreign exchange fluctuations, unique site conditions, design attributes and applicable tariffs must be considered when comparing actual projects. Relative costs are based on an average across all sectors.

**Middle East relative cost of construction**




**Note:** Relative cost of construction are based on typical build costs in USD. High and low cost factors for each building type have been calculated relative to the UAE (Dubai), where average costs equal 100. The relative cost bars plotted in the chart represent the average high and low cost factor for each country, based on the costs of the buildings included in the sample (excluding commercial fit-outs).

Source: AECOM

**ICD Brookfield Place, Dubai, UAE**
Image courtesy ICD Brookfield Place

# Major measured unit rates

| Item (Unit rates in USD) | Unit | Description | UAE (Dubai) | KSA (Riyadh) | Qatar (Doha) | Bahrain (Manama) |
|---|---|---|---|---|---|---|
| Excavation | $m^3$ | "Standard/minimum specification excavation for trench foundation; depth not excessive, i.e. no greater than 1-2 m" | 7 | 9 | 7 | 11 |
| Disposal of excavated material | $m^3$ | "Standard/minimum specification disposal away from site" | 7 | 6 | 5 | 6 |
| Filling | $m^3$ | Imported fill | 14 | 20 | 17 | 20 |
| Poured concrete, reinforced | $m^3$ | "Standard/minimum specification grade 20 or 30; superstructure, walls or slabs; reinforced " | 131 | 167 | 149 | 167 |
| Reinforcement | tn | "Standard/minimum specification 20mm bars" | 1,360 | 1,680 | 1,620 | 1,030 |
| Formwork/shuttering | $m^2$ | "Standard/minimum specification superstructure standard; fair face finish to walls" | 49 | 52 | 48 | 20 |
| Blockwork | $m^2$ | "Standard/minimum specification 200mm solid blockwork, usually internal walls" | 38 | 49 | 40 | 39 |
| Doors | no. | "Standard/minimum specification single leaf door, fire rated, timber, basic finish, usually 900mm wide, generally excluding ironmongery" | 1360 | 1,210 | 1,470 | 1,200 |
| Tiling to floors | $m^2$ | "Standard/minimum specification 300 x 300mm ceramic tiles" | 41 | 61 | 51 | 40 |
| Plaster to internal walls and ceilings | $m^2$ | 12.5mm thickness | 16 | 17 | 16 | 11 |
| Painting to internal walls and ceilings | $m^2$ | "Standard/minimum specification Emulsion" | 8 | 14 | 8 | 7 |
| **Exchange rate to 1 USD** | | | AED 3.67 | SAR 3.75 | QAR 3.64 | BHD 0.37 |

**Note:** All costs are based on Q3 2023.

Source: AECOM

# Major material prices

| Item (Unit rates in USD) | Description | Unit | UAE (Dubai) | KSA (Riyadh) | Qatar (Doha) | Bahrain (Manama) |
|---|---|---|---|---|---|---|
| | | | USD | USD | USD | USD |
| Cement | Ordinary Portland cement | Tonne | 81 | 105 | 99 | 89 |
| Sand | Sand for concreting | m³ | 11 | 15 | 18 | 24 |
| Aggregate | 19mm aggregate | m³ | 17 | 18 | 36 | 59 |
| Ready-mixed concrete | Grade 50 (OPC) | m³ | 76 | 91 | 93 | 106 |
| | Grade 40 (OPC) | m³ | 64 | 81 | 82 | 100 |
| | Grade 20 (OPC) | m³ | 65 | 68 | 77 | 94 |
| Reinforcing steel | High tensile | tn | 870 | 1,100 | 850 | 720 |
| | Mild steel | tn | 840 | 1,060 | 910 | 690 |
| Hollow concrete blockwork | 100mm thick | m² | 11 | 10 | 10 | 10 |
| | 200mm thick | m² | 14 | 12 | 17 | 12 |
| Structural steelwork | Mild steel grade 50 to BS 4360 | tn | 1,290 | 1,930 | 2,430 | 940 |
| Timber | Hardwood | m³ | 890 | 1,000 | 960 | 980 |
| | Softwood | m³ | 340 | 510 | 370 | 350 |
| Fuel | Diesel | Litre | 1.02 | 0.20 | 0.56 | 0.48 |
| | Petrol Premium 95 | Litre | 0.87 | 0.62 | 0.58 | 0.56 |
| **Exchange rate to 1 USD** | | | AED 3.67 | SAR 3.75 | QAR 3.64 | BHD 0.37 |

**Note:** All costs are based on Q3 2023.
Cost rates are indicative and represent supply only costs of the materials listed.
Location factors should be applied to address geographic variations in each country.
The rates are exclusive of VAT (Value Added Tax) or similar, where applicable.

Source: AECOM

# Labour costs

| Description | Unit | UAE (Dubai) USD | KSA (Riyadh) USD | Qatar (Doha) USD | Bahrain (Manama) USD |
|---|---|---|---|---|---|
| **Skilled operatives** | | | | | |
| Concreter | Hour | 6.0 | 9.3 | 6.3 | 6.9 |
| Steel Fixer | Hour | 6.0 | 9.8 | 6.3 | 6.4 |
| Bricklayer | Hour | 6.5 | 10.4 | 8.0 | 6.9 |
| Carpenter | Hour | 6.5 | 10.4 | 8.0 | 6.4 |
| Mechanical Installer | Hour | 8.4 | 11.2 | 7.1 | 7.6 |
| Electrician | Hour | 9.0 | 12.3 | 9.3 | 6.9 |
| Laborer (skilled) | Hour | 5.7 | 8.0 | 6.3 | 4.7 |
| **Supervision** | | | | | |
| Foreman | Hour | 11.2 | 13.6 | 13.2 | 9.8 |
| MEP Foreman | Hour | 12.5 | 16.3 | 13.2 | 9.8 |
| Site Engineer | Month | 7,010 | 7,490 | 5,750 | 5,790 |
| Construction Manager | Month | 11,220 | 13,020 | 12,950 | 12,270 |
| **Exchange rate to 1 USD** | | AED 3.67 | SAR 3.75 | QAR 3.64 | BHD 0.37 |

Note: All costs are based on Q3 2023.
These rates (US$) are indicative and represent an all-in unit cost for each of the disciplines listed; and are
- inclusive of: wages, salaries and other remunerations prescribed by local labour legislation; average allowances for costs of employment; recruitment; visas/permits; paid leave; travel; accommodation; health and welfare
- exclusive of: overtime working; contractor mark-up for overheads and profit; VAT (Value Added Tax) or similar where applicable.
These rates should not be misinterpreted as contractors' day work rates.

