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Introduction

The FIDIC Future Leaders Advisory Council (FLAC) was established to bring together a group of professionals under the age of 40 and is appointed by the FIDIC board to advise FIDIC on a number of activities and operations and provide opportunities for future leaders to participate actively in FIDIC with their peers and to develop the next generation of leaders in the consulting engineering and wider infrastructure sector.

The primary functions of the council are to:

- Engage with future leaders in the consultancy and engineering sector to promote FIDICs activities.
- Work with FIDIC to create targeted activities for its Future Leaders programme.

The FLAC provides opportunities for future leaders to participate actively in FIDIC with their peers and to develop as the next generation of leaders in the consulting engineering and wider infrastructure sector

This publication forms part of this remit. It is important that future leader's voices are heard if the industry is to move towards the sustainable development goals (SDGs), net zero and beyond.

The contributions in this report explore the issues currently faced by future leaders but also considers the issues that the next generation of future leaders may face.



Adam Bialachowski
Chair - FIDIC Future Leaders
Council



Rodrigo Juarez
FIDIC Future Leaders Council



Jeshika Ramchund
FIDIC Future Leaders Council

Foreword from Future Leaders Council Chair



For the sixth year, FIDIC's Future Leaders Advisory Council (FLAC) is delighted to issue its annual booklet to share the thoughts of future leaders, their ideas, priorities, diversity, and efforts, through different articles from all over the world.

The 2022 FIDIC Global Infrastructure Conference is one of the most significant and unique events in international scale for the engineering sector.

This year, the conference will be focusing on "Building a better tomorrow, by investing today: Sustainable infrastructure development to improve community wellbeing". The conference will include the participation of business leaders, decision-makers, subject experts, funding agencies, future leaders and other relevant stakeholders from all over the world who will meet to discuss, face and tackle the global business challenges within a positive, diverse, balanced and resilient environment.

We are pleased that the Future Leaders Advisory Council is featured prominently at the conference through the Future Leaders Symposium, Technical Tour and FLAC meetings. We hope that our presence is effective, tangible and will provide a real opportunity for future leaders to unify their voice and to play an active part in FIDIC and the industry.

Having the voices of upcoming and young engineers is important as they bring new and innovative points of view towards project delivery and the development of wider infrastructure, which in the next decade will be instrumental in determining the global trajectory towards net zero.

This booklet forms an important part of sharing the views and experiences of individuals to help build capacity across the sector. The FLAC was impressed with the quality and breadth of the submissions and is happy to report that this year's booklet could be considered the most comprehensive publication to date. We hope that you enjoy reading the articles that future leaders have prepared and find the content and context both interesting and valuable.

We look forward to welcoming you in Geneva!

Kindest Regards,

Adam Bialachowski,
Rodrigo Juarez,
Jeshika Ramchund

Presenting Authors

Acknowledging that the past few years has been challenging for everyone, the FIDIC Future Leaders Advisory Council wanted to provide a platform for future leaders in the consulting engineering industry to share, reflect and come forward with new ideas or challenges.

Having experienced life in the 'new normal', we invited Future Leaders to reflect on the challenges and benefits that have emerged from the Covid pandemic as the world shifts focus back towards in-person meetings and returning to the office and project locations

In this edition we explore several important topics from internal processes, through staff thinking and approach, through to the significant and substantive area of sustainability and the role of FIDIC and its contracts in the procurement process.

For this, the FLAC selected, as presenters, the authors whose articles better reflect the above principles. Given the challenges we face it is important that the industry shares and communicates thoughts, experiences and ideas by individuals using their unique experiences.

Authors:

- Artur Henrique de Morais Brito, Brazil
- Michael Walker, Canada
- Zhiquan Ding, China
- Diana Castiblanco, Colombia & Valentina Álvarez Botero, Colombia
- Yuki Tsushima, Japan

Sustainable and inclusive sanitation programme: assuring the water security in the metropolitan region of São Paulo



Artur Henrique de Morais Brito, Brazil



Artur is a Project Manager at TPF Engenharia, the Brazilian subsidiary of the multinational Belgium group, TPF S.A. He graduated in civil engineering at the Federal University of Pernambuco and infrastructure engineering at ESTP Paris and is currently attending a master's degree in production engineering at the University of São Paulo.

At TPF, Artur started his career elaborating feasibility studies and currently as a project manager is involved in supervision and management contracts, as well as corporate management. Artur is a member of both FIDIC's Future Leaders Advisory Council and the FIDIC Digital Transformation Committee.

Water is a precious gift. There is no exception for the biggest city and metropolitan region in Latin America. Composed of 39 municipalities, the Metropolitan Region of São Paulo (MRSP) is the home for more than 22 million people, which creates significant demand for large quantities of water every year to supply its needs. The MRSP consists of nine water production systems, *Cantareira*, *Baixo Cotia*, *Alto Cotia*, *Guarapiranga*, *São Lourenço*, *Rio Grande (Billings)*, *Ribeirão da Estiva*, *Alto Tietê* and *Rio Claro* all of them shown in *Figure 1*. The *Cantareira* system is the largest and together with the *Guarapiranga* system and *Alto Tietê* system, they supply the entire city of São Paulo, with 12 million people.

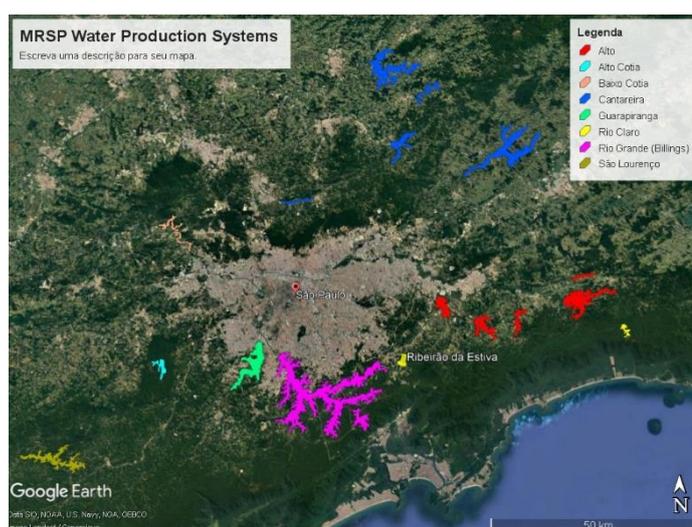


Figure 1 - MRSP Water Production Systems.
Source: Google Earth

At the end of 2013, the MRSP experienced one of its greatest periods of drought, caused by low rain levels which generated a water crisis that lasted for over two years and even expanded to other states. The *Cantareira* system, for example, was at breaking point and in danger of collapse with water levels reduced to 8,9% of its storage volume¹. Those were difficult times and the MRSP has invested a lot in the subsequent years to ensure the supply of water to its entire population and to improve the level of water security in its reservoirs.

