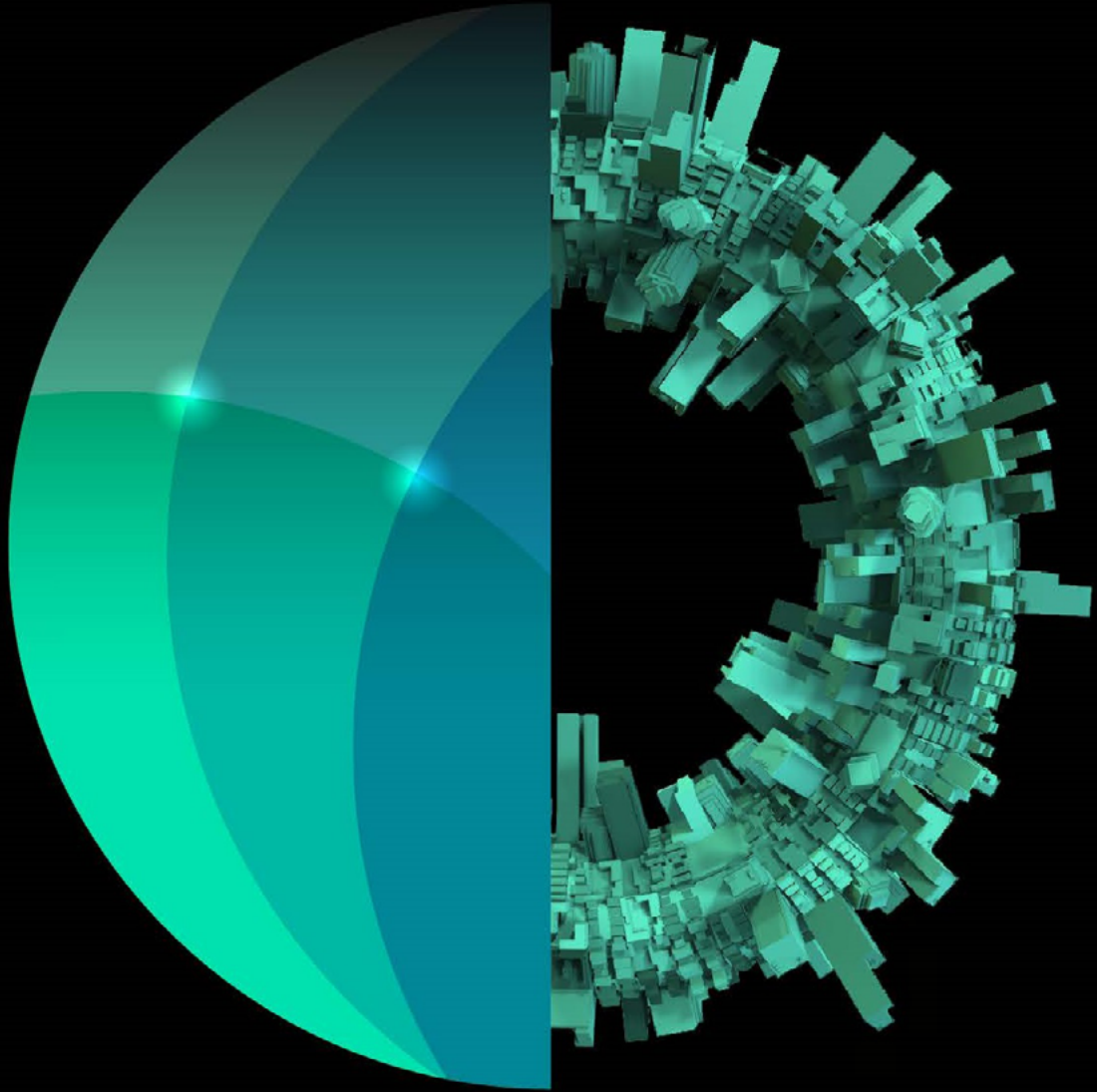


**Deloitte.**



Delivering infrastructure program  
success in inflationary times

Around the world, persistently high inflation poses a significant threat to government infrastructure programs, which are known to deliver long-term economic, environmental, and societal benefits. But as we examine in this paper, rather than cancelling or postponing programs based on cost rises, governments can follow several important steps to ensure that the intended gains for communities are realized in the timeframes needed.

In the wake of Covid-19 and the onset of the Russia-Ukraine conflict, there has been substantially renewed interest in the potential benefits offered by building infrastructure from roads to airports, schools to hospitals, and greener energy sources to digital networks, including in nations as far apart as the US, Italy, Brazil, Saudi Arabia, and China<sup>1</sup>.

In spite of fears over rising costs for construction, materials, labor, debt servicing, and beyond, the wisest course for governments is to push ahead carefully with their infrastructure initiatives and not to be stymied or deterred by these concerns. Realistic management of cost areas and a determined focus on the ultimate outcomes being targeted, can enable infrastructure chiefs and policymakers to meet clear needs in their localities and successfully deliver impactful long-term benefits. Financial metrics should be recalibrated to reflect changing macroeconomic conditions, and to incorporate clearheaded thinking around how infrastructure projects can address community needs and drive economic activity.

At the planning table, infrastructure chiefs should focus on smart prioritization and program design, carefully quantifying targets, and moving to full lifecycle costing and value for money measurements that match up to current conditions. Equally, it will be critical to refine and improve processes around contracting and inflation risk distribution, communicating regularly and openly with construction firms and with any private investors involved. In many cases, talking with these partners throughout the project lifecycle will reduce adversarial positions and improve success.

There is no doubt that inflation will remain a significant consideration for construction and infrastructure projects worldwide, waxing and waning but nearly always pushing project costs higher. As governments consider the potential effects of rising prices, it will be of paramount importance that they maintain momentum towards their targeted results. With a clear appreciation of both the shifting economic conditions and the enormous societal needs at play, governments can design, monitor, and adjust infrastructure programs in ways that deliver profound economic, environmental, and societal benefits.

