



INSURING THE CONSTRUCTION OF MEGAPROJECTS WITH A VIEW TO A SUSTAINABLE FUTURE

INTRODUCTION

Megaprojects in the construction and engineering sectors – railways and roads, airports, power stations, and petrochemical and industrial plants worth more than EUR 1.5 billion – represent total investments of several billion euros. Despite their complexity, these projects are constantly growing in number. If we combine all the sectors where megaprojects make up an important part of the landscape (power, natural resources, transport, defence and space), we are looking at a market of between USD 6,000 to 9,000 billion¹ per year.

SCOR's portfolio has included infrastructure megaprojects since the company was founded in 1970, and reflects the changes that these major projects have brought to their host countries.

In this article, we explore insurance industry challenges and best practices in terms of supporting megaprojects over the long term, in light of our commitment to sustainability and climate change-resilient solutions.

AS WELL AS PROVIDING FINANCIAL CAPACITY AND RISK MANAGEMENT EXPERTISE, SCOR HAS DEVELOPED A WELL-ESTABLISHED STRATEGY TO SUPPORT ITS CLIENTS

- ◆ **New industries and research:** SCOR is a respected insurance partner for nuclear power plant projects, bringing its globally recognized French expertise in this area to the Flamanville plant in France, the Okiluoto plant in Finland, and several CGN plants in China. We are also involved in scientific projects such as the International Thermonuclear Experimental Reactor ITER, the Extremely Large Telescope built by ESO² in Chile, CERN in Switzerland, and the new Venice flood barrier.
- ◆ **Transport:** SCOR underwrites the construction of airports (Heathrow T5, Hong Kong, Dubai, Jeddah, Orlando), as well as tunneling and metro projects: London, Hong Kong, Singapore, Cairo, Riyadh, Los Angeles, the Grand Paris Express³ and projects across China, and leads several resilient infrastructure projects such as Taiwan High Speed train⁴ and the fixed links in Denmark, Sweden and Germany, Storebaelt, Oresund and recently the Fehmarnbelt project.
- ◆ **Sustainable resources:** the Great Man-made River⁵ in Libya, hydro power plants in Ethiopia and Cameroon and the Rogun⁶ dam in Tajikistan are just a few examples of our expertise in water schemes and renewable energy projects. We also increasingly support offshore wind farms and solar plants with a deep understanding of their technical evolutions and challenges.

1. Bent Flyvberg "The Oxford Handbook of Megaproject Management" (2017)

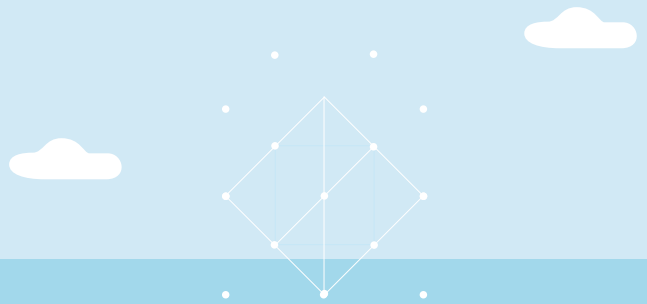
2. The dome has a diameter of 86m and a height of almost 80m

3. The Grand Paris Express consists of 70 underground stations and 200km of automatic metro lines

4. The largest Public Private Partnership project to be financed

5. In total, more than 4,000 kilometres of pipeline were to be laid with some 1,350 production wells and reservoirs with capacity as big as 24 million cubic meters

6. Once completed it will be a 335m high earth fill dam



BEST PRACTICES IN TERMS OF INSURING MEGAPROJECTS, BEARING IN MIND THAT EACH PROJECT BRINGS ITS OWN SET OF COMPLEXITIES AND CHALLENGES

No two megaprojects are alike. Nevertheless, there are some general trends and good practices that apply across the board.