One of the many actions taken was the creation of the **Sustainable and Inclusive Sanitation Programme** by the *Companhia de Saneamento Básico do Estado de São Paulo – SABESP*. This

¹ Source : <https://www.redebrasilatual.com.br/ambiente/2014/05/nivel-do-cantareira-tem-novo-recorde-negativo-e-chega-a-8-9-aponta-sabesp-1519/>

programme was officially signed at the end of 2019 and operates for a period of five years, until 2025, concentrating investments around \$350m and more than R\$1.5bn to finance over 100 contracts. Within this amount, \$250m is being provided by the World Bank, which brings an international perspective and experience into the programme, as well as a greater degree of concern and controls in the social-environmental area.

The main objectives of the programme are to provide access to water and sewage to sections of the population, in particular those in vulnerable conditions and to contribute to the water security of the Metropolitan Region of São Paulo. To achieve these objectives, the programme is structured in four components, as shown in *Chart 1*.

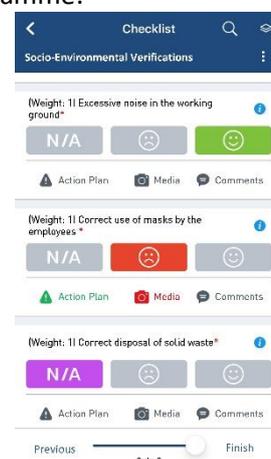
Component	Name	Description
1	Water Availability and Losses	Aims to grant access to water and sewage to more than 530,000 people , through the implementation of more than 150,000 water connections and almost 50,000 sewage connections. Moreover, improvements are expected to be done to the dams owned by SABESP, with the aim to ensure water security and, consequently, the security of the entire system. Finally, to reduce the losses in the networks, 850km of water network will be renewed.
2	Water Security of the Guarapiranga	This component aims to improve the sewage network in the watershed of <i>Guarapiranga</i> to reduce the direct discharge of sewages in the reservoir.
3	Technical Assistance	Aims to finance the hiring of studies, projects, supervision, and management contracts to support the entire programme.
4	Emergencies	This is an interesting dispositive inside the programme, once, it has no value provisioned, but if a water crisis or other emergency event occurs in the MRSP, the investments can be relocated from the other components to this one to promote a fast and solid response.

Chart 1 - Sustainable and Inclusive Sanitation Program Components.
Source: Author

Within this context, TPF Engenharia is part of a joint venture responsible for the management of the entire programme, to assist the client in different sorts of activities, such as:

- Elaboration and participation in the missions and technical meetings with the World Bank.
- Control, evaluation and update of the physical and financial evolution of the actions in the programme.
- Track the preparation and implementation of each of the components and actions planned.
- Assist the client in the definition of strategies to the future of the programme.
- Verify if the contractors are following the guidelines in the social-environmental plan, which is a relevant topic to the World Bank and to SABESP
- Perform field inspections.

To achieve the above objectives and provide the best service possible to SABESP, TPF has used innovative tools to address some issues in the contract. First, the data required to fully understand the programme was compiled in a structured database and then linked to a dashboard in Power BI, where the main information can easily be seen by the client. This information includes items such as the action plan for the next months, the schedule of



disbursements and the status of each one of the actions foreseen in the programme.

When considering the field inspections, TPF has implemented flexible checklists on a mobile platform, supported by the supervision module of the PLUG (Unified Platform of Management) which is a management platform created by TPF. In this platform we can define what will be evaluated, such as the management of solid wastes, the monitoring of noises and atmospheric pollution, occupational health and safety, and even proactive prevention against Covid 19, as well as how the inspection will be done.

In view of the above, the programme clearly demonstrates and embraces the sustainable objective and the actions of SABESP and TPF are aligned with the UN's sustainable development goals and are especially important for Goal 6 - **Clean Water and Sanitation** and Goal 9 - **Industry, innovation, and infrastructure**. The solutions being put in place are designed to be resilient and endure operation for many years. The use of innovative technologies also allows for fast and precise decision-making which is an important endeavor for São Paulo and the environment as part of guaranteeing access to potable water for the entire population and to avoid the waste of precious water resources.



Michael Walker, P.Eng., PE, PMP, Canada

Michael is a senior project manager located in Regina, Canada with 19 years of consulting and construction experience. Working at Associated Engineering, he helps his clients deliver a variety of municipal and nation building projects and programs across Western Canada, including work for private corporations, municipalities, provincial, and federal governments including clients such as Parks Canada. These projects include traditional delivery models, as well as P3 and design-builds.

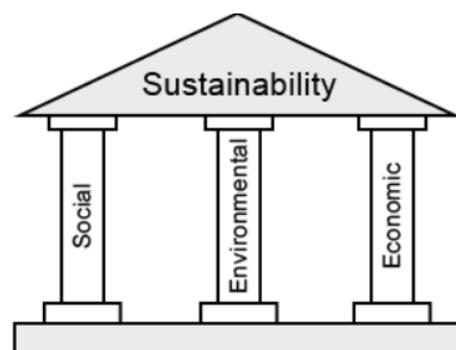
Michael has a long history of contribution to FIDIC and ACEC-Canada through presentations, conference participation, committees and working with DFS to deliver the FIDIC Future Leaders Management Certificate programme. In these areas, Michael works to assist the progression of the industry to provide better value to clients and fellow consultants through training and the promotion of the growth of communication and other critical skills for business and life. In addition to his continued work as the Canadian representative for FIDIC's Future Leaders Advisory Council, Michael is a member of the overall management and governance team for the evolution of the FIDIC Academy and also chairs the ACEC-SK Careers in Consulting Committee, both of which aim to attract, advance skills and retain people in the industry.

The Covid pandemic forced consulting practices, including our own, to accept and adapt quickly to issues never seen before and to operate with a greater degree of flexibility. Now, however, we see a swing of the 'flexibility pendulum' back from its extreme.

This transition to the 'new normal' that we have heard so much about is equally new territory for management as we try to navigate the return to office, in-person meetings and social events. These and many other factors are stressors to our firms, colleagues, the industry, and how we manage these stressors will shape our industry for years to come.

There are a wide variety of sustainability articles that focus on the outputs of our firms (designs, planning, advice) but I challenge the reader to undertake the uncomfortable process of looking internally to our firms themselves, and your management's approach to the sustainability of your own firm.

This is a thought experiment that we challenge the participants of the FIDIC Future Leaders Management Certificate (FLMC) programme to do and it continues to generate interesting feedback. Just as our communities and clients have restrictions based on the 'pillars of sustainability' – social, environmental and economic – so do our firms. Since we are an industry of people, the impacts of how we implement policies from each of these pillars are predominantly focused around the interaction of people and the firm's policies. Too often we succumb to the trap of



'greenwashing' our own firms' policies on our websites, claiming top wages and benefits, stellar environmental practice, and fantastic social licence to operate. When it comes down to it, individuals are still opting to leave the engineering and consulting industry for exactly the opposite reasons. For example, being attracted by contractors, or owners with packages that better meet the needs of that individual.

To be clear, I am not advocating for higher compensation packages, or endless volunteering to humanitarian causes, or the lack of consumption of energy to run our computers and offices. I am advocating for **sustainable** practices of all of the above. We too often incorrectly associate sustainability with extreme changes, but in reality it is really not the case. For example, my firm (Employee owned, 1,000 people, based in Canada) is carbon neutral and has been since 2009. This is a great achievement, but we haven't achieved this by making our staff walk to construction sites, or by sacrificing profitability, as we wouldn't be able to continue serving our clients if we weren't in business.