# Inflation: state of play

In recent quarters, inflation has emerged as a major economic concern for most countries. Broadly, European nations have been among those most heavily impacted by rising costs, not least Germany where price growth, elevated by soaring energy costs, topped 10% in 2022, leading to a technical recession the following spring.<sup>2</sup> Meanwhile, overall Eurozone inflation rose similarly sharply before cooling a little in early 2023 - although headline rates remained well above central bank targets.<sup>3</sup> In the US, a 40-year high of 9.1% was reached in June 2022,<sup>4</sup> and inflation was running above 4% almost a year later.<sup>5</sup> In China and Japan, figures have been elevated by local standards: rises neared 3% and 4% respectively.<sup>6</sup>

For infrastructure projects, cost increases will often be more severe still.<sup>7</sup> Some of the biggest drivers of increased estimates for new projects and rising costs in ongoing schemes have been materials price inflation, with several energy-intensive goods at the forefront. The latest Linesight commodity price report estimates that in the year to Q2 2023 - while steel prices are likely to fall in many jurisdictions, and lumber price increases could ease a little - brick, cement and several other materials will generally have soared. In the US, brick costs will be up by 20% in the 12-month period, with cement and concrete up 13% and 11% respectively. In Germany, cement costs will have leapt 48% amid an energy supply crisis, a figure estimated at 18% in Japan. Meanwhile, in France, plasterboard will have risen 25% thanks to energy price inflation, and in Australia, asphalt prices will have risen 11% on the back of high demand.<sup>8</sup>

Price pressures vary markedly across countries and regions but are expected to remain in evidence for some time yet, given lingering supply stresses from the Covid pandemic and Russia-Ukraine conflict.<sup>9</sup>

Beyond materials price inflation, infrastructure programs also face various other cost challenges. Elevated energy prices are pushing up daily operational expenses on construction sites. Land acquisition prices, too, remain high, making it more challenging for infrastructure planners to find appropriate sites for new projects. And the cost of servicing existing debt and raising new finance continues to mount.<sup>10</sup> But perhaps most strikingly, labor costs are being forced continually higher, in the face of deepening shortages of personnel in a number of key skills areas.<sup>11</sup> The demand driven by super-sized construction projects - notably in China and India,<sup>12</sup> as well as the US and Europe<sup>13</sup> - will exacerbate these strains.

Looking ahead, the clear and present threat of economic slowdowns in several nations - even if short-lived - should not disincentivize spending; governments must view these challenges as bolstering the case for the generative, multiplier effects of infrastructure investment.<sup>14</sup> With a technical recession in the Eurozone triggered by Germany's energy supply crisis, a cooling of growth in the US, and relatively sluggish GDP expansion in China and elsewhere, infrastructure investments are ever more important as a powerful tool for governments to catalyze growth and deliver long-term societal benefits.

# Core considerations for governments

Government infrastructure chiefs need to respond to and prepare for continued cost volatility, which will impact significantly on budget capacity and project affordability, and could reshape value-for-money dynamics. Contracts may need to be reassessed and even revised based on improved allocations of cost risks, and governments should consider if suppliers may attempt to remove themselves from inflexible commitments.<sup>15</sup>

Given these sharply rising nominal costs, project heads may be uncertain of how to deliver the boosts to productivity and economic growth they are hoping to generate. The danger of project stagnation means governments will need to assertively focus on what ultimate goals need to be achieved, with clear-sighted prioritization of new work and a reconsideration of scope on some schemes. In-progress construction efforts may also need to be taken to the finish line, due to contractual obligations.

In order to reduce the impact of these rising costs, governments should sharpen their focus on efficiency and effectiveness. Bold policy decisions will likely be critical to solving the construction labor shortage. Incentives to support technological advancements could also be vital - and these improvements may include digital transformations and sustainable power transitions, smarter collaboration tools, and well-governed robotics.<sup>16</sup>

Rather than prompting a pause to schemes or an adversarial stance between the parties involved, the pressures in evidence should instead lead to a stronger momentum and more cooperative, creative approaches to working together. This could mean fairer risk sharing between parties, or governments taking on some further cost risk, where realistic, given their financial capacities. In some cases, the conditions may necessitate additional innovative strategies such as bundling smaller projects for suppliers to create economies of scale.<sup>17</sup>

With infrastructure programs remaining an essential driver of global growth, governments should focus on the following measures:

## **Prioritize project allocation**

Amid sharply rising costs, governments face tough decisions over which projects are most affordable, realistic, and well-placed to deliver locally important outcomes. The potential is clear for infrastructure spending to stimulate economic activity and an ongoing multiplier effect, but with a risk of initial costs ballooning and key on-the-ground outcomes being delayed, there will be a need to astutely prioritize schemes.<sup>18</sup>

These pressures will result in many leaders embarking on classic cost-benefit analyses, but alone these can be misleading and obscure the full scope of opportunities to generate long-lasting positive outcomes.<sup>19</sup> Therefore, governments will need to contemplate elevating some projects and delaying others based on not only these traditional considerations but also what deeper and broader local or national impacts a specific initiative might have over its lifespan.

In order to fully understand local needs and perspectives, governments must first commit to thoroughly and effectively collecting, analyzing and actioning community engagement feedback among intended users of planned infrastructure.<sup>20</sup> This should include a wide range of people, including those from grassroots organizations and disadvantaged groups, and should be used to guide decisions about which projects go ahead first and potentially how they can be designed and built. By doing so, governments can help manage their investments effectively and ensure the most needed outcomes are delivered more quickly.

### **Quantify economic and societal gains**

In order to achieve a balanced, broad view of projects, governments must develop sustained, quantified metrics of the social and environmental consequences of their planned infrastructure investments. These effects may range from tackling inequality and ensuring fair access to services, to improving transport and connectivity for families and workers, to creating jobs and addressing socio-economic issues, and far beyond. Infrastructure schemes, when well designed and executed, have the potential to empower wellbeing, education and equality across generations - establishing durable resilience for entire communities and their environments in the process.