Source: AECOM

# MENA exchange rate comparison

| | Euro zone | UK | India | China | Japan | UAE | KSA | Qatar | Oman | Bahrain | Kuwait | Egypt | Lebanon | Jordan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 USD = | EUR | GBP | INR | RMB | JPY | AED | SAR | QAR | OMR | BHD | KWD | EGP | LBP | JOD |
| H1 2012 | 0.77 | 0.63 | 52.1 | 6.3 | 79.7 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.278 | 6.0 | 1,490 | 0.707 |
| H2 2012 | 0.79 | 0.63 | 54.6 | 6.3 | 79.8 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.281 | 6.1 | 1,483 | 0.707 |
| H1 2013 | 0.76 | 0.65 | 55.0 | 6.2 | 95.5 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.284 | 6.9 | 1,486 | 0.707 |
| H2 2013 | 0.75 | 0.63 | 62.0 | 6.1 | 99.6 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.283 | 6.9 | 1,489 | 0.707 |
| H1 2014 | 0.73 | 0.60 | 60.8 | 6.2 | 102.4 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.282 | 7.0 | 1,489 | 0.707 |
| H2 2014 | 0.78 | 0.62 | 61.2 | 6.2 | 109.2 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.287 | 7.2 | 1,492 | 0.707 |
| H1 2015 | 0.90 | 0.66 | 62.8 | 6.2 | 120.3 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.299 | 7.5 | 1,491 | 0.707 |
| H2 2015 | 0.91 | 0.65 | 65.4 | 6.3 | 121.8 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.302 | 7.8 | 1,488 | 0.707 |
| H1 2016 | 0.90 | 0.70 | 67.2 | 6.5 | 112.8 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.302 | 8.4 | 1,508 | 0.709 |
| H2 2016 | 0.91 | 0.78 | 67.2 | 6.7 | 105.9 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.303 | 11.6 | 1,508 | 0.709 |
| H1 2017 | 0.92 | 0.79 | 65.7 | 6.9 | 112.4 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.305 | 18.0 | 1,508 | 0.709 |
| H2 2017 | 0.85 | 0.76 | 64.5 | 6.6 | 111.9 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.302 | 17.8 | 1,508 | 0.709 |
| H1 2018 | 0.83 | 0.73 | 65.7 | 6.4 | 108.7 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.301 | 17.7 | 1,508 | 0.709 |
| H2 2018 | 0.87 | 0.77 | 70.7 | 6.8 | 111.9 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.303 | 17.9 | 1,508 | 0.709 |
| H1 2019 | 0.88 | 0.77 | 70.1 | 6.8 | 110.4 | 3.67 | 3.75 | 3.64 | 0.38 | 0.376 | 0.304 | 17.4 | 1,508 | 0.709 |
| H2 2020 | 0.89 | 0.75 | 73.2 | 6.5 | 103.0 | 3.67 | 3.75 | 3.64 | 0.38 | 0.38 | 0.300 | 15.7 | 1,508 | 0.710 |
| H1 2021 | 0.86 | 0.74 | 74.3 | 6.5 | 112.0 | 3.67 | 3.75 | 3.64 | 0.38 | 0.38 | 0.300 | 15.7 | 1,508 | 0.710 |
| H2 2021 | 0.90 | 0.76 | 75.8 | 6.4 | 121.8 | 3.67 | 3.75 | 3.64 | 0.38 | 0.38 | 0.305 | 18.3 | 1,508 | 0.709 |
| H1 2022 | 1.03 | 0.91 | 81.5 | 7.1 | 144.7 | 3.67 | 3.75 | 3.64 | 0.38 | 0.38 | 0.311 | 19.6 | 1,508 | 0.709 |
| H2 2022 | 0.94 | 0.83 | 82.7 | 6.9 | 131.9 | 3.67 | 3.75 | 3.64 | 0.38 | 0.38 | 0.307 | 24.8 | 1.508 | 0.709 |
| H1 2023 | 0.92 | 0.79 | 82.10 | 7.3 | 144.6 | 3.67 | 3.75 | 3.64 | 0.38 | 0.38 | 0.309 | 31.0 | 15,000 | 0.709 |

Source: Bank of England, www.fxtop.com

# Weights and measures

## Metric measures and equivalents

### Length

| | | | | |
|---|---|---|---|---|
| 1 millimeter (mm) | = | 1 mm | = | 0.0394 in |
| 1 centimeter (cm) | = | 10 mm | = | 0.3937 in |
| 1 meter (m) | = | 100 cm | = | 1.0936 yd |
| 1 kilometer (km) | = | 1000 m | = | 0.6214 mile |

### Area

| | | | | |
|---|---|---|---|---|
| 1 square centimeter ($cm^2$) | = | 100 $mm^2$ | = | 0.1550 $in^2$ |
| 1 square meter ($m^2$) | = | 10 000 $cm^2$ | = | 1.1960 $yd^2$ |
| 1 hectare (ha) | = | 10 000 $m^2$ | = | 2.4711 acres |
| 1 square kilometer ($km^2$) | = | 100 ha | = | 0.3861 $mile^2$ |

### Capacity/volume

| | | | | |
|---|---|---|---|---|
| 1 cubic centimeter ($cm^3$) | = | 1 $cm^3$ | = | 0.0610 $in^3$ |
| 1 cubic decimeter ($dm^3$) | = | 1000 $cm^3$ | = | 0.0353 $ft^3$ |
| 1 cubic metre ($m^3$) | = | 1000 $dm^3$ | = | 1.3080 $yd^3$ |
| 1 liter (l) | = | 1 $dm^3$ | = | 1.76 pt |
| 1 hectolitre (hl) | = | 100 litre | = | 21.997 gal |

### Mass (weight)

| | | | | |
|---|---|---|---|---|
| 1 milligram (mg) | | | = | 0.0154 grain |
| 1 gram (g) | = | 1000 mg | = | 0.0353 oz |
| 1 kilogram (kg) | = | 1000 g | = | 2.2046 lb |
| 1 tonne (t) | = | 1000 kg | = | 0.9842 ton |

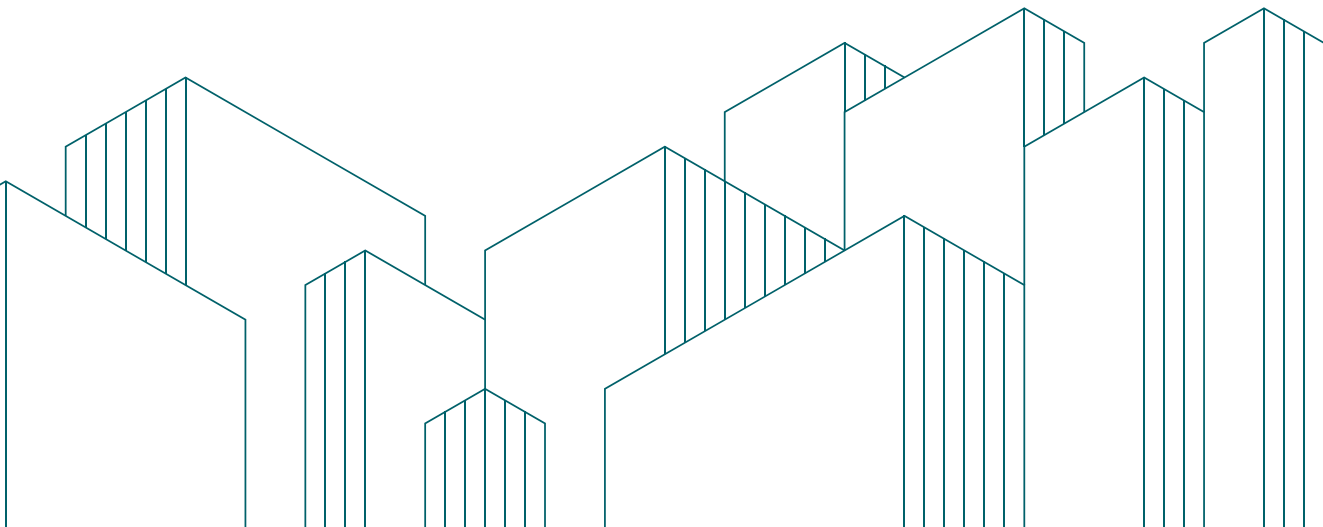
## USA measures and equivalents

### U.S. dry measure equivalents

| | | | | |
|---|---|---|---|---|
| 1 pint | = | 0.9689 UK pint | = | 0.5506 liter |