If we could simply refrain from overly greenwashing our websites and LinkedIn posts, we could more accurately attract and retain the staff that match our firms' individual values. If we can accurately portray these values to the field of current and future employees, then we not only raise our firms' contribution in the world, but companies could also reduce staff turnover which has a significant impact to our economic bottom line. Achieving such an outcome would therefore result in more funds being available to contribute to causes important to our firms (economic, social, or environmental).

Proof of such achievements can be in the form of some sort of certification or guideline such as ISO 26000:2010 (which is not certifiable) but should also contain so many more pieces that I fear are not valued as much as they are claimed to be. These include easy policies that have positive ROI to firms, such as equity and diversity training, growth programmes, parental leave wage top-up, mental health resources, flexible work arrangements and environmental programmes (shoreline clean-up, tree planting, carbon neutrality, etc.).

I would like to demonstrate the positive ROI on one item above. Since an easing of Covid restrictions the associated requirement for remote working has been changed to a gradual or full return to the office (or flexible work arrangements), however the ROI is difficult to calculate on this item as the impact is generally an intangible and difficult to measure directly. So to assist let's look at a specific area such as the parental leave wage subsidy. I will give what I think to be a fairly moderate and mid-range example by selecting a mid-level female engineer in Canada – let's say eight to ten years of progressive experience, and an annual salary of CA\$100,000 (for ease of calculation).

Canada has a government funded maternity and parental leave but it only provides wage coverage up to a maximum level (15 weeks at CA\$638/week max for new mothers and CA\$638 for an additional 35-week period for all new parents to be CA\$31,900 over 50 weeks combined). Therefore, many employers in Canada offer a top-up policy to reduce stress on new parents (diapers aren't cheap!) and to encourage a return to the firm once the period is over in the form of 'golden handcuffs' or a repayment of the funds if the employee selects to leave the firm within a given period of time (usually one to two years depending on level of top-up).

In my experience and discussion with others in the industry, across consultants, owners, and contractors, this varies from no policy, to a 100% top up for up to 12 months (wow!). To be somewhat fair, I present the difference between the 'do nothing' and what I consider to be the industry average policy in Canada (top-up for part of the leave period – to 100% of base salary for 21

weeks). It should be noted that detailed research is being conducted currently and more accurate numbers are soon to be available.

If we were to take the average cost for this top-up, it would be the difference between the government coverage and the base wage, which works out to about CA\$1285/week. Over 21 weeks (15 maternity and six weeks parental) this would equate to be just shy of CA\$27,000. Assuming that this person has the world average of 2.4 children (higher than the current 1.47 Canadian average), the total cost to provide this benefit would be CA\$65,000 over the average lifetime of the employee. This is not a small amount of money to either entity, but I would argue that a new parent evaluating starting a family with a firm that provides any top-up would be significantly better off compared to one that doesn't. I would also argue that the industry average bonus structure would dwarf this number over the working life of the individual. This can then (and does) factor into the decision to move firms or industries when this time in life approaches and results in net movement away from firms without these policies in my experience, resulting in higher turnover rates in those firms and higher staffing costs (which they were trying to avoid).

Based on numbers from a Canadian benefits website, and our mid-level female engineer, the cost to replace this employee is around 150% of her annual salary (CA\$150,000) should she elect to change employers. This includes factoring hard costs such as recruitment, interviewing, orientations and soft costs, such as reduced productivity during onboarding and time spent with the new hire by senior staff. For reference, the SimplyBenefits.ca website notes that costs or turnover range from 30-50% for juniors, up to 400% for senior staff which lines up with what I have heard over the years from the industry.

For this average case to make economic sense, the policy would need to increase the retention of the employee to compensate for the cost which is exactly what the retention agreement achieves (increasing by CA\$65,000/year divided by CA\$150,000 = 0.43 years or three months). Additionally, with the current gender split being nowhere near 50/50 (females/males) in the consulting industry in Canada (Engineers Canada's goal of 30% female engineers by 2030 gives a good idea of how far we have to go). We can see that our policies likely have a negative impact on our ability to hire and retain female staff in our industry. Combined with public government benefits up to 100% for 52 weeks for employees of all genders, one can see that there is significant pull away from the industry, which is costing our firms huge sums in turnover.

I personally took a parental leave (albeit for only six weeks) and can say that the goodwill towards the firm from both myself and my spouse resulted in many extra hours of effort after my leave based on my feelings of reciprocity which likely more than made up for the direct cost.

To add to the financial example above, the ability to work flexibly (location and time) have also become somewhat standard in the industry and clients have become accustomed to video calls and flexible meeting arrangements. This has a two-fold benefit, which I hope we will not lose sight of as individuals return to the office. With the reduced need to be in-person full time (I do think there is value in minimum 60% in office time to allow for team building and better communication), we can reduce the commuting impacts on the environment and our colleagues. These costs include economic factors to the colleague such as vehicle fuel and maintenance, time that can be used for other interests, and environmental benefits including emissions reductions.

In addition to being able to work from home on a part-time basis, we also see increased geographic flexibility in staffing for fully remote work, which increases the talent pool for firms across the world. It is important, however, to recognise there may also be some disadvantages as the above can also

cause issues as some locations will inevitably lose the local talent to remote work arrangements, which will cause other stressors in those locations.

Overall, I believe that this flexibility is beneficial as long as management policy and processes can adapt and not return to the weak policy of attendance management. A return to these policies will inevitably drive employees that have enjoyed the flexibility to other employers, and further increase the cost to the industry in turnover cost. To lose sight of the benefits and progress that we have realised over the pandemic years in flexibility would be very unfortunate, but I think we need to keep the progress moving forward to achieve sustainability and improved resiliency of our overall industry. Those firms that can take advantage of this 'new normal' will inevitably be an employer of choice and will benefit from the policies that keep the talent in their firms, and the associated reduced turnover costs.

So, please take the time and reach out to your colleagues (on which these policies impact) and see if they are prepared to share their thoughts on what can be done to improve your firm's ability to attract and retain staff. This will help to continue your firm's sustainability journey! Finally, if you want a fresh view from others in the industry, I encourage you to talk to some of the FLMC participants at this year's FIDIC Global Infrastructure Conference!



Zhiquan Ding, CEng MICE, MRICS, LEED AP, CHINA

After graduation from Dalian University of technology in 2009, Zhiquan Ding is now working as a project manager as well as department director in CCCCFHDI Engineering Co. He has spent 13 years in building design and project management and has implemented lots of applicable sustainable strategies in his projects for local community wellbeing. After his years of green building experiences, he has obtained LEED AP Credential offered by US Green Building Council.

He is a chartered engineer in the UK, a member of UK Institution of Civil Engineers, a UK Royal Institution of Chartered Surveyor, a Registered Investment Consulting Engineer in China, a Registered Constructor in China, a Register Consultant Engineer in China and a FIDIC Certified Engineer. He has finished more than 80 projects, published 12 scientific papers, and obtained seven patents. His projects have also won lots of national level prizes in China.