Delivering upon these promises of broader gains requires the outcomes to be quantified where possible, and to be considered in all planning and ongoing discussions throughout project lifecycles - not just at the traditional points of procurement and construction. The importance of realistic quantification and ongoing measurement should also be embedded in leadership and culture, emphasized from as early as the ideation, design and appraisal stages of projects, through procurement and construction, and onto ongoing operation.<sup>21</sup>

A successful approach here will reflect 'Infrastructure for Good' principles,<sup>22</sup> with metrics developed for both environmental and societal gains, alongside financial growth - driving a robust assessment of which planned projects should be actioned, when and why, and creating measurable indicators for the lasting outcomes that will be delivered. Equally, during a project's subsequent construction and operation, these factors should be tracked consistently, allowing for timely course corrections. Such quantification could also help with attracting private capital backing for projects, where desired.<sup>23</sup>

### **Review affordability and value for money**

Inflationary pressures significantly accentuate the importance of accurately assessing costs and the value likely to be delivered. Cost considerations must be made more sophisticated, therefore, and moved on from simple nominal amounts to estimates updated at regular intervals in line with economic realities. These costs must also be viewed in the context of the value being offered to societies.

For governments, it is critical to analyze where and by how much costs might be underestimated – including through reference class forecasting that considers real historic errors. It can be vital to communicate the probabilities of cost outcomes, and to use cost windows instead of fixed amounts, given inherent uncertainties in forecasting.<sup>24</sup> Regular assessments are imperative, particularly to spot parts of the supply chain where costs are increasing the most, such as with the widespread steep increases to bricks, cement, and concrete costs, and to enable the use of relevant contract amendment measures to help manage inflationary impacts. Equally, it will be critical not to over-assume risks or overprice them in requests for proposals (RFPs).

At the same time, it is vital to adjust value for money metrics in line with changing realities. This must happen throughout project tendering, assignment, progress and completion, and also through operation. This means direct and indirect value capture should both be planned in from the start, measured throughout, and include economic multiplier effects from money reinvested or spent locally, and from rises in taxes or tolls – as well as including growth in the local talent pool and quality of life, and improvements to health and inclusion.<sup>25</sup> Meanwhile, decisionmakers should consider how to bring forward and catalyze the multiplier value from infrastructure, by actively driving incentives for construction skills and technological advancements. A combination of more digitized collaboration and predictive analytics, and onsite automation, robotics, and drones, can all sharply accelerate construction completion and therefore the realization of value.<sup>26</sup>

### Improve lifecycle costing

Full lifecycle costing is critical to infrastructure chiefs achieving a clear-sighted focus on long-term outcomes. It should cover forecast costs for the entire gamut of project life, from strategy, options analysis and planning to business case creation and feasibility studies, through design and construction, and through to handover and operation – and even onto replacement and decommissioning.<sup>27</sup> Costing efforts should always aim to be dynamic and anticipate change, delays, and unforeseen challenges.<sup>28</sup>

Effective full lifecycle cost analyses, using deep data insights, can help guide the most important decision making, including strategic direction and operational or ownership considerations, as well as more granular choices over processes, materials, and day-to-day maintenance.<sup>29</sup> When conducted at the outset and at regular intervals through the lifecycle of an infrastructure project, these can more reliably manage expenses and increase end value.<sup>30</sup>

The balanced view that can be derived from this approach gives governments the proper context for assessing costs at each project stage. As with the construction of the Channel Tunnel connecting the UK and France, for example, projects may experience large cost increases during construction, but years later be regarded as powerfully boosting national productivity and delivering tangible economic and societal benefits that continue to multiply across numerous other domains.<sup>31</sup> Transparent communication around these matters can help ensure all stakeholders, from local communities to constructors and any financial backers involved, retain focus on both the costs and the broader outcomes being targeted.

## Refine contract management

Fostering practical and positive relationships with the private sector will be essential to infrastructure scheme success. Part of this is proper contract management - including fairness and clarity over expected costs, measurement methodologies, planned project stages, and junctures for potential rescoping or contract adjustments. There must also be fair risk allocation and clear mechanisms for resolving disputes.

Where a project is in train, contracts may need to be scrutinized to understand provisions that address unexpected circumstances. While most agreements will not allow for an increase in price, there may be points for renegotiations such as for reductions in scope, or an extension of deadlines and exemptions for contractors from some late delivery penalties. Government bodies should proactively assess their contracts and be ready for suppliers to request such provisions be activated, or even to exit contracts based on force majeure, or extraordinary uncontrollable circumstances.<sup>32</sup>

When writing new contracts, governments will need to consider a more collaborative approach, perhaps allowing for target price ranges, with specific price revision clauses in the event of higher-than-expected inflation. As noted by Global Infrastructure Hub, these approaches can be discussed or devised with the supplier community, with early engagement improving co-operative mindsets.<sup>33</sup> The need for realistic risk allocation may drive heightened usage of caps and collars in agreements, as well as the issuance of 'cost plus' contracts that can better preserve constructor margins. Alliance contracts could also come to the fore in the interests of sharing risks, broadening inputs as key decisions are made, and introducing more innovative financing and procurement approaches. There may also be a need for different balances of ownership and operating responsibilities to meet the targeted outcomes, and governments should assess potential benefits and risks associated with long term leases, joint ventures, partnerships and franchising.<sup>34</sup>



# Conclusion

Infrastructure programs are essential mechanisms for governments around the world, generating productivity growth, creating jobs, and birthing major societal and environmental benefits. Amid high inflation, rather than allowing project stagnation, it will be critical that governments maintain momentum and deliver the intended results. This demands a clear-sighted management of costs, value targets, contracts, and the assignment of risks.