UNDERSTANDING THE DIVERSE RISK UNIVERSE OF MEGAPROJECTS: THE ART & SCIENCE OF UNDERSTANDING RISKS

The role of the underwriters is to analyze the project in detail and understand all the risks involved, in order to provide their clients with the right support and set appropriate terms and conditions. This includes:

- ♦ examining the nature of the project, the detailed scope of works, the construction methods and technology used, the location and cat exposure, the project planning, the detailed breakdown of values, and the expected revenues to be covered. All of these help us to calculate our maximum exposure as well as the correct terms and conditions.
- ♦ studying the risk analysis conducted by the owner and the contractors, the transparency involved in sharing this across the contract chain and with the insurers, the mitigation measures put in place, and the choice of best construction solutions to reduce the exposure at the most exposed stages of the project – the Tunnel Code of Practice, developed jointly by insurers and the tunnel industry, is very detailed in this regard.
- ♦ looking at how the owner is adapting the contract structure to the level of risks involved. For small and easy-to-build constructions, a lump sum type of contract is the preferred option. When there are uncertainties in terms of the quantities of material and equipment involved, a cost-plus fee contract could be more suitable. When design challenges are present, a design and build contract is ideal and when real design, planning and cost challenges are present, the best solution is a partnering contract where ideas and benefits are shared. All of this has implications for insurers' risk analysis.

Megaprojects sometimes involve many contractors with highly fragmented contracts, with the aim of putting different companies against each other. As numerous studies on the subject have shown, it has become standard practice to overshoot budgets and timeframes for these projects. This can create a risk aggravation factor for the insurers and reinsurers, even if additional costs and extended timeframes often also mean additional premiums for the underwriters.

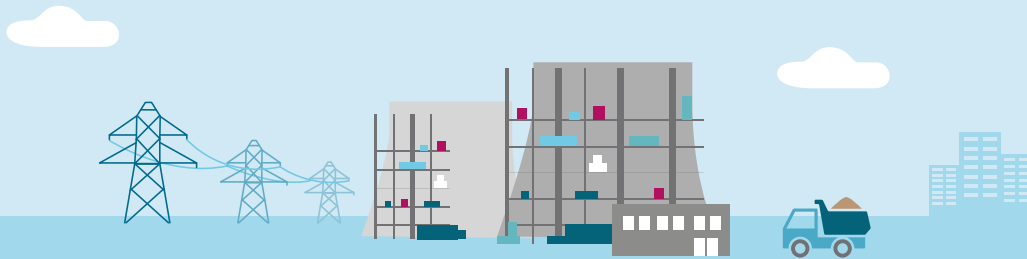
For megaprojects based on Public Private Partnerships (PPP), Built Operate and Transfer (BOT), or on project financing⁷, requests for delay in start-up cover (DSU in respect of loss of revenues, debt service, fixed costs...) - in case material damage delays the final handover - are frequent, usually driven by lenders' requirements. The amount of cover requested is nowadays greater, and this increases our global exposure because it directly impacts the underwriters' maximum possible loss, which must be fully included in our estimations. There must be a very clear understanding of the potential financial loss in the event of delay: interest rates, fixed costs, return on investment, estimation of future income, price of raw materials, and so on, in order to correctly evaluate exposure.

THE ROLE PLAYED BY INSURERS IN RISK AND PROJECT MANAGEMENT

Risk management is now an essential component of any enterprise, and construction projects are no exception. Risk management requires a dedicated organizational structure (a dedicated team or person), specific processes and risk registers. Risk registers must reflect the main risks to which the project is exposed, whether these are of a contractual or financial nature, or affect the quality and duration of the construction work. We have to ensure that adequate mitigation measures are in place, paying particular attention to risks that could cause material damage.

It is worth noting that the risk register of a project owner is different from that of a contractor, as each party has different responsibilities.

7. Structured financing often with anticipated cash-flow in particular in the water, electricity production and gas transport sectors



Even if our influence on these issues is limited, we try to convince our insureds to adopt a standardized risk register for all the stakeholders in the project.