### U.S. liquid measure equivalents

| | | | | |
|---|---|---|---|---|
| 1 fluid ounce | = | 1.0408 UK fl oz | = | 29.574 ml |
| 1 pint (16 fl oz) | = | 0.8327 UK pt | = | 0.4723 liter |
| 1 gallon | = | 0.8327 UK gal | = | 3.7854 liter |



# Imperial measures and equivalents

### Length

| | | | | |
|---|---|---|---|---|
| 1 inch (in) | | | = | 2.54 cm |
| 1 foot (ft) | = | 12 in | = | 0.3048 m |
| 1 yard (yd) | = | 3 ft | = | 0.9144 m |
| 1 mile | = | 1760 yd | = | 1.6093 km |
| 1 int. nautical mile | = | 2025.4 yd | = | 1.853 km |

### Area

| | | | | |
|---|---|---|---|---|
| 1 square inch (in2) | | | = | 6.4516 $cm^2$ |
| 1 square foot (ft2) | = | 144 $in^2$ | = | 0.0929 $m^2$ |
| 1 square yard (yd2) | = | 9 $ft^2$ | = | 0.8361 $m^2$ |
| 1 acre | = | 4840 $yd^2$ | = | 4046.9 $m^2$ |
| 1 sq mile (mile2) | = | 640 acres | = | 2.59 $km^2$ |

### Capacity/volume

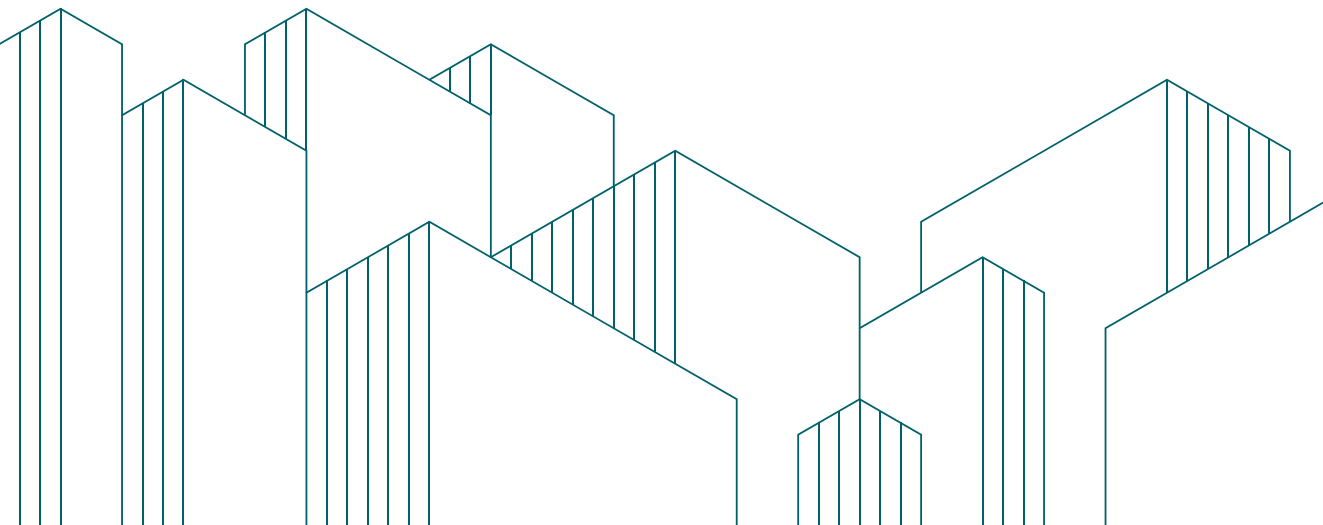
| | | | | |
|---|---|---|---|---|
| 1 cubic centimeter ($cm^3$) | = | 1 $cm^3$ | = | 0.0610 $in^3$ |
| 1 cubic decimeter ($dm^3$) | = | 1000 $cm^3$ | = | 0.0353 $ft^3$ |
| 1 cubic meter ($m^3$) | = | 1000 $dm^3$ | = | 1.3080 $yd^3$ |
| 1 litre (l) | = | 1 $dm^3$ | = | 1.76 pt |
| 1 hectolitre (hl) | = | 100 litre | = | 21.997 gal |

### Mass (weight)

| | | | | |
|---|---|---|---|---|
| 1 ounce (oz) | = | 437.5 grains | = | 28.35 g |
| 1 pound (lb) | = | 16 oz | = | 0.4536 kg |
| 1 stone | = | 14 lb | = | 6.3503 kg |
| 1 hundredweight (cwt) | = | 112 lb | = | 50.802 kg |
| 1 ton | = | 20 cwt | = | 1.016 tonne |