Government infrastructure chiefs, facing the current macroeconomic conditions, should take the following steps:

- Understand what long-term outcomes matter most and prioritize projects accordingly
- Quantify affordability and value for money in line with current realities, updating these assumptions and targets throughout key project stages
- Improve full lifecycle costing for projects, taking a dynamic view that incorporates uncertainties and focuses on long-term results
- Refine contract management to reflect the macroeconomic impact on existing obligations, and to ensure new agreements have a forward-thinking approach to risk

Governments globally are developing, implementing, and managing infrastructure programs in the interests of long-lasting stimulus and societal benefits. Given the immense complexity of these decisions and the high import of getting them right at every stage, many infrastructure chiefs are turning to Deloitte to help develop the right strategies and bring about the most enduring impacts.

Infrastructure decisionmakers who build in smart cost management and deep value creation, can position themselves to meet both the immense challenges of today and the powerful growth opportunities on the path ahead.



# Contacts



**Beckmann Danielsen, Rikke**  
Global Financial Advisory  
Government & Public  
Services leader  
[rdanielsen@deloitte.dk](mailto:rdanielsen@deloitte.dk)



**Flynn, Michael**  
Global Infrastructure,  
Transport & Regional  
Government leader  
[micflynn@deloitte.ie](mailto:micflynn@deloitte.ie)



**Houghton, Luke**  
Global Infrastructure &  
Capital Projects leader  
[lhoughton@deloitte.com.au](mailto:lhoughton@deloitte.com.au)



**Alfaro, Juan**  
Infrastructure subject  
matter expert  
[jalfaro@deloitte.es](mailto:jalfaro@deloitte.es)



**Kalish, Ira**  
Chief Global Economist  
[ikalish@deloitte.com](mailto:ikalish@deloitte.com)

# Endnotes

1. Euronews.com, 'Lula's Workers' Party wants PPPs to focus on sustainability to boost Brazil's growth,' <https://www.euronews.com/2022/05/18/brazil-economy-ppp>, May 18, 2022, and, Saudi Infrastructure Expo, 'Invest in Saudi Arabia,' <https://www.saudiinfrastructureexpo.com/invest-in-saudi-arabia/>, accessed March, 2023, and, The White House, 'Delivering Results from President Biden's Bipartisan Infrastructure Law,' <https://www.whitehouse.gov/build/>, accessed March 2023, and, US Department of Transportation, 'President Biden Announces First of its Kind Infrastructure Investment for Nine Nationally Significant Mega Projects,' <https://www.transportation.gov/briefing-room/president-biden-announces-first-of-its-kind-infrastructure-investment-nine-nationally>, January 31, 2023, and, European Commission, 'Italy's recovery and resilience plan,' [https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/italys-recovery-and-resilience-plan\\_en](https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/italys-recovery-and-resilience-plan_en), accessed March, 2023, We Build Value, 'the €100 billion in investments to rebuild Italy infrastructure,' <https://www.webuildvalue.com/en/global-economy-sustainability/italy-infrastructure-investment-100-billion.html>, September 14, 2023, and, Council on Foreign Relations, 'China's Massive Belt and Road Initiative,' <https://www.cfr.org/backgroundunder/chinas-massive-belt-and-road-initiative>, February 2, 2023, and, Bloomberg, 'These Are the Megaprojects in China's \$1 Trillion Infrastructure Plan,' <https://www.bloomberg.com/news/features/2022-08-25/how-china-will-spend-1-trillion-on-infrastructure-to-boost-economy>, August 25, 2022.
2. De Statis, 'Inflation rate at +10.4% in October 2022,' [https://www.destatis.de/EN/Press/2022/11/PE22\\_472\\_611.html](https://www.destatis.de/EN/Press/2022/11/PE22_472_611.html), November 11, 2022.
3. Brussels Times, 'Euro zone inflation reached 10.6% in October,' <https://www.brusselstimes.com/323787/euro-area-inflation-reached-10-6-in-october>, November 17, 2022, and, Reuters, 'UK inflation hits 41-year high as Hunt readies tough budget,' <https://www.reuters.com/world/uk/uk-consumer-price-inflation-hits-111-october-2022-11-16/>, November 16, 2022, and Office for National Statistics, 'Consumer price inflation, UK: April 2023,' <https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/consumerpriceinflation/april2023>, May 24, 2023, and Euractiv.com, 'No pause in sight as ECB eyes next rate hike,' <https://www.euractiv.com/section/economy-jobs/news/no-pause-in-sight-as-ecb-eyes-next-rate-hike/>, June 12, 2023.
4. CNBC, 'Inflation rose 9.1% in June, even more than expected, as consumer pressures intensify,' <https://www.cnbc.com/2022/07/13/inflation-rose-9point1percent-in-june-even-more-than-expected-as-price-pressures-intensify.html>, July 13, 2022.
5. Bloomberg, 'US Inflation Slows, Giving Room for Fed to Pause Rate Hikes,' <https://www.bloomberg.com/news/articles/2023-06-13/us-inflation-slows-giving-room-for-fed-to-pause-rate-hikes>, June 13, 2023.
6. The State Council, The People's Republic of China, 'China's CPI up 2.8% in September,' [http://english.www.gov.cn/archive/statistics/202210/15/content\\_WS634a0f3cc6d0a757729e1345.html](http://english.www.gov.cn/archive/statistics/202210/15/content_WS634a0f3cc6d0a757729e1345.html), October 15, 2022, Reuters, 'Japan's consumer inflation hits near 41-year high, keeps BOJ under pressure,' <https://www.reuters.com/markets/asia/japans-consumer-inflation-hits-41-year-high-keeps-boj-under-pressure-2023-02-23/>, February 24, 2023, and, Global Times, 'China's CPI rises 1.6% in November year-on-year, a stark contrast to runaway inflation in US, Europe,' <https://www.globaltimes.cn/page/202212/1281508.shtml>, December 9, 2022, and, Reuters, 'Japan's consumer inflation hits fresh 40-year high, eyes on BOJ policy,' <https://www.reuters.com/markets/asia/japans-nov-core-consumer-inflation-hits-fresh-40-year-high-2022-12-22/>, December 23, 2022.
7. Global Infrastructure Hub, 'As inflation drives up infrastructure delivery costs, consider these mitigations for existing and new contracts,' <https://www.gihub.org/articles/as-inflation-drives-up-infrastructure-delivery-costs-consider-these-mitigations-for-existing-and-new-contracts/>, June 22, 2022.