The Guyana Pegasus Suites Hotel and Corporate Centre project is located on the north coast of Georgetown, the capital city of Guyana, with a view of the Atlantic Ocean. It is considered that it will become a new landmark for not only the country but the entire Caribbean region.

The project covers an area of 15,000m² and has a total functional area of about 35,000m², consisting of a 12-story 54.4m high building and a seven-story 32.3m high podium, with a full range of functions including office area, multimedia centre, restaurant, cafe, gym, outdoor leisure space and parking facilities, as well as presidential suites and premium rooms. The project is designed according to US standard and LEED green building codes for all disciplines.



Fig.1 Front view of the hotel and business centre

Being the project manager, I always balance three bottom lines, which are environmental stewardship, social responsibility and economic prosperity, to achieve the enhanced quality of life for the local community. The main sustainable strategies that were applied in the project are composed of location and transportation, sustainable site, water efficiency, energy and atmosphere, material resources and indoor environmental quality. Below I discuss some of the aspects of each of these in more detail:

- 1. Location and transportation:** The bicycle facilities were considered and applied in the design to allow for better solutions. For example, the project site provides for bicycle storage spaces with shower rooms within the building for the convenience of individuals and to encourage green transportation and reduce carbon dioxide emission. Green vehicle design measures can also be adopted further for example, to designate 5% or more of all parking spaces as preferred parking for green vehicles to further encourage people to use such vehicles. Finally, the construction company should encourage workers to adopt public transportation during construction.
- 2. Sustainable site:** The heat island effect is considered in the design. The design can adopt to use paving materials with high-reflectance value, plant more grasses and trees, and reduce the area of hard paving. The construction company also needs to consider how to protect the natural field nearby and how to keep site clean without generating too many particulates during construction.
- 3. Water efficiency:** The design of the indoor water efficiency considers using rainwater to flush the toilet, adopting water-saving fixtures and fittings such as shower heads and toilets, etc. Whereas the outdoor design for water efficiency adopts local planting which only needs rainwater to thrive. In addition, water metering should be considered in the design to monitor and encourage reduced water consumption. Also, the construction company is encouraged to use rainwater to clean the construction equipment and cars.
- 4. Energy and atmosphere:** Energy-saving curtains wall can be applied in the design to stop heat entering the building and reduce electricity consumption and improve thermal efficiency. Energy-saving products like lighting, ventilation fans, pumps and elevators can also be specified in the design. As with water, energy metering can be applied in the design to control and monitor electricity consumption for end users and encourage energy saving. Renewable energy sources can also be adopted for the sustainable design, like the roof PV panel. In addition, the construction company should make efforts and put policies in place to save energy at the construction site. For example, turning off the lights when people leave the office.
- 5. Materials and resources:** Collection and storage areas on each floor can be set to collect recyclables and the construction waste can be recycled at site as much as possible to limit emissions from transport. The construction team are also encouraged to procure materials locally to further reduce the need for transportation which can reduce air pollution and save energy. Finally, the designer and constructor should work together to adopt the green-certified products and construction materials.
- 6. Indoor environmental quality:** The designer can install CO₂ monitors to control and monitor its level, this alongside the use of a high-quality ventilation system for clean air and systems at the entryway should prevent the dirt/particulates entering into the building. To optimise the internal environment, partition walls and the office layout are optimised for space and a better-quality view. Finally, items such as smoking can be prohibited to help air quality.

After the six main sustainable strategies are applied, the environmental, social and economic benefits are achieved. For environmental benefits, the overall energy consumption is reduced by more than 30% after adopting the relevant technical measures, the indoor water saving rate is

around 40% through water-saving appliances and the reuse of grey water. The outdoor water saving rate is 100% through the use of local drought-tolerant vegetation, etc.

For social benefits, as a landmark project in the country, this project's sustainable strategies provide advanced quality life for the local community and also provide a good sustainable example for other projects in this country to follow.

For economic benefits, around \$280,500 operating cost is saved annually after the energy-saving products adopted; 145 kWp renewable energy can be generated by the rooftop solar panel, saving around \$60,200 yearly.

Finally, I am very proud to be the project manager of this project, which has already become the landmark in Guyana. By promoting and being a sustainable design, it helps to provide a blueprint to the final finished luxury hotel and business centre and can give me and local community hope and bright future.

Rethinking consulting engineering - why the future prefers projects that consider the triple bottom line of economic, social and environmental benefits



Diana María Castiblanco, Colombia

Diana is a construction management specialist and architect with experience in the development, planning, administration, management and the design of infrastructure projects. She is studying to complete her master's degree in Finance.

At Joyco, a Colombian engineering consulting firm, Diana is responsible for coordinating and integrating key activities in the management of infrastructure projects developed through public-private partnerships (PPP).

Her responsibilities include technical and financial analysis, administrative decisions and risk management to ensure the company's projects are both suitable and profitable.



Valentina Álvarez Botero, Colombia

Valentina is a corporate communications specialist and international relations professional with a strong intercultural background and experience in high-level communications.

Since joining Joyco in 2021 as communications officer, she has been actively involved in the development, planning, and implementation of communications strategies. This experience has positioned Valentina to become deeply ingrained in the company's core business.

In her current position, she devised various communications plans to promote the business's international strategy and has overseen overall editorial control to ensure the proper content and tone of this messaging.

A more sustainable world is only achieved by the sum of every effort, and all actors play an indispensable role in this race to protect our planet. The Covid pandemic had an impact on all three dimensions of the 2030 Agenda - social, economic and environmental. That is why, now more than ever, companies are also responsible for taking serious steps towards achieving sustainable development. More precisely, consulting engineering firms work on a project-by-project basis on a wide-ranging sustainable issue related to physical planning, construction of buildings, transport and water management, among others.² Thus, these actors influence the development of a more sustainable world. That is why it is important to ask ourselves - "What is the impact of developing a project that considers the triple bottom line of economic, social and environmental benefits?"

The first aspect to address is the fact that **there is a high degree of awareness of the need to consider green designs** and consulting engineers can be seen as the basis on which this type of

² Hojem, T. & Lagesen, V. (2011). Doing environmental concerns in consulting engineering. Engineering Studies. 3. 123-143 ([Click here](#)).

project is built. So, integrating sustainability into the life cycle of a project is more than just adding new aspects to the processes and formats of the project.³ It implies a scope shift in the project development management, understood as the “strategic planning, administration, and controlling of a project during its development life cycle”.⁴

A paradigm shift in the consulting engineer’s role

Consulting engineering companies play a key role in the ongoing shaping and reshaping of the world we live in. This includes a comprehensive approach to sustainability that entails the belief that the **project’s success includes not only time, budget and quality aspects, but also the triple bottom line of economic, social and environmental benefits, both in the short and long term.** This implies a new perspective, in which consultants need to review their current roles and embrace their responsibilities as specialists in sustainable development and increasingly work together with a wider spectrum of stakeholders to achieve this common goal. This change not only brings a global and long-term perspective to the consultancy profession, but it also stands for the future of project-based organisations⁵ In the next section, we aim to present the impact of developing a project that considers economic, social and environmental benefits.