### Temperature conversion

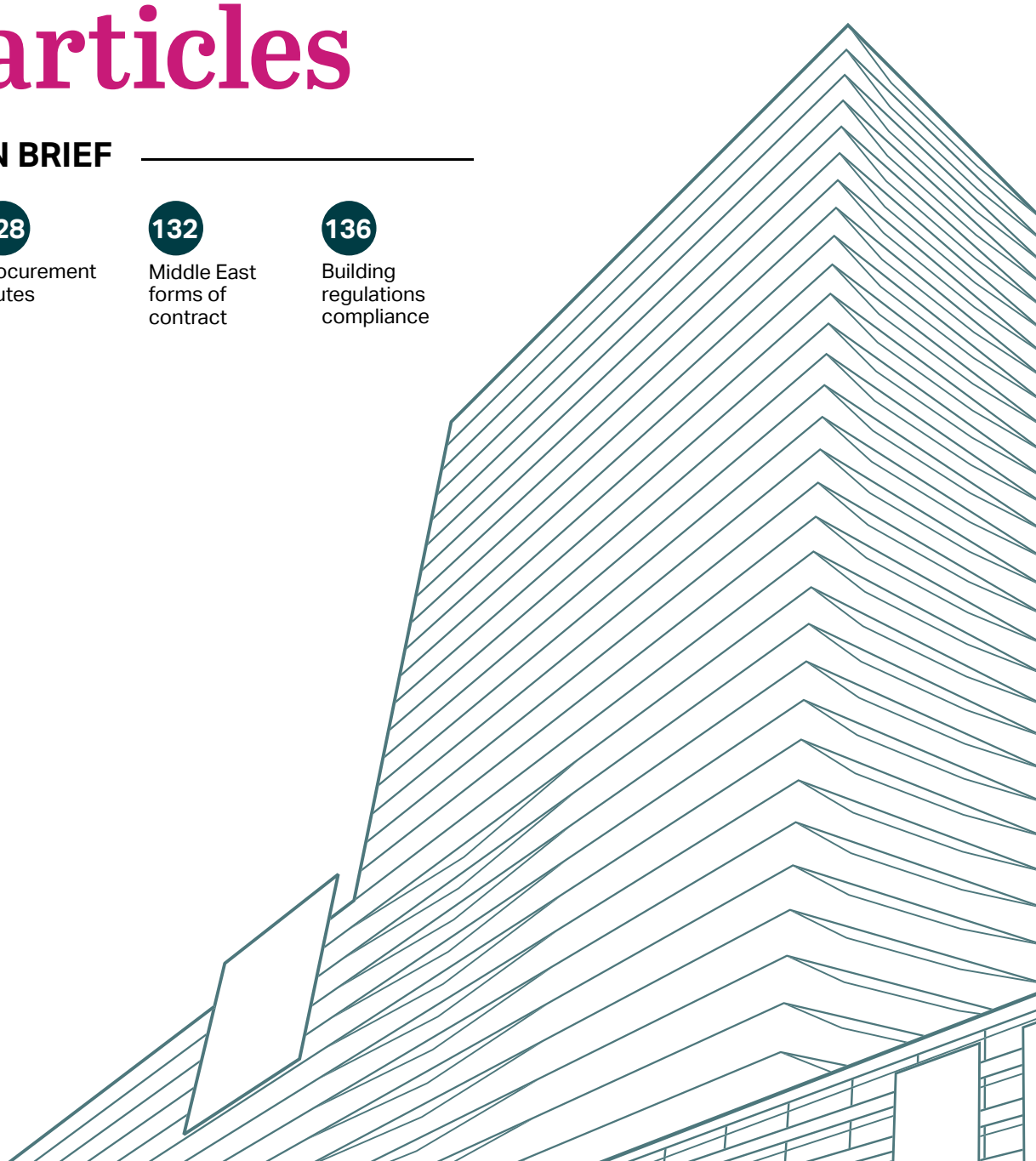
C = 5/9 (F – 32) F = (9/5 C) + 32

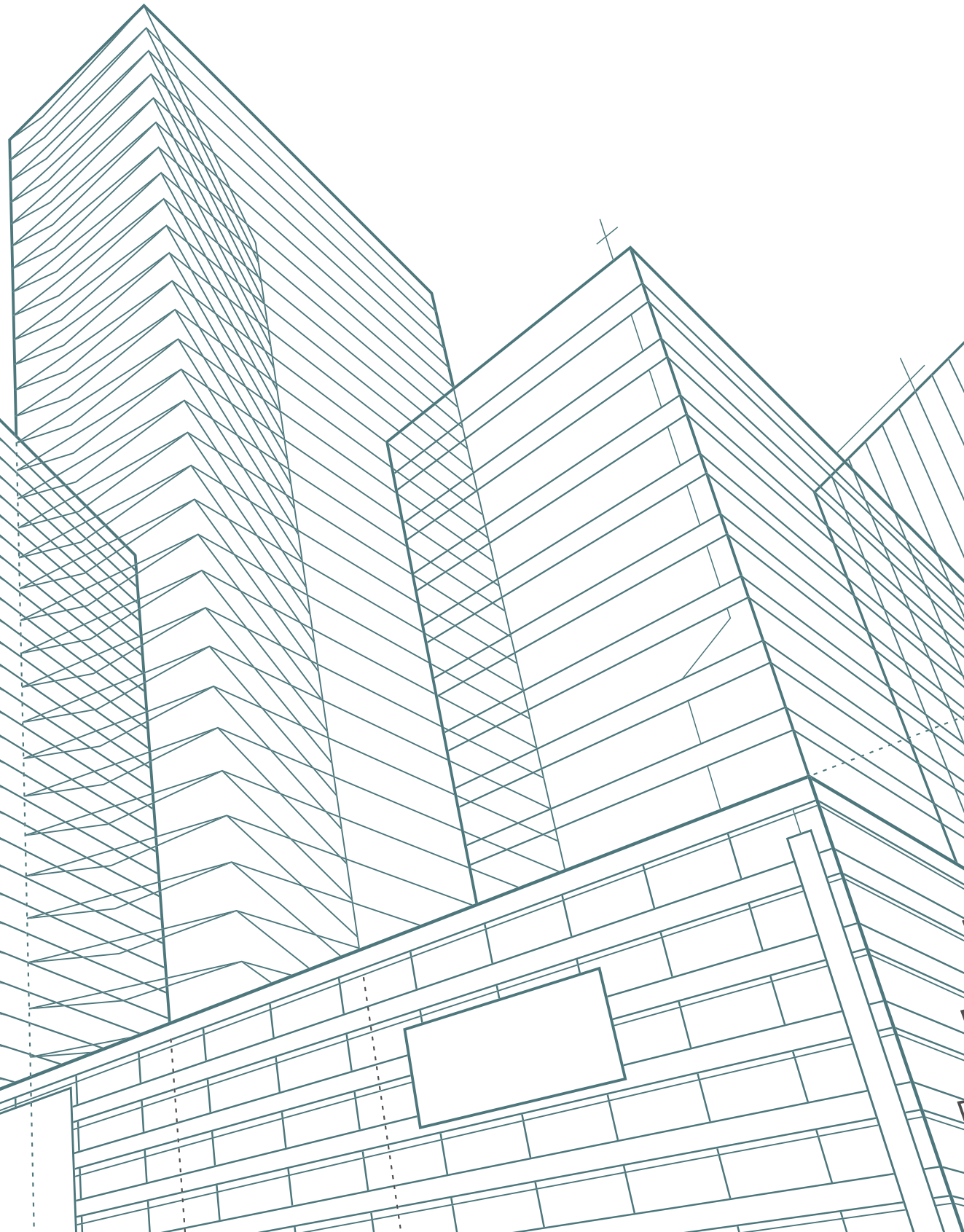


# 05 Reference articles

## IN BRIEF







# Procurement routes

## All clients expect projects to be delivered on time and within budget, with an agreed level of quality and with risk professionally managed by their management and consultant teams.

However, the majority of clients and construction professionals have experience of at least one project that was not delivered to the budget, time or quality levels expected. This is why the right procurement strategy, one that is considered robust, efficient, value-based and balances risk and control against the competing project objectives of cost, time and quality, is key to a successful project outcome.

AECOM has developed strategies for the delivery of projects that we know work, successfully delivering hundreds of projects over our long history. New and existing developers have the opportunity to learn from this knowledge and maximize the value from their time, cost and quality mix, whilst adhering to a process that increases the likelihood of their projects being successfully procured by the team involved.

So what is the right procurement approach for your projects?

Which funding strategy, funding partner, team behaviours, attitudes, communication channels, budget and program delivers the best approach, and how can we best combine these to lead our clients to ultimate success?

# AECOM's management of the procurement process

A considered, robust, efficient and value-based procurement strategy and process is critical to ensuring the procurement of an appropriate contractor (or contractors), consultants, equipment and materials to achieve the successful outcome of the project.

Procurement strategies developed aim to achieve an optimum balance of risk, control and cost certainty for the project. They also identify the selected procurement route, being the method adopted to deliver the procurement strategy.

AECOM offers important early advice to help determine the right procurement approach, adding value throughout the process. This understanding of our clients' time, cost and quality requirements maximizes the value we can offer.

The early identification and consideration of the client and project's key objectives and drivers is essential in ensuring its' successful procurement and delivery in line with the client's.

A clear understanding of project objectives, key drivers and critical success factors ensures:

- Understanding of timings and decision points for project procurement.
- Understanding of budget constraints and considerations.
- Consideration of procurement routes and requirement for packaging or phasing of works.
- Technical considerations.
- Consideration of the client's corporate governance and preferred procurement options.
- Identification, understanding and consideration of then project's risks and opportunities.

Some of the procurement strategies followed in the industry are listed on the next page, however, the real challenge is considering and selecting the right approach when considering an individual client and/or project need.

### Traditional lump sum

The design by the client's appointed consultants is completed before contractor's tender for and then carry out the construction of the works. The contractor commits to a lump sum price and a completion date prior to appointment. The contractor assumes responsibility for the financial and program risks for the carrying out of the building works, whilst the client takes responsibility and accepts the risk for the quality of the design and the design team's performance. The client's consultant(s) administers the construction contract and advises on aspects associated with design, progress and stage payments, which must be paid by the client. A variant on this is a traditional re-measured contract, where the tendered BOQ quantities are re-measured (either periodically or at the end of construction) and the contract price is adjusted accordingly based on the contractual rates for the revised quantities.