8. Linesight, 'Global Country Insights and Commodity Reports: Q1 2023,' <https://www.linesight.com/insights/linesight-global-commodity-report-q1-2023/>, May 23, 2023, and, Linesight, 'Global Country Commodity Reports: Q4 2022,' [https://downloads.ctfassets.net/11sus2df1m8x/59yZmj4tWuGDmO3jec3/5d12ff7f92cf561bb67a9a3db56553/Linesight\\_Global\\_Country\\_Commodity\\_Reports\\_Q4\\_2022\\_\\_5\\_.pdf](https://downloads.ctfassets.net/11sus2df1m8x/59yZmj4tWuGDmO3jec3/5d12ff7f92cf561bb67a9a3db56553/Linesight_Global_Country_Commodity_Reports_Q4_2022__5_.pdf), February 8, 2023, and, Irish Farmers' Association, 'IFA Review of Timber Prices 2021-2022,' <https://www.ifa.ie/markets-and-prices/ifa-review-of-timber-prices-2021-2022/>, December 5, 2022, and ING, 'Concrete prices won't fall before spring despite lower energy prices,' <https://think.ing.com/articles/concrete-prices-wont-go-down-before-spring-2023-despite-the-lower-energy-prices>, January 13, 2023, and Construction Enquirer, 'Forterra brick prices rise 30% in six months,' <https://www.constructionenquirer.com/2022/07/28/forterra-brick-prices-rise-30-in-six-months/>, July 28, 2022, and US Glass Mag, 'Producer Price Index: US Glass and Glazing Material Prices Increase in November,' <https://www.usglassmag.com/2022/12/producer-price-index-us-glass-and-glazing-material-prices-increase-in-november/>, December 12, 2022, and, Chartered Institute of Procurement & Supply, 'Construction materials cost inflation slowing after record rises in 2022,' <https://www.cips.org/supply-management/news/2023/january/construction-materials-cost-inflation-slowng-after-record-rises-in-2022-/>, January 16, 2023, and, Construction News, 'Industry set for downturn,' <https://www.constructionnews.co.uk/consultants/industry-set-for-downturn-12-12-2022/>, December 12, 2022, and, Statista, 'Growth rate of construction materials costs in the United Kingdom from 2018 to 2021, with forecasts until 2023,' <https://www.statista.com/statistics/1339598/construction-materials-costs-uk/>, February 17, 2023, and, For Construction Pros.com, 'Construction Industry Report Predicts 2023 Materials Pricing,' <https://www.forconstructionpros.com/business/article/22711010/linesight-construction-industry-report-predicts-2023-materials-pricing>, February 14, 2023.
9. Decofice, 'Will construction costs down in 2023?,' <https://www.decofice.com/will-construction-costs-go-down-in-2023/>, accessed March, 2023, and, For Construction Pros.com, 'Construction Industry Report Predicts 2023 Materials Pricing,' <https://www.forconstructionpros.com/business/article/22711010/linesight-construction-industry-report-predicts-2023-materials-pricing>, February 14, 2023, and, Construction Dive, '5 charts that hint at what's in store for construction in 2023,' <https://www.constructiondive.com/news/5-charts-hint-at-whats-in-store-construction-economy-2023/638059/>, December 6, 2022, and, Statista, 'Forecast of the growth of construction costs in selected cities worldwide in 2023,' <https://www.statista.com/statistics/868616/global-construction-cost-growth-by-country/>, August, 2022, and, Linesight, 'Global Country Commodity Reports: Q4 2022,' [https://downloads.ctfassets.net/11sus2df1m8x/59yZmj4tWuGDmO3jec3/5d12ff7f92cf561bb67a9a3db56553/Linesight\\_Global\\_Country\\_Commodity\\_Reports\\_Q4\\_2022\\_\\_5\\_.pdf](https://downloads.ctfassets.net/11sus2df1m8x/59yZmj4tWuGDmO3jec3/5d12ff7f92cf561bb67a9a3db56553/Linesight_Global_Country_Commodity_Reports_Q4_2022__5_.pdf), February 8, 2023, and Global Infrastructure Hub, 'As inflation drives up infrastructure delivery costs, consider these mitigations for existing and new contracts,' <https://www.gihub.org/articles/as-inflation-drives-up-infrastructure-delivery-costs-consider-these-mitigations-for-existing-and-new-contracts/>, June 22, 2022.
10. The Conversation, 'US is spending record amounts servicing its national debt – interest rate hikes add billions to the cost,' <https://theconversation.com/us-is-spending-record-amounts-servicing-its-national-debt-interest-rate-hikes-add-billions-to-the-cost-198280>, January 30, 2023, and, Fiscal Data.Treasury.gov, 'What is the national debt?' <https://fiscaldata.treasury.gov/americas-finance-guide/national-debt/>, accessed March, 2023, and, Allianz, 'Quantitative tightening and debt repayment costs in the eurozone,' [https://www.allianz.com/en/economic\\_research/publications/specials\\_fmo/eurozone-fiscal-policy.html](https://www.allianz.com/en/economic_research/publications/specials_fmo/eurozone-fiscal-policy.html), January 20, 2023, and, Institute for Fiscal Studies, 'The government's debt interest bill in June hugely increased by high inflation and seasonal effects,' <https://ifs.org.uk/articles/governments-debt-interest-bill-june-hugely-increased-high-inflation-and-seasonal-effects>, July 21, 2022.
11. Construct Connect, 'Construction Wage Growth Retakes Title for Fastest Rising Cost,' <https://www.constructconnect.com/construction-economic-news/construction-wage-growth-retakes-title-for-fastest-rising-cost>, January 20, 2023, and, Eurostat, 'Annual increase in labour costs at 4.0% in euro area,' <https://ec.europa.eu/eurostat/documents/2995521/14698153/3-15092022-BP-EN.pdf/d5da5db3-aca7-a087-07ba-4393501ccd22>, September 15, 2022, and, Construction News, 'Construction wage inflation tops 6%, workforce increases,' <https://www.constructionnews.co.uk/news/construction-wage-inflation-tops-6-per-cent-workforce-increases-16-08-2022/>, August 16, 2022, and GlobalData, 'Number of companies discussing 'labor shortages' up by 28% in 2022, finds GlobalData,' <https://www.globaldata.com/media/business-fundamentals/number-companies-discussing-labor-shortage-28-2022-finds-globaldata/>, November 21, 2022, and, Brookings, 'New data shows long Covid is keeping as many as 4 million people out of work,' <https://www.brookings.edu/research/new-data-shows-long-covid-is-keeping-as-many-as-4-million-people-out-of-work/>, August 24, 2022, and, Bloomberg, 'Covid Early Retirees Top 3 Million in US, Fed Research Shows,' <https://www.bloomberg.com/news/articles/2021-10-22/covid-early-retirees-top-3-million-in-u-s-fed-research-show>, October 22, 2021, and, BBC News, 'Immigration rules relaxed for builders and carpenters,' <https://www.bbc.co.uk/news/business-64969468>, March 16, 2023.
12. Blackridge Research, 'Ongoing Mega Infrastructure Projects in India,' <https://www.blackridgeresearch.com/blog/ongoing-mega-infrastructure-projects-in-india>, December 20, 2022, and Yahoo Finance, 'These Are the Megaprojects in China's \$1 Trillion Infrastructure Plan,' <https://uk.finance.yahoo.com/news/megaprojects-china-1-trillion-infrastructure-210016068.html>, August 25, 2022.
13. Reuters, 'London's \$23 billion Crossrail finally opens,' <https://www.reuters.com/world/uk/londons-24-billion-crossrail-finally-opens-2022-05-23/>, May 24, 2022, and, The Portugal News, 'Public tender for construction of Alentejo Central Hospital,' <https://www.theportugalnews.com/news/public-tender-for-construction-of-alentejo-central-hospital-50569>, July 30, 2019, and, Blackridge Research, 'Top 10 New Upcoming Europe Renewable Projects in 2022,' <https://www.blackridgeresearch.com/blog/top-new-upcoming-europe-renewable-projects>, January 7, 2022.