The triple bottom line in consulting engineering projects

The building sector is said to be responsible for up to 33% of all emissions, around 40% of all material consumption and 40% of all waste consumption.⁶ The outcomes of a sustainable management approach can be measured in two main lines - an **increase in energy efficiency** and a **transition towards a circular economy.**

The contribution of the consulting engineer in favour of sustainability must be implemented across the whole project lifecycle, through passive and active energy efficiency strategies. On one hand, the passive design optimises energy demand by maximising the use of natural energy opportunities as they relate to the location of the building, the local climate and the properties of the building materials. On the other hand, once the energy demand has been optimised, an active design that either uses or is able to produce electricity itself is implemented. Some of the technologies used to achieve this are solar panels, heat recovery systems, or the use of renewable energy sources such as wind turbines. Additionally, introducing circular economy thinking into the project lifecycle contributes to reducing material use (material efficiency measures), substituting high impact materials with lower impact materials and recirculating products or materials by reuse or recycle actions.⁷

Social benefits:

Sustainable construction benefits have a positive social impact, mainly associated with the health and wellbeing of the users. According to research carried out by Harvard TH Chan School of Public Health, Syracuse University Center of Excellence and Suny Upstate Medical School, workers in green

³ Silvius, A.J. & Schipper, R.P.J. (2014). Sustainability in project management: A literature review and impact analysis. *Social Business*. 4 (1), 63-96 ([Click here](#)).

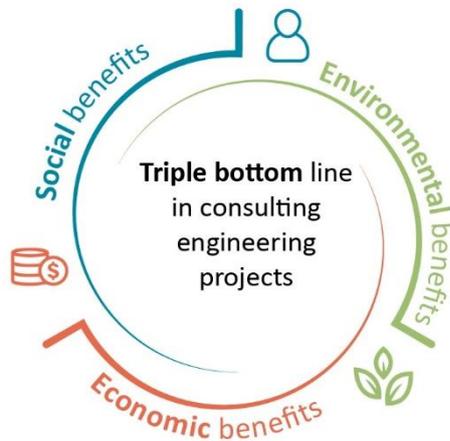
⁴ Austin, G. (2020, November 24). What Is Development Management? ([Click here](#)).

⁵ Armenia, S., Dangelico, R.M., Nonino, F., & Pompei, A. (2019). Sustainable Project Management: A Conceptualization-Oriented Review and a Framework Proposal for Future Studies. *Sustainability*. 11 (9). ([Click here](#)).

⁶ Ness, D & Xing, K. (2017). Toward a Resource-Efficient Built Environment: A Literature Review and Conceptual Model. *Journal of Industrial Ecology*. 21 (3), 572-592.

⁷ Cerdá, E., & Khalilova, A. (2016). *Economía circular*. *Economía industrial*, 401 (3), 11-20.

and well-ventilated building conditions register a 101% increase in cognitive scores.⁸ Also, we can expect a generation of awareness from users and a chain reaction can take place in which people replicate sustainability criteria in their daily lives.⁹ Lastly, local communities can benefit in terms of more employment opportunities generated by these constructions.



Environmental benefits:

Studies (see Hojem & Lagesen, 2011 [1]; Silvius & Schipper, 2014 [2]; Ness & Xing 2017 [3]) have shown the environmental benefits related to sustainable construction. Some are a lower environmental footprint during the life cycle of the project, savings in water consumption, less waste generation and efficient use of materials.

Economic benefits

It is commonly taught that a sustainable approach is more expensive than a traditional building, but many green buildings cost the same or even less thanks to an integrated design that contemplates recyclable materials and the

environment from the start.¹⁰ The economic benefits for the government, investors, operators and users are numerous and in the medium and long term mean a better return on investment. Some of these benefits include a decrease in operating and maintenance costs, tax benefits for builders, value-added in construction projects and a reduction in public spending on environmental protection strategies and health care systems due to lower pollution and better life quality.

Undoubtedly, the transformation of sustainable infrastructure requires continuous learning, changes in production models, business models, management systems and even governance.¹¹ The benefits offered by sustainable construction, however, compared to a traditional one, are not only a significant reduction in natural resource usage and a lower environmental impact, but also in social welfare and the wellbeing of all inhabitants of our shared global ecosystem.

⁸ Almaster, S. (2020). Beneficios de la economía circular en la construcción de edificaciones. (Bachelor Dissertation). ([Click here](#))

⁹ Harvard TH Chan School of Public Health, Syracuse University Center of Excellence, & Suny Upstate Medical School. (n.d.). The impact of green buildings on cognitive function. ([Click here](#))

¹⁰ Malaver Jaramillo, N. P & Ortiz Esguerra, N. F. (2018). Análisis de las edificaciones sustentables como la mejor alternativa económica, social y ambiental para la construcción en Colombia. (Specialization Dissertation). ([Click here](#))

¹¹ Masseck, T. (2018). *Economía circular en el sector de la construcción*. ([Click here](#))

Strategies to Achieve Sustainable Sewerage System in Japan



Yuki Tsushima, Japan

Yuki Tsushima is a junior consultant working for Nihon Suido Consultants Co.. A civil engineer for six years, he has been engaged in planning and design of various kinds of sewerage treatment plants in Japan and participated in overseas projects. He is an active member of the ECFA young professional committee and serves as a chairperson.

Background

Japan's public sewerage system has rapidly developed after-the 1960s, post-second world war economic growth period after which public hygiene, flood control and environmental conservation of public waters have improved. In the recent years, though the percentage of the population having sewer systems has reached 80%, new challenges have emerged in the field of-aging infrastructure management, service continuity during earthquake disasters and labour shortages due to the decrease in population. In addition, climate change has forced sewerage systems to play new roles, such as countermeasures to extreme weather events and contribution to carbon neutrality.

Due to shifting trends in infrastructure from construction to management and renovation, Japan's Future Leaders (FL) are seeking ways to enhance our infrastructure to an advanced-level but not just by new build, but by making the best use of existing facilities and improving their systems together with their renovations. This paper introduces some of our strategies for the future development in Japan's sewerage system.

Challenge 1 - labour shortages

Japan's population growth rate has turned negative in recent years, leading to a decrease in water demand/revenue, as well as the shortage of labour. Sewerage services are mainly owned/operated by local public entities and the problem of human resource shortages is serious in small municipalities. The municipalities with a population below 50,000 amount to 561 bodies and occupy 40% of a total, each having less than five personnel working in the respective sewerage service section.

Along system-streamlining strategies such as regional partnerships of public sewerage systems and innovative public-private sector collaborations, the digital transformation (DX) of sewerage systems is an important key factor.

Data centralisation through BIM/digital twins and the digitalisation of asset registers made maintenance/management of facilities possible by small number of staff. Further, it allows remote real-time data collection and keeps personnel safe during natural disasters. Although such systems have several challenges, such as 3D modelling, onsite scanning, etc, we believe that digital transformation in this field is essential for the future.

Another area of innovation is artificial intelligence. Currently, operation and maintenance are performed mostly by well experienced experts. As the number of skilled personnel decreases in the

future, their experience, knowledge and knowhow must be carried over to the next generation by introducing automated O&M, BIM, safety procedure and check lists, abnormality detection systems, etc.