### Accelerated traditional

As per traditional lump sum, however procured in the market place before being fully designed (normally 80-85 per cent designed), and leaving more simple elements of the building to be procured once the contractor has been appointed. It is important to understand how a client procures the remaining elements of work with a contractor under this approach, and to design out those areas that carry inherent risk early in the process. It may also involve the procurement of an early works package for enabling and/or piling works.

### Design and build

Employer's requirements and/or design is developed to an initial stage to allow tendering of the project, before detailed design and construction are both undertaken by a single contractor (usually with appointed specialist design consultants) in return for a lump sum price. There are variants on this option depending on the degree to which initial design is included in the client's requirements. Where a concept design is prepared by a design team employed directly by the client before the contractor is appointed (as is normally the case), the strategy is called develop and construct. The contractor commits to a lump sum price, for completion of the design and the construction and to a completion date, prior to their appointment. The contractor can either use the client's concept design to complete the design or use their own scheme to finalize it within the employers requirements set. With design and build it is important to design out or specify in detail those parts of the building the client wants to see perform a particular function or provide a particular visual impact.

### Two stage

A contractor is invited to become part of the project team in stage one, usually by way of a pre-construction fee or commitment to preliminaries and mark-up percentage. They jointly procure the project with the client, until such time that a second stage lump sum offer can be agreed, which should be before construction begins on site. An understanding of the original appointment and the subsequent framework, under which the second stage is agreed, are the important aspects of this approach, as well as working with transparency and trust preventing an early commitment to a full scheme that a client cannot afford.

### Management contract

Design by the client's consultants generally overlaps with the construction. A management contractor is appointed early to tender and let elements of work progressively to subcontractors and specialists work packages. The contracts are between the management contractor and the trade contractors, rather than between the client and sub-contractors. The management contractor will not carry out construction work, rather is employed to manage the process. The management contractor, in theory, assumes responsibility for the financial (and program) risks for the works, but in reality this is normally diluted by the terms of the contract so their liability is similar to that of a construction manager.

### Design, manage and construct

Similar to the management contract, with the contractor also being responsible for the production of the detailed design or for managing the detailed design process.

### Turnkey contract

A form of a design and build contract in which a single contractor or developer is responsible for all services, possibly also including finance. Under a turnkey project, the client enters into a contract with one party to deliver the entire project. The project is handed over once it is complete and fully operational. The client is normally not involved in any of the decisions throughout the building process. There are several variations of 'turnkey' contracts, including Engineer-Procure-Construct (EPC), Build-Own-Lease-Transfer (BOLR), Design-Build-Operate-Transfer (DBOT), or PFI.

### Engineer, Procure and Construct (EPC)

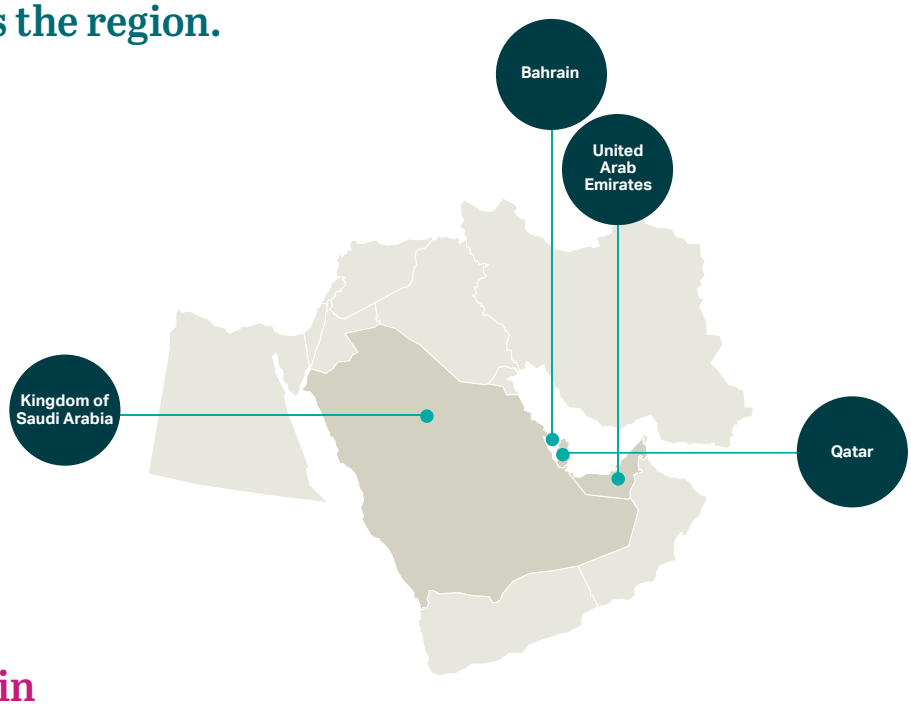
EPC is a form of "turnkey" contract. This form of procurement places risk in the right hands and offers solutions to clients' engineering requirements from those specialized to meet the performance requirements set by a client team. Many of the large utility companies procure work in this way, bringing high levels of certainty from the supply chain which helps to achieve business critical benefits over the long-term.

### Public Private Partnerships (PPP)

A detailed and complicated form of procurement used predominantly for public services when the private sector feels it is advantageous to design, build, finance and operate a particular service or building type. It is becoming more popular in the Middle East as a way to limit public sector spending, whilst meeting the demands of a growing population. AECOM has been involved with PPPs for over 25 years. We have successfully completed many projects worldwide and use this global knowledge to benefit clients locally.

# Middle East forms of contract

## This section considers the different forms of contract used in construction across the region.




## Bahrain

Government work in the Kingdom of Bahrain is undertaken using a bespoke suite of contract forms that were issued in 2009.

Private developers predominantly use the FIDIC Conditions of Contract for Construction, the 1999 edition of the 'red book', which is well understood in the local market, but often heavily amended for specific use.

Most of the work completed in Bahrain is under a traditional lump sum form of contract, where the design is completed upfront and price agreed with a contractor before work begins on site.

Design and build and two-stage procurement are in use across the Kingdom, but are not considered to be the industry norm. As more international private developers have started working in Bahrain, with time constraints as their main driver, the market has adjusted to accommodate this demand. Design and build contracts, however, are not routine. This is largely due to the Council for Regulating the Practice of Engineering Professions (CRPEP) restrictions on contractors undertaking in-house design which necessitates the novation of the client's architect or a subconsultant appointment.

# Kingdom of Saudi Arabia

Construction contracts in the private sector are generally based on FIDIC forms of contract, and are amended to suit the particular conditions for each project.

Employers prefer lump sum versus remeasured contracts, and normally exercise great control in the administration of the construction process by imposing various restrictions on the engineer's (consultant) authorities under the contract. All contracts are subject to Saudi laws where Islamic Sharia law is the prime source of legislation. Litigation and arbitration are both available for resolution of disputes in the private sector.

Within the public sector, however, construction contracts are based on the Standard Conditions for Public Works, which are amended to suit particular projects. These conditions are generally based on those given in the 4th edition of the FIDIC Conditions of Contract for Works of Civil Engineering Construction, the FIDIC 4 'red book', but with greater control given to the employer for the administration of the contract.