Because of the heavy losses suffered by underground works and buildings in late 1990's and early 2000's, the insurance sector has developed Codes of Practice to mitigate certain exposures, such as the Tunnel Code of Practice and the Fire Code of Practice. We strongly recommend including such Codes in the policy wording to ensure efficient and collaborative risk management by all project stakeholders, including insurers.

When going to a site to conduct a survey, insurers work alongside the owner and the contractors to help analyze potential causes of loss and to implement appropriate mitigation methods. SCOR's underwriters and their risk surveyor partners have conducted for hundreds of risk surveys, which gives us an excellent overview of risk management practices on large infrastructure projects – this is useful not just in terms of benchmarking between projects, but also in terms of spreading best practices and lessons learned from similar projects or types of exposure.

The most important consideration, however, is to adapt to the new needs of megaprojects and to be as innovative as our insureds, because as we have already mentioned, no two megaprojects are alike. Each project must be studied in depth to define terms, conditions and loss mitigation measures, as well as the most appropriate human and technical resources needed to efficiently manage the policy.

MANAGING CLAIMS

Major claims in the construction industry (above USD 50 million) have increased significantly in the past 10 years compared to the previous decade, with megaprojects obviously being impacted more than smaller projects (see latest [IMIA newsletter, 44th issue](#)).

Claims management is a key component of major project insurance, particularly when it comes to large-capacity, long-term and technical projects. For policies with timeframes of well over five years, you need strong reactivity and good technical skills for claims management. This includes having good internal claims experts and working with adequate loss adjusters or third-party providers at the insurance or reinsurance level, by way of a claims control or claims cooperation clause.

Another possible option in terms of claims management is to create a claims compensation fund managed by independent experts and governed by the underwriters. This solution is often used in the case of low claims-compensation figures, and/or when the local cedants do not have the requisite skills or resources to deal with the number of claims involved (on the Taiwan high-speed train, for example, we had more than 5,000 claims notifications).

THE HEATHROW EXPRESS LINK TUNNEL COLLAPSE

In 1994, a major collapse occurred on the Heathrow Express tunnel works and damage continued over the following days. The reinstatement cost was almost GBP 150 million, i.e. almost three times the original contract cost.

Since that time the recommendations given by the "Code of practice for Risk Management of tunnel works" developed by Insurers and Tunneling practitioners has been largely adopted worldwide

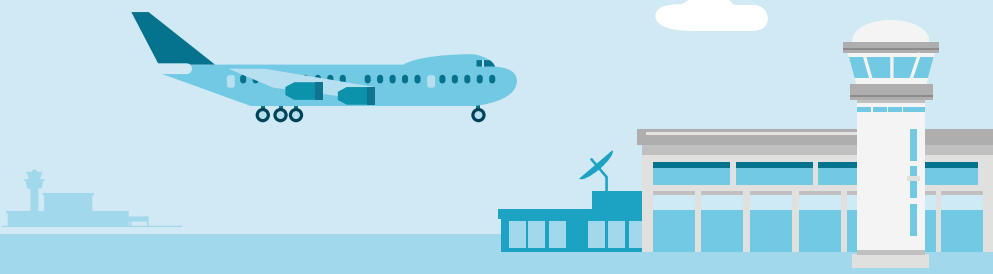


We highly recommend that owners look not just at the price of the cover but also at the experience, financial stability and expertise of the insurers and reinsurers behind it. All too often, these considerations are forgotten – owners need to consider not just the competitiveness of the contract, but also the quality of the signature.

MAINTAINING CAPACITY OVER LONG PERIODS

Megaprojects frequently last for more than six years and can involve multiple delays.





The capacity provided by insurers must be stable, to ensure that the insurance panel will be around for the full duration of the project.

The MOSE Project for the Venice flood barrier began in 2003 and is still ongoing. The Gotthard base tunnel in Switzerland opened after 16 years' construction. The Rogun Dam in Tajikistan is scheduled to go on for 17 years, and the Grand Paris Express project is due to last for 12 years.

Construction insurers have to stay with the risk from start of the works on the ground to full completion, so capacity needs to be available for the entire duration of the project.