Challenge 2 - Contribution to carbon neutrality

Japan has set goals to achieve carbon neutrality by 2050. Current sewerage systems consume about 7,500 million, kWh and emit 5,960,000t CO₂ annually. This is equal to about 0.7% of total energy consumption and 0.5% of total GHG gas emissions in Japan. WWTPs and pumping stations can decrease CO₂ emissions by upgrading their systems for more efficient energy saving ones when renovations/replacements are required. Another approach is to utilise their by-product as a rich resources and energy production such as biogas production, phosphorus recovery (fertiliser production), and sewage heat recovery which have been employed in sewage systems in the recent years. Promotion of such innovations are expected to increase, eventually leading to design and construct an eco and energy efficient infrastructure system.

Challenge 3 - Disaster resilient infrastructure

Frequently, Japan has been hit by significant earthquakes which inflict severe damage to buildings and infrastructure. In addition, climate change has brought disasters, flooding in particular, which has seriously damaged sewage treatment/pumping facilities.

Building codes have been revised after such events, and the reinforcement of existing facilities has been implemented in the course of building resilient infrastructure against natural disasters. Physical countermeasures have been carried out in a series of stages, starting from investigation/survey through to planning, design and construction. Further, they include the disaster damage estimation, formulation of disaster-prevention plans, reinforcement designs of facilities, and recovery/restoration/support in the event of disasters.

It should be noted that since physical measures are limited due to the constrained budgets, non-physical measures, such as business succession plans and emergency response drills, are encouraged and used in combination to prevent/mitigate the damage against disasters.

Summary and thoughts

Due to a major shift in the trend in the infrastructure market from the construction to the management and renovation in Japan, several new challenges have arisen in the field of sewerage systems to play new roles to support the public. In the light of these challenges, it is important for FLs not only to contribute as expert professionals in the field of civil engineering, but also to build up a showcase of the best practices to sustainably succeed in the future. Knowledge and skills in a wide range of fields, such as digital technology, finance and business management, are needed to effectively and successfully implement measures to enhance Japan's sewerage systems to the next level. We believe that it is the duty of young consultants to combine technology and ideas of various fields, providing solutions that meet the needs of society.



Recognised Authors

In this section, we would like to highlight the contribution of notable authors with exciting articles.

They have provided us with opinions, experiences, and innovative ideas on how to potentially recover from the side-effects of the pandemic and how to overcome the challenging times we have been facing.

Authors:

- Aaron Ferguson, Canada
- Cristina Medrano, Colombia
- Leandro Valentin Ospina Hamon, Colombia
- Marlen Gutierrez Ortega, Colombia
- Rafael Ardila & Julián Martínez, Colombia
- Sebastian Santiago Rioja, Colombia
- La Toya Ouna, Kenya
- Juan Pablo Sandoval, Mexico
- Barasa Ongeti & Wafaa Balla, Sudan



Aaron Ferguson, P.Eng., PE, Canada

Aaron is a head of section and bridge engineer located in Halifax, Nova Scotia, Canada with over seven years of consulting and construction experience. Working at COWI, Aaron is a bridge engineer, with a specialisation in inspection and site engineer services. At COWI, he has developed a conceptual and detailed understanding of new and existing bridge structures, particularly in understanding their in-situ performance through complex bridge inspections.

With seven years of exclusive bridge engineering experience, Aaron provides bridge engineering services to multiple projects concurrently in an efficient and timely manner. Additionally, as a line manager with 15 direct reports, Aaron is his team's primary contact for professional development activities, performance reviews and engagement through its corporate action plans. Aaron is also playing a key role in the team's continued development and growth through being a mentor to junior staff and supporting recruitment efforts in Halifax and Toronto.

Aaron has a strong track record of participation and leadership within ACEC-Canada at the national and provincial level within the past five years. In 2018, Aaron was approached by ACEC-Canada and Consulting Engineers of Nova Scotia (CENS) to be the Nova Scotian representative on the ACEC-Canada Future Leaders Network (then known as Young Professionals Network), which had been vacant to date. In 2019, Aaron created the CENS FL group in 2019 February through the assistance of the alignment of select CENS board members, which quickly grew to 10-12 members through his recruitment efforts. In 2021, he became the ACEC-Canada Future Leaders Network chair for the 2021-2023 term, becoming the first chair from Atlantic Canada. Aaron fulfils the mandate of strengthened communication and the sharing of best practices between Future Leader Groups from ACEC member organisations across Canada with representatives from each province and territory. As chair, Aaron hosts and executes quarterly roundtable calls with the other provincial/territorial representatives while sitting on ACEC-Canada's board of directors. Through this role, he is an ambassador for the consulting engineering industry, CENS, and current and past Future Leaders of the Atlantic Canada region.

When should we stop 'trying things'? Perhaps a heavy philosophical question but consider for a moment how someone's mentality has changed over the years. From kindergarten, grade school, university, working as a professional and onwards and upwards. I am sure each person upon reflecting can conclude that saying "why not?" and jumping head-first into a new challenge becomes more and more infrequent as we get older. Is it risk aversion? No new challenges left? Spooked by uncertainty? It's tough to say.

Consider for a moment the perception of time. In our younger days as students, the day-to-day schooling felt as if it literally could not go any slower. Starting in September and free for the summer in late June? That's an eternity! Now, in our professional lives as consultants three to six –month projects are the 'short' ones. We are often discussing schedules week-to-week rather than day-to-day and find our schedules are discussed week-to-week not days. Now - what does this have to do with trying things you might ask? Hold that thought for a moment and acknowledge how the

perception of time, specifically what feels like a long time, how we progress through our schooling and professional careers.

When I started my bridge engineering career as a co-op student, my mentor at the time asked me what I wanted to do after graduating from university? Slightly confused, thinking the only right answer was to commit my graduated self to the company, I answered “to work on bridges and hopefully be a project manager someday”. Unmoved by my answer, my mentor responded: “Why project management?” It was at that time, I quickly realised a 16-month long co-op, while feeling like an eternity at the time, was a mere fraction of my working career. In short, I had no idea what I wanted to do or be - and that’s ok! At this point in my life, I still had difficulty coming up with the real reason I became an engineer besides the status-quo “I like math and science”. My mentor left me with an idea to ponder - consider your career as a sandbox (yes, a literal sandbox). – get dirty, try things out, get bored with something and move on, and perhaps even dig around aimlessly and see what you stumble into.



Hard to imagine after more than a year of reviewing shop drawings, assisting project managers and writing meeting minutes, that I really comprehend what else is out there in the dunes of the sandbox. Now fast-forwarding a year and returning to the same employer as my co-op, but now full-time, I’m back in the sand. I was fortunate to have a major bridge rehabilitation project in my backyard that COWI was involved with (see “The Big Lift” in Halifax, NS, 2015-2018). While an extremely technically challenging project, I was determined as a new grad to try to find my mark on the project. How did I do this? I found a way to somehow be part of the onsite engineering team for overnight and weekend shifts for a three-year period - a.k.a. jumping into the unknowns of the sandbox. I started out as a back-up member, then working as part of the night/day/weekend rotation, to ultimately leading the group through the final stages of construction. All because I just jumped head-first into my first opportunity to get involved. Since then, I have spearheaded and led inspections both solo and leading a team on long-span complex structures within Atlantic Canada all the way to parts of Africa (while still lost in the sandbox).