All public work contracts are let on a remeasured basis and are subject to the Saudi Government Tendering and Procurement Regulations, as issued by royal decree. It is also noted that several of the large scale developments planned have aggressive schedule targets, and as such there is also a growing appetite for the design and build form of contract with these developments.

Riyadh, KSA

# Qatar

In Qatar, the most common forms for building works are those used by the Public Works Authority (PWA) departments through the Ministry of Municipality (MM) and the Qatar Petroleum Company (QP) forms, or FIDIC based amended bespoke forms.

The contracts are generally on a fixed price lump sum basis, utilizing bills of quantities or specifications and drawings, however, the design and build route is becoming more prevalent in the market. The contracts are often biased towards clients, wherein the contractor buys all the project risks for an increased initial price, however, such contracts are generally administered in a reasonable manner..

A high proportion of private sector projects utilize a bespoke form based on the FIDIC forms of contract, such contracts are generally fixed price lump sum which follows the general theme of most contracts in the state.

The Public Works Authority (Ashghal) utilize an in-house bespoke contract which was updated in 2018 to become more contractor-friendly with a greater share of risk. The updated suite is now tailored to a particular procurement route more suitable to the individual project needs. This approach should reduce the volume of project specific amendments included in tenders.

Major international projects frequently use a more traditional FIDIC forms (typically the 1999 version) with amendments to dispute resolution clauses and removal of DAB provisions.

Before any contract is awarded, there are commonly several rounds of negotiation, during which the price and other contractual terms can be modified to respond to a reduction in contract price.

“Before any contract is awarded, there are commonly several rounds of negotiation, during which the price and other contractual terms can be modified to respond to a reduction in contract price.”

Doha, Qatar

# United Arab Emirates

## Construction contracts in the UAE are predominantly based upon the FIDIC forms of contract.

Large-scale developers and major repeat clients in the region generally now develop and utilize bespoke forms of contract, tailored to each individual client.

Such contracts generally use the FIDIC 4 'red book' form as a basis, amended to a greater or lesser degree depending upon the risk profile of each client. This also applies to works procured by Dubai Municipality. Abu Dhabi Municipality, however, bases contracts on a modified FIDIC 3 form, taken from the 3rd edition of the FIDIC conditions of Contract for Works of Civil Engineering Construction.

Contracts based on the 1999 'red book' are often used in the UAE, but in general, the market remains firmly rooted in the FIDIC 4 form.

Civil works' contracts within the UAE are mostly procured on a re-measurable basis, whereas building works will generally be based on a fixed price lump sum.

However, there are exceptions. More and more clients are procuring projects using a fast-track approach and will therefore incorporate a re-measurable element, reflecting those parts of the design that are incomplete at tender stage.

There is also a significant increase in appetite for the use of design and build forms of contract, as clients intend to transfer a large share of the risk on to the contractors, as well as seeking overall project schedule savings due to earlier procurement being enabled.

**"Civil works contracts within the UAE are mostly procured on a re-measurable basis, whereas building works will generally be based on a fixed price lump sum."**

Dubai Marina, UAE

# Building regulations and compliance

**This section outlines the procedures for obtaining building permissions across the region. AECOM's project management team is vastly experienced in the procedures for building permits internationally and locally and is able to guide and oversee this process.**

# Bahrain

Procuring a municipal building permit in Bahrain is now completed through the on-line portal, Benayat, over a seven-stage process:

## Stage one
**Prepare drawings**

The client must engage a consultant to prepare the necessary architectural and engineering drawings and documents for the next stages of submission. It is generally sufficient to include simple outline plans, cross-sections to indicate overall heights and an area statement.

## Stage two
**Obtain pre-approval**

Certain projects will require a pre-approval from the Urban Planning Development Affairs, Road, Planning and Design Directorate (RPDD), Civil Aviation Authority and other authorities. Specific criteria is listed out within the online portal and should the project fall under any of the requirements, then the pre-planning approval is required.

## Stage three
**Third party checker**

Before the building permit submission and after the pre-approval, if required, the building permit package is to be submitted to a third party engineering firm to review and confirm compliance with the building code and application criteria. The reviewing firm must be of a similar grade to the submitting firm and must be registered with the Council for Regulating the Practice of Engineering Professions (CRPEP). A full list of firms is provided on the Benayat portal.

## Stage four
**Building permit application and third party declaration**

Upon agreement with the third party, the documents are to be uploaded to the online network. The third party must, within seven days, validate the application online to allow the process to move to the Government entity review.

## Stage five
**Government entities review**

Once the submission is made and the third party validates, the respective Government entities will review and provide any conditions. The main authorities involved at this stage are the Municipality, Sanitary Engineering Planning and Projects Directorate (SEPPD) and the Electrical Distribution Directorate (EDD).

## Stage six
**Fee payment**

Once the submission has been reviewed and there are no objections/non-conformities, the municipal charges must be paid for the following elements:

1. Building Permit Fees.
2. Building Permit Insurance Deposit.
3. Infrastructure Fees (if applicable).
4. Civil Aviation Fees (if applicable).

## Stage seven
**Issue of building permit**

Upon payment of the fees the building permit, along with any conditions, will be issued electronically via the Benayat system for works to proceed.

**Application audit**

Within two weeks of issuing the building permit, it shall be reviewed by the authorities audit team. The audit team shall inform the engineering office to resubmit or modify the drawings if any changes are required to be made to meet the relevant building code standards.

# Kingdom of Saudi Arabia

Obtaining a building permit in the Kingdom of Saudi Arabia varies from region to region, however, they tend to follow the same basic principles. The various procedures and approvals from the main municipality, the branch municipality and the fire department need to be obtained. Obtaining these approvals typically takes between three to four months depending on the nature and size of the building/project.

The following is a general outline of the steps needed to obtain a building permit:

## Stage one

**Obtaining a letter from the main municipality**

A letter from the owner is submitted to the main regional municipality, along with a copy of the land deed. The municipality checks the masterplan of the area to ensure the suitability of the plot for the construction of a building. The municipality then writes a letter to the branch municipality of the area where the plot is located. This process takes five days and does not incur a charge.

## Stage two

**Obtaining a preliminary location permit from the branch municipality**

The owner submits a copy of the letter obtained previously from the main municipality to the branch municipality, requesting an inspection of the plot to ensure that the plot length, width and total area are as indicated on the deed. The branch municipality then issues an approval to use the land. This process takes five days and does not incur a charge.

## Stage three

**Obtaining approval from the fire department**

The branch municipality writes to the fire department, or civil defense, to obtain its approval of the plan submitted by the owner for the fire-alarm and fire-fighting systems. The fire department approves these plans and sends them back to the municipality. This process takes ten days and does not incur a charge.

## Stage four

**Obtaining a final building permit**

The branch municipality issues a building permit and sends it to the main municipality for approval, which is given dependent on the nature of the building. The owner can collect the permit from the main municipality after one to three months. The cost of this permit is SAR 1,200.

# Qatar

Compared with many other countries, the planning and building approval process in Qatar is relatively clear and structured. Land ownership, other than by Qatari nationals and the state, is still extremely limited.

The key process in securing development rights is obtaining a land title or 'PIN', since without it all other permits and applications cannot be commenced. Once the land is secured, the project masterplan is submitted for approval to the Planning Department and local municipality offices. Prior to initiating the building permit process, it is essential to secure Masterplan approval from Ministry of Municipality (MM)-Urban Planning. For government projects, land allocation approval must be obtained from MM - State Property Department, and for private land, the title deed is required before initiating the building permit process. Approval from MM-Infrastructure Planning Department is mandatory for any infrastructure, building or structure, such as pumping stations, substations, EFA tanks, etc.