In order to keep insurers on the panel throughout these long periods, there has to be a good balance between the financial stability of the insurance panel and adequate terms and conditions, including regular reviews of the terms over the course of the project.

ADAPTING TO CALLS FOR TENDER: THE BALANCE BETWEEN OPTIMIZATION AND LONG-TERM VIABILITY

Under European Parliament Directive 2004/18/EC, European tenders are compulsory for the award of public works contracts, including any servicing contracts. Insurance is part

of these servicing contracts, adding more transparency to the way in which insurance is placed.

Formal calls for tenders are now also common practice with private investors. In these tenders, owners are keen to balance the price, which is not the only driver, with other factors.

When choosing a panel of (re)insurers for your megaproject, it is important to check that they have a strong financial rating and ideally have their own capacity, along with adequate experience and resources. A leader with a large share can be a positive indicator of confidence in the project, and underwriting teams with a global approach to the segment tend to have a real competitive edge. They have the advantage of seeing several megaprojects every year, of various types and in different locations. The fact of having loss experience in many countries and jurisdictions gives international and global insurers the solid experience they need to provide clients with the best insurance solutions, tailored to their specific needs.

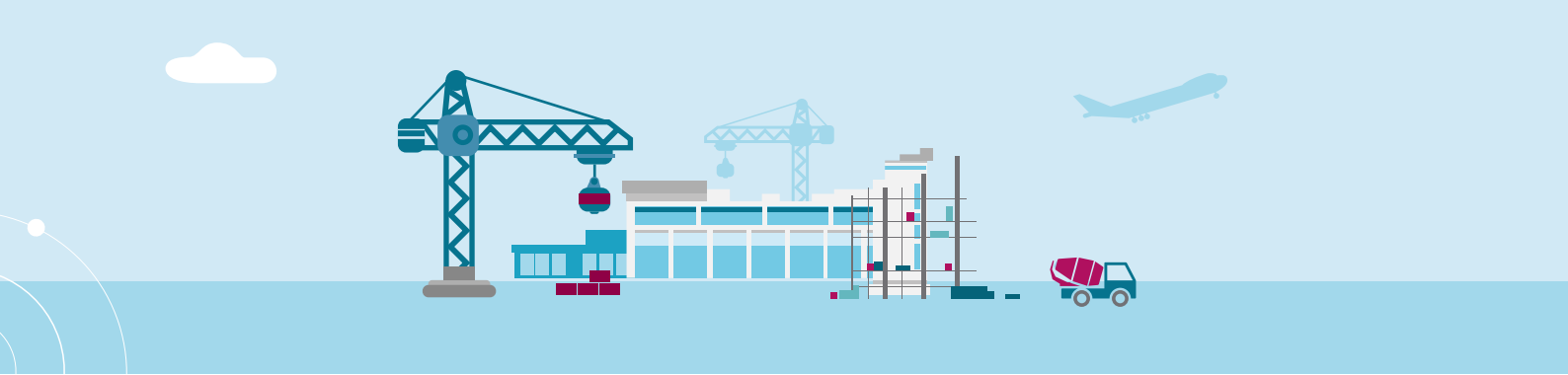
Achieving a good balance between a smart local service and stable capacity, good technical knowledge and long term presence, help to put in place a cover that will respond on any changes, claims and risk management issues for the full duration of the project.

EFFICIENT RISK MANAGEMENT: THE INSURER'S POINT OF VIEW

FOLLOW-UP AND MAINTAINING COVER, DESPITE FREQUENT CHANGES

Megaprojects require extensive follow-up by the insurers, sometimes involving hundreds of endorsements and thousands or even tens of thousands of claims when third-party liability is covered. These constraints carry their own risks if they are not monitored correctly. A break in the information chain also represents a risk to which our teams are highly alert, particularly regarding contractual endorsements (change of timeframe, increase in sums insured, additional works to be covered by the policy, etc.).