Similarly, I have taken a similar approach to my involvement with consulting engineering profession. I was approached in 2018 to become the Nova Scotia representative on ACEC-Canada’s Future Leaders Network. Before I could fully understand the role, I jumped in and committed to fulfilling the need. Along the way there were definite growing pains, moments of uncertainty, and no real consideration for the ultimate objective of my involvement; I just wanted to pounce on an opportunity. Since then, I have created the Consulting Engineers of Nova Scotia Future Leaders group and served as chair and now the 2021-2023 ACEC-Canada Future Leaders Chair and the first ever from Atlantic Canada. Did I ever expect this is how it would have unfolded when I said yes to joining on? Goodness knows, but the sandbox is a funny place where there is not set path.

On a more formal note, I believe everyone has probably heard the quote “life begins at the edge of your comfort zone” from Neale Donald Walsch. In the simplest of ways, it really defines what the sandbox is - going into the unknown and just “trying it”. In another light, Eduardo Briceño at TEDxManhattanBeach, described people operating in two zones: the learning zone (sandbox) and the performance zone (comfort zone). Paraphrasing, the skills we know and can operate at a high-level occur in the performance zone while our learning, growing, mistakes occur in the comfort zone.

As our careers progress, we identify what skills and activities fit within our performance zone. It is where our strengths lie, our skills are best understood, the goals are known and well defined - we understand the full body of work that problem presents. Without any time spent in a learning zone, however, our realm of comfort is so limited, that it ultimately becomes non-conducive to a healthy development (whether professionally or personally). A successful balance relies on leaping from one zone to the next in perpetuity.

	Learning Zone	Performance Zone
Goal	Improve	Do as best as we can
Activities for	Improvement	Execution
Concentrate on	Haven't mastered yet	Have mastered
Mistakes to be	Expected	Minimized

Although I'm not a new grad nor a senior engineer with all the answers, I believe the idea of being in the sandbox is independent of someone's experience or time in the industry. The reality is that opportunities come in many shapes and forms and at time intervals we rarely expect. You must, however, be in the sand and diving into new things to really see those opportunities come to fruition - it's never too late to be getting your hands dirty in a new challenge.

Now, with my line management position, I have a direct role in the staffing, development, and managerial duties of 12-15 staff. At this point in my career, I do not even know where in the sandbox I am at anymore, but I know I am still in it. Just seeing a challenge, jumping forward and seeking out support when I need it while most definitely stumbling along the way. However, I'm giving my reports the same advice I was given - "Just try it!" If it was a good experience, great! If it was a negative experience, guess what, that's also great! There is no bad experience in my opinion - just another item in the memory bank to help inform the next decision and to recalibrate.

Enjoy the sandbox, folks.



Cristina Medrano, Colombia

Cristina is the head chief of strategic development at Joyco S.A.S. BIC. She is a civil engineer specialising in integrated project management. With more than ten years of experience, she has developed extensive experience in strategic business development and cost analysis, mainly in the field of road infrastructure.

She has worked in the private sector supporting construction and consulting firms in obtaining large-scale projects with public and private clients. Her main interests are the implementation of sustainable practices for the care of the planet and the constant updating on the advances in the energy sector, mainly in those that minimise the impact on the environment.

If a general review were made of how the world is doing, undoubtedly, it would be found that it is getting better and better. If we had at this time an overview of the evolution of society over the last 200 years, we would see a 76% global reduction in extreme poverty, an increase in life expectancy of 41 years and a 40% reduction in infant mortality¹.

All this is thanks to the technological advances that have taken place during this time period, since technology is not only what is happening in this fourth industrial revolution, but a wider set of actions, resources, and procedures that have been used in the different sectors that have contributed to the development of humanity. But it is not all numbers. We cannot ignore how in the last decades a collective conscience has been generated around sustainability, where governments, companies and individuals have turned their efforts not only to obtain an economic benefit, but to find a balance with social and environmental issues.

This human development has generated an accelerated growth in cities, where infrastructure plays a key role. According to United Nations forecasts, by 2050, 70% of the world's population will live in cities². It is here where 'smart cities' take a great relevance, whose ultimate goal is to build cities with sustainable infrastructure that generate a circular economy, making use of resources and waste and generating high-value products for the city.

¹ Rosling, H. (2018). Factfulness. Barcelona. Centro de Libros PAPF, SLU.

² "El Periodico" Newspaper. El 70% de las personas vivirán en las ciudades en 2050. 2017.
<https://www.elperiodico.com/es/tecnologia/20161121/70-personas-viviran-ciudades-2050-5686544>

In some developed countries and in pioneers of 'smart cities', great advances have been observed in the implementation of different technologies that make cities achieve a better convergence with the environment. For these cities the growth and momentum no longer invades and violates the

ecosystems where they are located, but on the contrary, generates a positive impact on the environment.

In turn, at the core of its growth is the citizen, where efforts have been directed to increase their quality of life. This is achieved through the implementation of increasingly effective public transport lines, reducing the emission of toxic gases, in the creation of efficient and safe spaces that generate memorable experiences and in general several applications that different technological developments.

In contrast, in developing regions, there is still a long way to go, as economic inequalities between countries and even between cities within the same country directly influence technological progress. Few cities in this segment can point to a breakthrough in the implementation of these technologies. The interesting thing is that you don't have to start from scratch, you can build on the existing infrastructure. The most important thing is to have clear objectives, to understand what is to be improved or changed, to adopt the best technology that will have a positive impact on a triple purpose - environmental, economic and social.

On the other hand, the good news is that any effort is valid in this changing world. It is not necessary to implement a series of technologies simultaneously to achieve to be categorised among these 'smart cities. Beyond its denomination, it tends to fulfill the objectives set. It is to be clear that cities must grow with control and planning.

It is here where political will and private investment play fundamental roles in this development, from transforming public lighting to LED lighting, to the construction of bioclimatic buildings that generate renewable and decontaminating energies. From obtaining fleets of passenger transport, buses with hybrid energy systems to generating mobile applications that indicate where to get the cheapest gasoline, the time of arrival of the bus, the nearest place to dispose of batteries and electronic devices, etc.

Given the circumstances, the invitation for those cities that are beginning to take their first steps on this long road is to learn from the experiences of large cities, not to work in isolation. This will allow them to have the systems and proven technologies that will optimise time and costs and, as a result, minimise the risks that may arise.

The challenges of today are major. The world is growing at an accelerated pace and all actions implemented must be adjusted to this speed. Likewise, education at all levels is fundamental. The concept of sustainable cities should be more and more popular among the population, to understand what it is, what it consists of and what benefits are obtained.

The faster a culture focused on innovation and sustainability is generated, the more organic and accelerated the advances and developments will be, generating less impact and less distrust among the end-users, the citizens.

The world is getting better every day and we are confident that it will continue to do so.



Leandro Ospina Hamon, Colombia

Leandro is a civil engineer specialising in financial administration and roads, traffic and transportation with nine years of general experience in coordinating projects in the planning, execution, control, and closing stages, specifically in the tasks of profit margin analysis, budget estimation, financial planning (CAPEX and OPEX), coordination of personnel and contractors, review of engineering designs, execution of the contractual scope and performance of site visits. At Joyco BIC S.A.S I have been working as a project coordinator in estimation for approximately three years.