The statutory approval process comprises multiple stages that in turn, dictate the program parameters.

The stages are as follows:

## Opening of the file

Submission of MM documents, forms and architectural preliminary drawings.

## Stage one

**DC1 approval**

General overviews and strategies for the utilities and primary infrastructure are submitted to the relevant utility service providers for comment. During this process, each department generally issues a series of reference numbers that are then used as the file number for all future submissions.

The culmination of this round of submissions is the DC1 approval. As the design develops, a second round of submissions are made to the same utility departments for final approval. In addition, a submission is made to the Qatar Civil Defense (QCD) department who review the fire and life safety aspects of the project.

**DC1 submission:**

1. Fire and life safety (including egress paths, occupancy load, emergency lighting, fire ratings, etc.).
2. Kharamaa drawings.
3. Private Engineering Office (PEO) approval for building façades.
4. PWA-Roads approval for Gate Levels.
5. Qrail approval (if within Qrail Protection Zone).
6. MOT-LTPD approval for ingress and egress (for major projects only).

## Stage two

**DC2 approval**

Depending upon the scale and nature of the project, separate traffic studies may be required and these would be submitted to the Road Affairs Department for approval. Qatar Civil Defence may request modifications to Air conditioning and mechanical ventilation (ACMV), Firefighting (FF) / Fire Alarm (FA) at this stage.

**DC2 submission:**

1. Firefighting.
2. Fire alarms.
3. Air conditioning and mechanical ventilation (ACMV) (upon request).
4. Emergency lighting.
5. Kahramaa Electricity and Water loads confirmation.
6. Ooredoo for telecom.

7. MOI-SSD approval (for security cameras).
8. Woqod approval (if applicable).
9. PWA Drainage approval.
10. Qrail approval (if within Qrail Zone).

## Stage three

**Final stage/building permit**

Once the DC2 approval is secured a further set of standard forms are circulated with a consolidated set of documents for final signing and approval. These documents constitute the building permit.

As a general guide the whole process usually takes at least 80 days (duration for private sector is stated in the KPI document issued by MM in relation to the corresponding size and type of the project), depending upon the quality of the submission, although in practice it often takes much longer due to comments from different departments and progressive design revisions.

During the whole of this process, it is generally not advisable to revise or modify any submission as it may delay the approval process. All submissions must be in Arabic, or bilingual, and should be endorsed by locally registered and approved design companies. International companies cannot make these submissions by themselves. There are some parts of Qatar that are exempt from the building permit approval process. These are generally related to oil and gas production facilities.

Recently, a number of revisions have been made to the design standards of buildings, in particular, high-rise structures.

These address issues such as fire safety, refuge areas, the use of lifts in the event of fire, and the nature and extent of façade glazing.

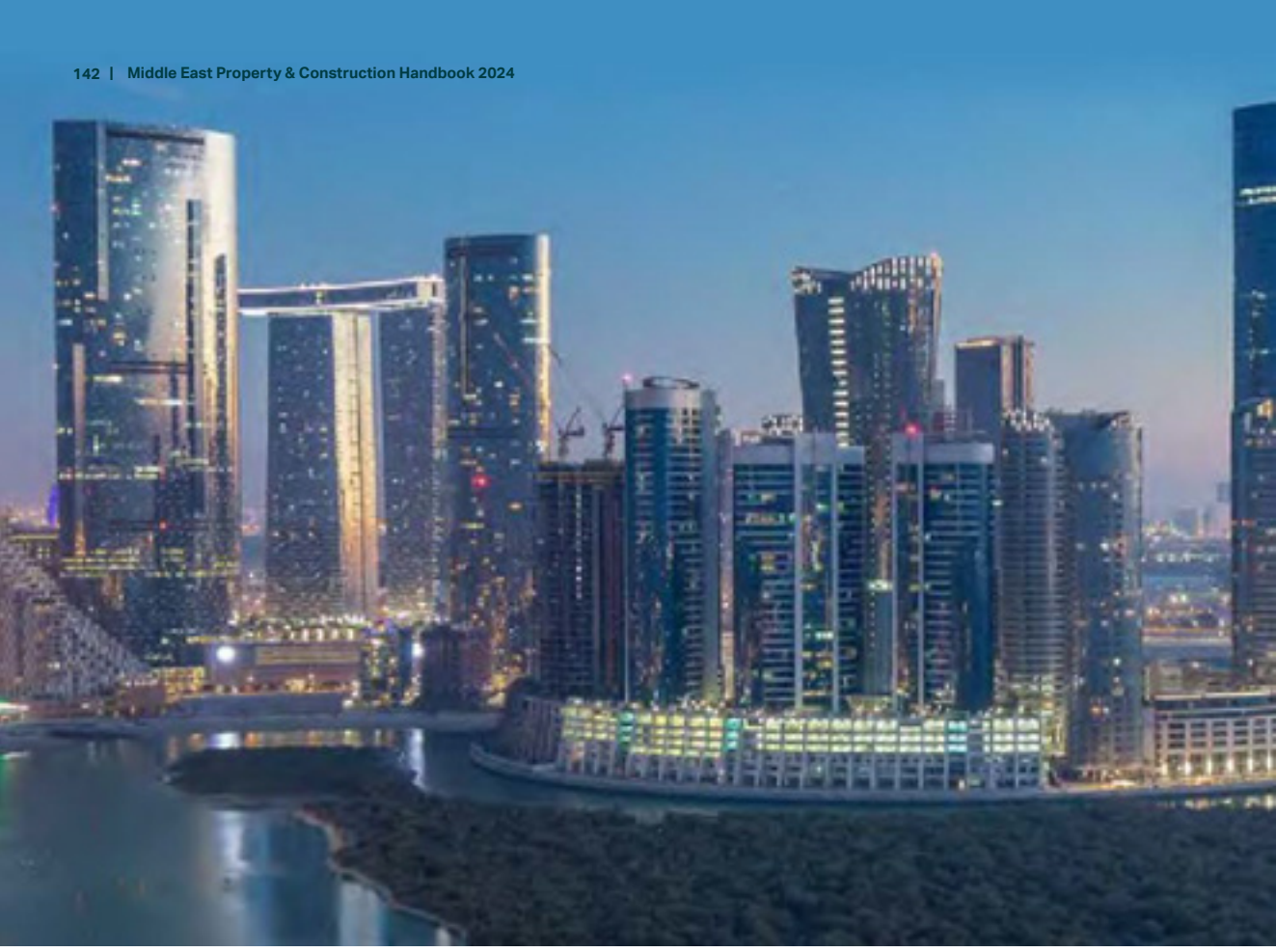
Fit out and refurbishment projects now follow a similar DC1 and DC2 process, a change from the requirement to obtain a maintenance permit before work commenced. The approval process is now under the control of the Ministry of Municipality and Approvals.

This submission must be made by a registered local consultant and failure to do this can significantly delay the approval and permitting process.

Following approvals from all of the required stages, and receipt of the municipality building permit, it is only then that officially marks the time works may then commence on site. However, at the landlord's discretion, mobilisation and demolition works may commence.

The main risks associated with civil defence approvals and municipality building permits are as follows:

- Submission of incorrect information, resulting in rejection of the application.
- Administrative delays within the civil defence department.
- Public holidays and governmental shutdowns.



# United Arab Emirates

The following is a general outline of the procedure for obtaining a building permit in the UAE, however, there are many further obligations and procedures to be completed within each of the stages. For example, stage three of the building permit application requires no less than 15 different forms, documents and separate approvals to be submitted as part of the application.