On a large transportation project in Asia, reduction of the financial interest rates drastically lowered the DSU sum insured over the course of the project and we had to estimate a return premium. What do you do when your capacity is not balanced with the overall estimated premium?

These changes can affect the risk profile, the different aggregates (natural disasters, terrorism, construction, property) and the financial data and, as a result, the Maximum Possible Loss (MPL) that needs to be monitored. On Dubai Airport, the sum insured for one of the terminals increased by more than 40% over the course of the project. All the insurers involved had to adapt their capacity and protection to continue covering this major infrastructure project for the UAE.

Other events can also affect an insurance policy, such as a breach of contract between the project owners and the contractors, an embargo (Russia, Iran), civil war or unrest (Arab spring), economic instability (Argentina, Greece), or changes in the insurance panel involved. Our insurance policies for these projects cover all the stakeholders involved – clients, project managers, contractors and subcontractors – throughout the construction period, i.e. several years, and they cannot be terminated. In relation to these projects, we must therefore not only analyze the political and economic environment ahead of time, but also be prepared to deal with exceptional situations during the contract period.

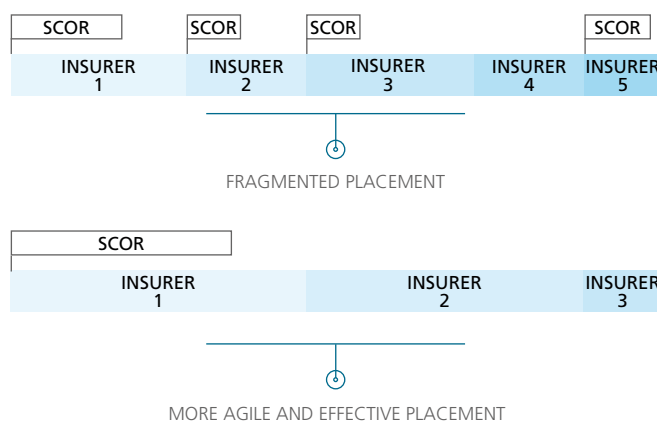
HOW INSURERS ARE ALSO MANAGING THEIR OWN EXPOSURE

The long-term viability of (re)insurers does not just depend on their capital management and financial ratings. The average lifespan of megaprojects is considerably longer than 5 years and (re)insurers need to be there for the whole duration of the project. Certain underwriters have had a more than adequate rating and been confirmed for highly competitive placements, but their management teams have decided, for reasons of profitability and capital allocation, to no longer offer coverage for the construction line of business. Replacing insurance/underwriting capacities during the construction phase of a project is always a tricky issue, which only experienced brokers and insurers can handle.

How do you keep track of accumulation? Each project gives us an opportunity to learn and improve our processes. We were reinsurers for the Channel Tunnel construction project, with many small shares backing nearly all the insurance