14. World Economic Forum, 'Recession in 2023? That depends on where you are in the world,' <https://www.weforum.org/agenda/2023/01/global-recession-economic-outlook-2023/>, January 16, 2023, and, Go Banking Rates, '5 Reasons We Should Expect an Economic Recession in 2023,' [https://www.gobankingrates.com/money/economy/reasons-expect-economic-recession-2023/?utm\\_term=incontent\\_link\\_14&utm\\_campaign=1198301&utm\\_source=yahoo.com&utm\\_content=18&utm\\_medium=rss](https://www.gobankingrates.com/money/economy/reasons-expect-economic-recession-2023/?utm_term=incontent_link_14&utm_campaign=1198301&utm_source=yahoo.com&utm_content=18&utm_medium=rss), December 19, 2022, and, CNN Business, 'Here's what could tip the global economy into recession in 2023,' <https://edition.cnn.com/2022/12/29/business/global-economy-2023-recession/index.html>, December 29, 2022., and Bloomberg, 'GDP Latest: Euro Zone Avoids Recession But Inflation Picks Up,' <https://www.bloomberg.com/news/articles/2023-04-28/france-grows-again-as-europe-s-recession-fears-fade-gdp-latest>, April 28, 2023, and The Guardian, 'UK narrowly avoids recession after figures show growth flatlining,' <https://www.theguardian.com/business/2023/feb/10/uk-narrowly-avoided-recession-last-year-official-figures-show>, February 10, 2023, and, Financial Times, 'Eurozone set to avoid recession this year as economists' gloom lifts,' <https://www.ft.com/content/47082456-0538-4490-855a-bc4589b6b30d>, January 22, 2023, and The Guardian, 'EU tipped to avoid recession after gas crisis eases,' <https://www.theguardian.com/world/2023/feb/13/eu-tipped-to-avoid-recession-after-gas-crisis-eases-cost-of-living>, February 13, 2023, and CNBC, 'UK narrowly avoids recession in back half of 2022 despite december slump,' <https://www.cnbc.com/2023/02/10/uk-narrowly-avoids-recession-in-back-half-of-2022-despite-december-slump.html>, Economist Intelligence, 'US GDP growth slows sharply in the first quarter,' <https://www.eiu.com/n/us-gdp-growth-slows-sharply-in-the-first-quarter/>, May 4, 2023, and Financial Times, 'Federal Reserve warns of credit crunch risk after US bank turmoil,' <https://www.ft.com/content/77d42ab5-694b-4bdb-9e5b-d8e106e2c02f>, May 8, 2023, and Forbes, 'Federal Funds Rate History 1990 to 2023,' <https://www.forbes.com/advisor/investing/fed-funds-rate-history/>, May 3, 2023, and CNN Business, 'China's economy shakes off Covid legacy to grow 4.5% in Q1,' <https://edition.cnn.com/2023/04/17/economy/china-gdp-q1-2023-intl-hnk/index.html>, April 18, 2023, and Financial Times, 'China's lowest growth target in decades signals era of caution,' <https://www.ft.com/content/c51c202e-aff8-4019-a34e-a6f94baca024>, March 6, 2023, and, World Economic Forum, 'Recession in 2023? That depends on where you are in the world,' <https://www.weforum.org/agenda/2023/01/global-recession-economic-outlook-2023/>, January 16, 2023, and World Bank, 'Risk of Global Recession in 2023 Rises Amid Simultaneous Rate Hikes,' <https://www.worldbank.org/en/news/press-release/2022/09/15/risk-of-global-recession-in-2023-rises-amid-simultaneous-rate-hikes>, September 22, 2022, and, Financial Times, 'ECB must do more to tackle inflation 'monster', says Christine Lagarde,' <https://www.ft.com/content/83d44991-4988-4e4f-8143-81d34b2b4173>, March 5, 2023, and, USA Today, 'January CPI inflation rate slows to 6.4% but monthly inflation rose by 0.5%,' <https://eu.usatoday.com/story/money/economy/2023/02/14/cpi-january-inflation-data-today-live-updates/11247836002/>, February 14, 2023, and, The Wall Street Journal, 'Fed's Tightening Plans Collide With SVB Fallout,' <https://www.wsj.com/articles/feds-tightening-plans-collide-with-svb-fallout-9a3b8c27>, March 14, 2023, and, Financial Times, 'Bank of England raises interest rates to 4.25% despite banking turmoil,' <https://www.ft.com/content/b3315028-974c-4d03-9ab9-8f8aacc72985>, March 23, 2023.
15. Institution of Civil Engineers, 'Presidential Roundtable Summary: What impact will inflation have on global infrastructure pipelines?,' <https://www.ice.org.uk/media/skjdxyjc/pres-rt-write-up-inflation-may-22.pdf>, May, 2022.
16. <https://www.gartner.com/en/newsroom/press-releases/2023-05-24-gartner-forecasts-worldwide-government-it-spending-to-grow-8-percent-in-2023>, and, <https://www.pbctoday.co.uk/news/digital-construction/construction-technology-news/the-importance-of-digital-transformation-in-the-construction-industry/117780/>, and Information Age, 'How robotics is heralding a new era in construction,' <https://www.information-age.com/how-robotics-heralding-new-era-in-construction-123502823/>, April 4, 2023, and, For Construction Pros, 'Robotic Automation's Potential to Enhance Productivity, Efficiency and Safety on Construction Sites,' <https://www.forconstructionpros.com/construction-technology/article/21451998/abb-group-robotic-automations-potential-to-enhance-productivity-efficiency-and-safety-on-construction-sites>, May 26, 2021, and, Forbes, 'Built Robotics Unveils Autonomous Pile Driving Robot, Expediting Solar Rollout,' <https://www.forbes.com/sites/heatherwishartsmith/2023/03/20/built-robotics-unveils-autonomous-pile-driving-robot-expediting-solar-rollout/?sh=312f80587591>, March 20, 2023.
17. Global Infrastructure Hub, 'Economic shocks are worsening the bankability of infrastructure deals – here are 8 ways to keep capital flowing and get projects off the ground,' <https://www.gihub.org/articles/economic-shocks-are-worsening-the-bankability-of-infrastructure-deals-here-are-8-ways-to-keep-capital-flowing-and-get-projects-off-the-ground/>, April 4, 2023, and, Global Infrastructure Hub, 'Bundling of public private partnerships (PPPs) to create efficiencies and economies of scale,' <https://www.gihub.org/innovative-funding-and-financing/case-studies/bundling-of-public-private-partnerships-ppps-to-create-efficiencies-and-economies-of-scale/>, September 20, 2021.
18. IMF Blog, 'How Fiscal Restraint Can Help Fight Inflation,' <https://www.imf.org/en/Blogs/Articles/2022/11/21/how-fiscal-restraint-can-help-fight-inflation>, November 21, 2023, and AP News, 'Inflation taking bite out of new infrastructure projects,' <https://apnews.com/article/inflation-us-infrastructure-projects-e89dcd5f3e623e532353f087265f9a63>, June 19, 2022.
19. Deloitte, 'How should governments prioritize infrastructure stimulus investments,' <https://www.deloitte.com/content/dam/assets-shared/legacy/docs/perspectives/2022/gx-how-to-prioritize-infrastructure-stimulus-investments.pdf>, 2022.
20. Useful Projects, 'Maximising Social Value from Infrastructure Projects,' [https://usefulprojects.co.uk/wp-content/uploads/2020/01/Maximising\\_social\\_value\\_from\\_infrastructure\\_projects\\_v1.1.pdf](https://usefulprojects.co.uk/wp-content/uploads/2020/01/Maximising_social_value_from_infrastructure_projects_v1.1.pdf), accessed June, 2023.
21. Useful Projects, 'Maximising Social Value from Infrastructure Projects,' [https://usefulprojects.co.uk/wp-content/uploads/2020/01/Maximising\\_social\\_value\\_from\\_infrastructure\\_projects\\_v1.1.pdf](https://usefulprojects.co.uk/wp-content/uploads/2020/01/Maximising_social_value_from_infrastructure_projects_v1.1.pdf), accessed June, 2023.