It is the responsibility of the construction contractor or lead consultant to obtain the building permit, although all applications must be signed by locally registered consultants.

## Stage one
**Submitting the preliminary application**

The applicant submits a preliminary application to the relevant municipality or statutory authority and pays a deposit.

## Stage two
**No Objection Certificates (NOC)**

These are obtained from various governmental and municipal departments including; civil defense, the fire department, drainage, communication, water and electricity, civil aviation, oil and gas, coastal and military.

## Stage three
**Submitting the building permit application**

The full building permit application, including all NOCs, is submitted to the relevant municipality or statutory authority.

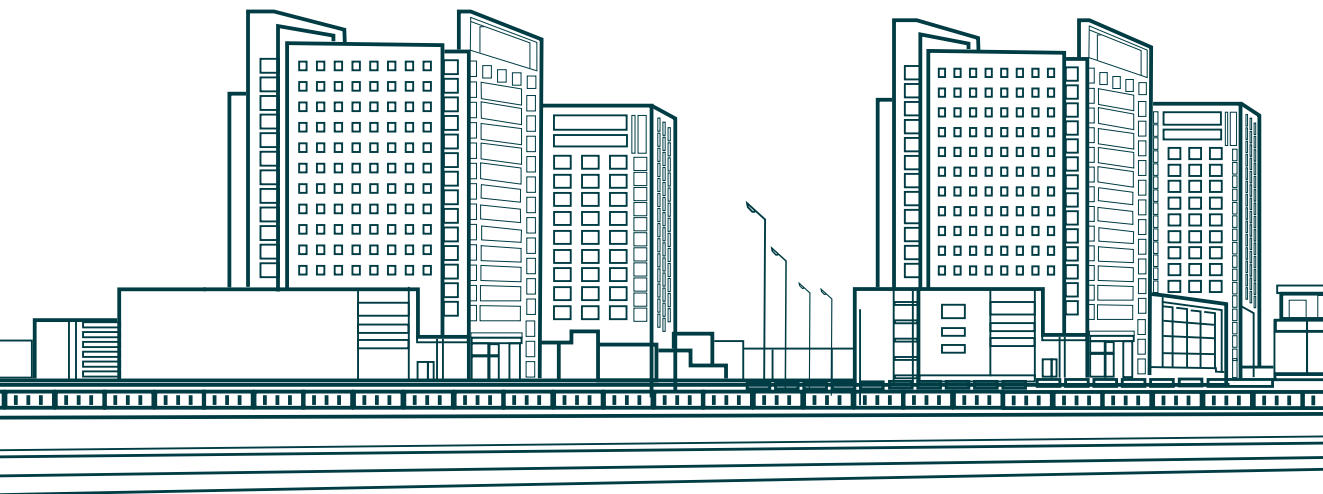
## Stage four
**Obtaining the building permit**

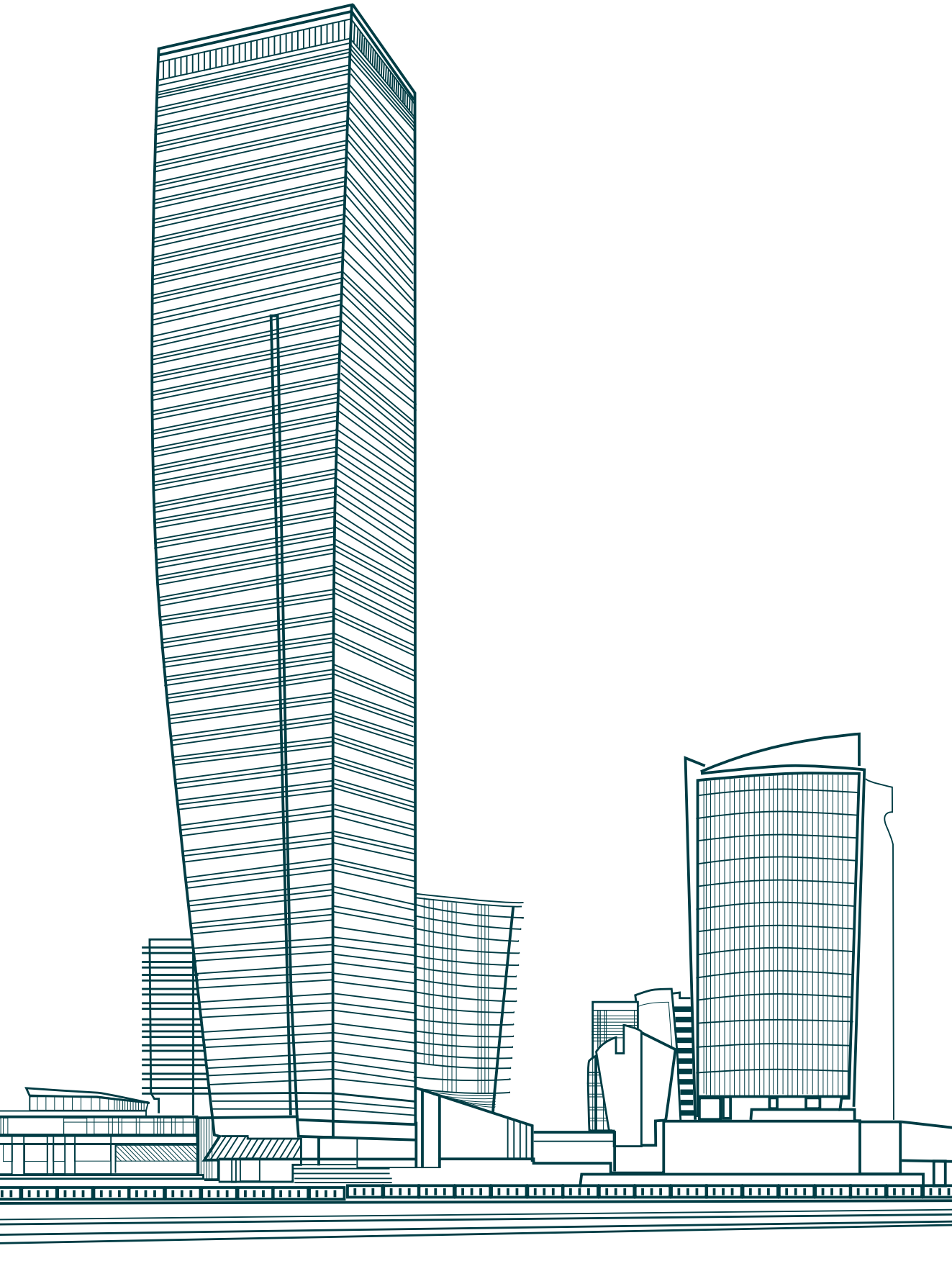
On approval, the applicant collects the building permit and applies for a demarcation certificate.

## Stage five
**Obtaining the building completion certificate**

NOCs are to be obtained from various governmental and municipal departments, this is so you can submit to the relevant municipality or statutory authority for the final building completion certificate application, along with all supporting documents.

# 06 Office directory





# Directory of offices

## United Arab Emirates

**Abu Dhabi**
(Regional Head Office)
International Tower
Capital Center
Level 10
PO Box 53
Abu Dhabi

T: 971 2 613 4000
F: 971 2 613 4001
abudhabi@aecom.com

**Al Ain**
Liwa Center Building
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Al Ain

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F: 971 3 755 4727
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# How can AECOM's Program Cost Consultancy (PCC) team help?

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