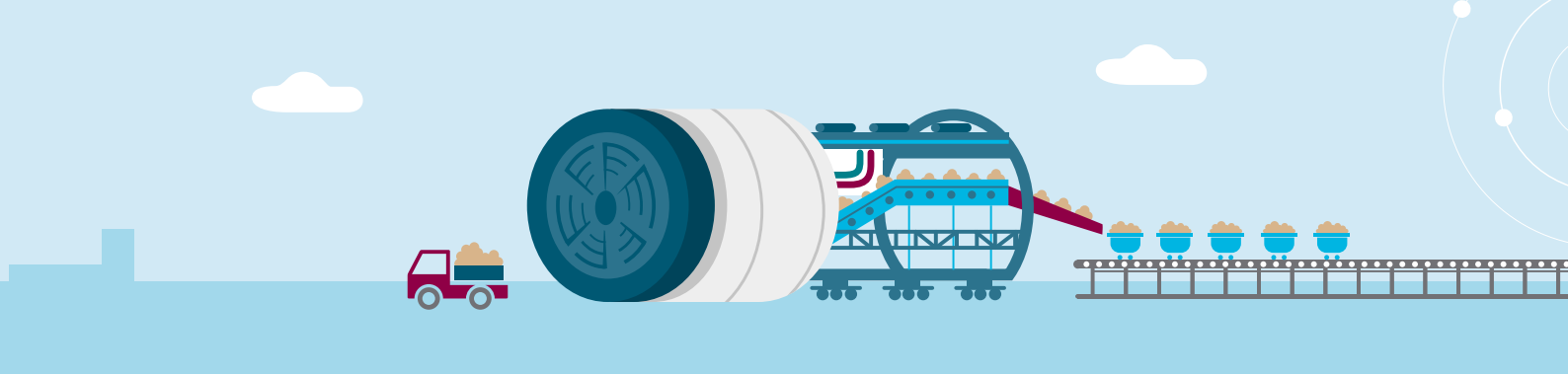
companies involved in the placement. This insurance scheme was developed in conjunction with all the parties involved, which included nearly every insurance company on the French and British markets. The tunnel was a world first with a contract worth around EUR 5 billion (in 1987 figures). Each of the cedants took out facultative cover with different reinsurers. As a result, SCOR found itself with a total of 14 facultative covers, which meant that in the end, we had one of the largest shares of the placement. Our teams quickly adopted the accumulation principle by creating links between the various accounts in order to monitor both our aggregate commitment and the evolution of the contract. We then realized that not all the cedants were giving us the same information. It differed considerably from one cedant to the other, creating an unsatisfactory situation for both the reinsurers and the insured.

Lessons learned:



Over-fragmentation of placements is not good business practice and can lead to several problems over the life cycle of the project, particularly when the main risk carriers in terms of capacity, i.e. the facultative reinsurers, are disconnected or distant from the project status on the ground.

Accumulation of capacities is also of great concern to us when it comes to the expansion of an existing operating plant or several projects on the same site. We monitor our aggregate commitments on major petrochemical projects and/or plants by considering our contribution to the operational cover and the cover requested for the construction contracts. In such cases, the amount of capital involved matches the operating loss risk. There is also a risk of propagation if a fire or explosion affects several sites at once.

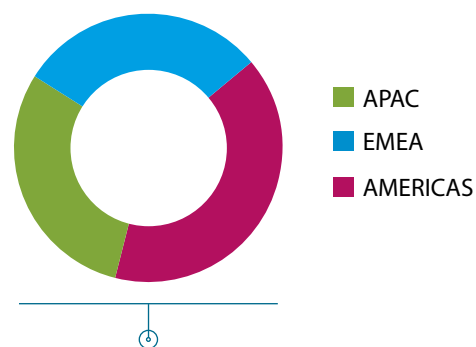


Our underwriters study the different accumulated exposure scenarios to define the maximum share we could take of the risks involved.

These situations are obviously handled in conjunction with both the underwriting management team and the Group risk management team, who are also consulted on the subject of exceptional projects before the underwriting contract is signed (amounts insured, timeframe, type of construction, etc.). This was the procedure used for the London Olympic Games, for which all the projects were covered by a single policy. This policy included an examination of the terrorism exposure involved, even though our London subsidiary was covered by Pool Re. As for the Grand Paris Express, the focus was on the long-term capacity commitment and the project cash-flow in respect of premium and reserves.

How do you handle diversification and mutualization with megaprojects? A reinsurer's strategy is necessarily long-term and designed to diversify its portfolio. For megaprojects, this means writing those projects on a worldwide basis and covering a wide range of occupancies. Our experience in different sectors, from tunnels to large petrochemical plants

in various countries, and from nuclear plants in China to airports in the U.S., are an integral part of our history, while the expertise required for these megaprojects is sourced locally whenever necessary.



A BALANCED SPLIT BY REGION OF RISKS

Each insurer has its own risk appetite, but a good balance between regions, between short duration and long tail, between civil works and industrial risks, and between standard and more innovative technology, makes for a balanced portfolio.