22. Economist Impact, 'Infrastructure for Good,' <https://impact.economist.com/projects/infrastructure-for-good/>, <https://impact.economist.com/projects/infrastructure-for-good/>, accessed June, 2023.
23. EDHEC Infrastructure Institute, 'The Pricing of Green Infrastructure,' <https://edhec.infrastructure.institute/wp-content/uploads/2022/10/The-Pricing-of-Green-Infrastructure.pdf>, September 2022, and, MSCI, 'ESG and the cost of capital,' <https://www.msci.com/www/blog-posts/esg-and-the-cost-of-capital/01726513589>, February 25, 2020, and, SG Voice, 'Does good ESG performance lower the cost of capital?,' <https://sgvoice.energyvoice.com/investing/1675/esg-performance-cost-of-capital/>, July 14, 2022, and, Science Direct, 'ESG scores and cost of debt,' <https://www.sciencedirect.com/science/article/pii/S0140988322003383>, August, 2022, and, SSRN, 'The Impact of a Firm's ESG Score on Its Cost of Capital: Can a High ESG Score Serve as a Substitute for a Weaker Legal Environment?,' [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4286057](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4286057), December 11, 2022.
24. Institute for Government, 'How to value infrastructure, Improving cost benefit analysis,' <https://www.instituteforgovernment.org.uk/sites/default/files/publications/IfG%20Report%20CBA%20infrastructure%20%5Bweb%20final%5D.pdf>, accessed June, 2023, and Deloitte, 'How should governments prioritize infrastructure stimulus investments?,' <https://www.deloitte.com/content/dam/assets-shared/legacy/docs/perspectives/2022/gx-how-to-prioritize-infrastructure-stimulus-investments.pdf>, accessed June, 2023.
25. Deloitte, 'The virtues of value capture,' <https://www.deloitte.com/content/dam/assets-shared/legacy/docs/smart-cities-virtues-of-value-capture-19nov.pdf>, accessed June, 2023, and, McKinsey & Company, 'Four ways governments can get the most out of their infrastructure projects,' <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/four-ways-governments-can-get-the-most-out-of-their-infrastructure-projects>, January 6, 2020.
26. McKinsey Global Institute, Reinventing Construction: A Route to Higher Productivity,' [https://www.mckinsey.com/~media/McKinsey/Business Functions/Operations/Our Insights/Reinventing construction through a productivity revolution/MGI-Reinventing-construction-A-route-to-higher-productivity-Full-report.pdf](https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Operations/Our%20Insights/Reinventing%20construction%20through%20a%20productivity%20revolution/MGI-Reinventing-construction-A-route-to-higher-productivity-Full-report.pdf), February, 2017, and, Construct Connect, 'Robots Are Coming to the Construction Site,' <https://www.constructconnect.com/blog/construction-robotics>, June 13, 2022.
27. Deloitte, 'Optimising value from capital projects,' <https://www2.deloitte.com/uk/en/pages/infrastructure-and-capital-projects/solutions/optimising-value-from-capital-projects.html>, accessed June, 2023, and, Deloitte, 'Improving capability and performance across the capital project lifecycle,' <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/infrastructure-capital-projects/deloitte-au-icp-improving-capability-performance-capital-project-lifecycle-180718.pdf>, accessed June, 2023, and, LinkedIn, 'Life-Cycle Costing Analysis.: Mandatory for all Infrastructure Projects,' <https://www.linkedin.com/pulse/life-cycle-costing-analysis-mandatory-all-projects-ramachandran/>, May 13, 2017.
28. Deloitte, 'Capital Programmes: Orchestrating Success,' <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/infrastructure-and-capital-projects/deloitte-uk-orchestrating-for-success.pdf>, accessed June, 2023.
29. LinkedIn, 'Life-Cycle Costing Analysis.: Mandatory for all Infrastructure Projects,' <https://www.linkedin.com/pulse/life-cycle-costing-analysis-mandatory-all-projects-ramachandran/>, May 13, 2017, and, Deloitte, 'Improving capability and performance across the capital project lifecycle,' <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/infrastructure-capital-projects/deloitte-au-icp-improving-capability-performance-capital-project-lifecycle-180718.pdf>, accessed June, 2023.
30. Corporate Finance Institute, 'Life Cycle Cost Analysis,' <https://corporatefinanceinstitute.com/resources/accounting/life-cycle-cost-analysis/>, May 15, 2023, and, One Click LCA, 'Life Cycle Costing in Construction,' <https://www.oneclicklca.com/building-life-cycle-costing-in-construction/>, accessed June, 2023.
31. Washington Post, 'English Channel Tunnel Project Running Over Budget as Costs Rise,' <https://www.washingtonpost.com/archive/real-estate/1989/10/07/english-channel-tunnel-project-running-over-budget-as-costs-rise/4173c9de-fe1c-4fa7-a321-b82ad7d71409/>, October 7, 1989, and, Euro Tunnel, 'The Channel Tunnel – interesting facts,' <https://www.eurotunnel.com/uk/build/>, accessed June, 2023.
32. Global Infrastructure Hub, 'As inflation drives up infrastructure delivery costs, consider these mitigations for existing and new contracts,' <https://www.gihub.org/articles/as-inflation-drives-up-infrastructure-delivery-costs-consider-these-mitigations-for-existing-and-new-contracts/>, June 22, 2022.
33. Global Infrastructure Hub, 'As inflation drives up infrastructure delivery costs, consider these mitigations for existing and new contracts,' <https://www.gihub.org/articles/as-inflation-drives-up-infrastructure-delivery-costs-consider-these-mitigations-for-existing-and-new-contracts/>, June 22, 2022.
34. Deloitte, 'Funding and financing strategies for smart cities,' <https://www.deloitte.com/global/en/Industries/government-public/perspectives/smart-cities-funding-and-financing-strategies.html>, accessed June, 2023, and, Deloitte, 'The Alliance Approach to Smart Cities,' <https://www.deloitte.com/content/dam/assets-shared/legacy/docs/gx-ps-smart-cities-alliance-approach.pdf>, June, 2023.



Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms, and their related Entities (collectively, the “Deloitte organization”). DTTL (also referred to as “Deloitte Global”) and each of its member firms and related entities are legally separate and independent entities, which cannot obligate or bind each other in respect of third parties. DTTL and each DTTL member firm and related entity is liable only for its own acts and omissions, and not those of each other. DTTL does not provide services to clients. Please see [www.deloitte.com/about](http://www.deloitte.com/about) to learn more.

Deloitte provides industry-leading audit and assurance, tax and legal, consulting, financial advisory, and risk advisory services to nearly 90% of the Fortune Global 500® and thousands of private companies. Our professionals deliver measurable and lasting results that help reinforce public trust in capital markets, enable clients to transform and thrive, and lead the way toward a stronger economy, a more equitable society, and a sustainable world. Building on its 175-plus year history, Deloitte spans more than 150 countries and territories. Learn how Deloitte’s approximately 415,000 people worldwide make an impact that matters at [www.deloitte.com](http://www.deloitte.com).

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms or their related entities (collectively, the “Deloitte organization”) is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

No representations, warranties or undertakings (express or implied) are given as to the accuracy or completeness of the information in this communication, and none of DTTL, its member firms, related entities, employees or agents shall be liable or responsible for any loss or damage whatsoever arising directly or indirectly in connection with any person relying on this communication. DTTL and each of its member firms, and their related entities, are legally separate and independent entities.