CHALLENGES OVER THE NEXT 30 YEARS

The way underwriters look at the insurability of construction projects has changed considerably over the past 30 years. To purely technical considerations and financial factors, we have added quality factors and planning issues, and looked at the way projects are financed, organized and risk managed. We now also incorporate societal and environmental issues, which are playing an increasingly important role in our analyses. For example, our assessment will be more positive if a dam project respects the Equator Principles, and if the World Bank is involved in the financing plan. We also value when the Project offers training programs for local populations to meet construction and operating needs. On another level, Environmental Impact Studies (EIS), which are often released publicly, are useful sources of information for underwriters.

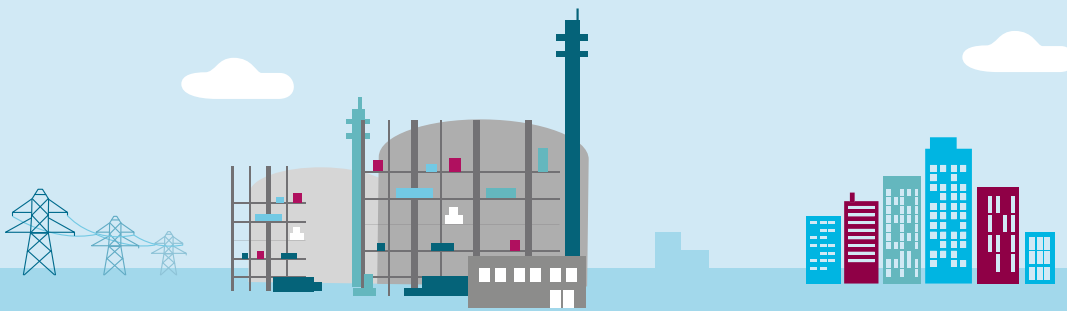
The main challenge for any megaproject insurer is to constantly adapt to the evolution of the construction industry: the construction industry is currently undergoing a technological revolution to increase productivity and

MORE INFORMATION

More than just a product, megaproject insurance is increasingly part of an entire service platform.

At SCOR, we work in close collaboration with construction companies and construction-tech start-ups to adapt and improve our risk management services and ultimately provide our insured clients with a better offering.

efficiency. New processes (BIM, 3D printing of structures) and new tools such as sensors are being used to obtain data on strain, stress, displacement, temperature, hot spots, wear, and so on, whether in real time or over longer periods. Today it is possible to aggregate and analyze this data in order to detect low signals or weaknesses in different parts of the structures or equipment installed.



A digital approach is even more pertinent for megaprojects when there is a large geographical spread and number of construction sites involved, or when the sites are not physically accessible by insurance surveyors.

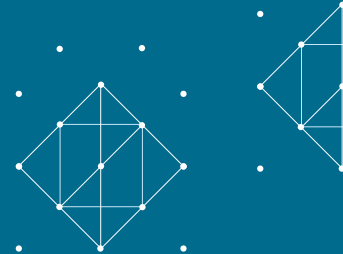
The recent Covid-19 global crisis also raises questions about investments going forward. Will governments push for large infrastructure projects to drive growth and sustainability, or will they concentrate on assisting existing small businesses and SMEs? Will they assist large corporate and development projects, on the condition that these projects improve their

social and environmental footprint? In the private sector, we currently see developers questioning about need for more office floor space in large skyscrapers, airport investors questioning about the need for more large terminals, oil price affecting investments for more petrochemical plants. Is this a short-term issue or a more drastic change affecting the volume of large infrastructure projects going forward? Or will this drive large investments in other type of infrastructure considered more appropriate to the new way of living and working and more adapted to the effect of climate change?

CONCLUSION

This newsletter outlines the key factors necessary for insuring construction of megaprojects. Partnership with clients and brokers, transparency in risk analysis, underwriting experience on a worldwide basis, availability of the financial capacity on the long term, having claims and risk management services are all key ingredients.

As a global (re)insurer of large infrastructure projects, we are continuously adapting to the needs of our clients and markets, to put in action our role as a solid partner supporting the development of sustainable and resilient infrastructures and societies.



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