Globally, in 2015 the United Nations adopted the sustainable development goals (SDGs), a universal call to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity¹². These are made up of 17 goals and 169 targets and Colombia decided to join with other countries to meet them. One of the first steps taken by Colombia in 2018, through its highest national planning authority, the National Council for Economic and Social Policy (Conpes), was to enforce the document, CONPES 3918, which defines the strategy for the implementation of SDGs in the country, establishing the monitoring, reporting and accountability scheme, the statistical strengthening plan, the territorial implementation strategy and the mechanism for dialogue with non-governmental actors². Four points are worth highlighting in this document:

1. The adoption of the SDGs and the sustainable development approach highlight the need to adopt a long-term vision that allows for stability in the implementation of public policies.
2. The need to promote balance and interdependence between the economic, social and environmental dimensions of development.
3. The new agenda is structured on the conception that development is not the sole responsibility of governments but on the contrary a mandate for all actors in society.
4. The nature of the targets associated with the SDGs establishes challenges in terms of measurement and production of quality information for monitoring the indicators.

The need for a long-term vision for the implementation of policies, the promotion of balanced development in all dimensions and the need for proper monitoring to ensure the achievement of the desired goals are significant points of the document. If we emphasize point 3, we can also realise that sustainability is an obligation to be not only fulfilled by the government, but also by all actors involved in it, especially companies that have the responsibility to achieve a balance between the economic, social and environmental components through the maximisation of shareholder wealth.

In the infrastructure sector, Colombia has great growth potential. Industry investments have

¹² United Nations Development Programme, what are the Sustainable Development Goals? 2015, ([Click Here](#)) link to the source

²National Economic and the social Policy Council Republic of Colombia, CONPES 3918, 15 of March 2018, ([Click Here](#)) link to the source

achieved a 600% growth and a future investment of 35 trillion Colombian pesos in 144 projects has been promised. Infrastructure consulting firms play a crucial role in the sustainability cycle because their projects have an enormous and direct impact on the environment and the communities that live near them³.

Joyco, a recognised company in infrastructure projects development with more than 40 years of experience, has pledged a commitment to the transformation, progress, and welfare with quality infrastructure, advocating from its pillars of i) Quality assurance, ii) Ensuring sustainability, iii) Maximise profitability and iv) Maintain and adapt the culture.

The circular economy of the country and the global policies of the SDGs led Joyco to become a Collective Benefit and Interest Company (BIC) or General Interest Company, to continue positively impacting the national and international economic, social and environmental areas. Within this organisation, I am mainly involved in the coordination and execution of the budget estimates of the due diligence and as a professional in charge of the follow-up and control of the different projects in the execution of the organisation. The impact of my functions can observe to two extents.

Directly: The main deliverables of my position, are 'project budgets'. These are the costing phase in the planning of a project and this planning is always evaluated from a technical, economic, social, and environmental compliance point of view, projecting to achieve the most positive impacts or mitigating the negative ones in the whole execution of the project lifecycle (planning, construction, operation, maintenance, and closure).

During the elaboration of the budgets, the organisation and the directors present many technical premises of mandatory compliance for the elaboration of a quality product. Still, when analysed in-depth, they are premises of sustainability, such as:

1. The first level cost estimate of all resources (materials, equipment, and labour) is based on the sources and communities close to where the project is executed, seeking that the project hires the greatest amount of resources from the area of impact
2. To seek cost optimisation, with different engineering ideas in all the project cycles based on ecological and environmental solutions. For example, the use of pavement recycling technologies to reduce transport costs and exploitation of stone materials
3. All processes, and activities evaluated and estimated always must be approved by the quality and environmental components.

Indirectly: The organisation has many policies, but in my opinion, they have two that are particularly practical for sustainability. The first is teleworking policy. Firstly, because it reduces the carbon footprint of the transport that workers have to make to their place of work. Secondly, it offers the worker more free time that can be used for other tasks other than personal growth and thirdly the worker saves the cost of transport.

The second policy is the implementation of technological tools for the management of all the information. The printed paper within the organisation does not exist and all information is sent in digital form, avoiding all the cumbersome problems of space management, eliminating the use of paper that has direct damage on the forests, reducing the time of transmission of information between the different employees of the organisation.

³*La República*, The infrastructure sector has investments close to \$35bn over ten years, 7 of October 2021, ([Click here](#)) link to the source

In conclusion, sustainable development is the balance between the economy, society and the environment and is a commitment of all, not only of the government or organisations, but infrastructure consultancies have a huge impact in achieving it, by producing positive impacts, or mitigating negative impacts.

Therefore, from my point of view, this balance of sustainable development is part of Joyco's organisational culture. Its application is always implicitly in the functions that I perform day-to-day, directly and indirectly. To achieve these direct or indirect results, the implementation within an organisation of a culture of sustainability is fundamental because it allows workers to have a guide for execution, generating results aligned with the sustainability that the world needs.



Marlen Gutierrez Ortegon, Colombia

Marlen Gutiérrez Ortegon qualified with a degree as a professional environmental engineer in 2013. Later she obtained a postgraduate degree in natural resources management and projects for climate change. She is currently in her third semester of a master's degree in mitigation and adaptation to climate change.

Working at Joyco S.A.S. BIC, since 2014, as an environmental and sustainability specialist, she has participated in the processes of consulting environmental studies and designs, as well as auditing, control, verification, monitoring and follow-up, preparation of environmental impact studies, due diligence processes and independent engineering for road infrastructure projects executed by the Instituto Nacional de Vías -Invias, Agencia Nacional de Infraestructura - ANI, among other Colombian state entities.

In Joyco S.A.S. BIC we consider that the environment and the human resource closely articulated with sustainable development are the basis for the execution of its projects, as well as its internal and external operation, so we developed and implemented the policies, pillars, values, and creed of the organisation around it.

These guidelines have allowed us to remain and consolidate our position in the infrastructure consulting market for more than 43 years in Colombia, by contributing significantly to the connection of regions of this country with quality infrastructure. This involved the design, monitoring, verification and support processes, strategies that contribute to sustainable development and mitigation and adaptation to climate change.

According to the experience I have developed in Joyco, I consider that the process for the implementation of new and clean technologies in various ways. These include the production of building materials, reduction of environmental and social impacts, the development of materials whose origin is waste and with the purpose of being used in the area of construction, improvement or maintenance of roads, counting on strict compliance with national and international technical specifications and adaptable to different topographic and climatic conditions. These are essential undertakings and peremptory measures for the development of sustainable infrastructure in the world.

In addition, the implementation of carbon sequestration and fixation systems and the development of methods to eliminate or reduce GHGs present in the atmosphere without generating negative effects on natural resources, all play their role.

Another important factor that should be emphasised is the incorporation of innovative and light treatment systems for runoff water contaminated by vehicle traffic on road corridors and associated infrastructure, to avoid contamination of water sources with hazardous waste, which affects aquatic fauna and flora.

Specifically, in the road infrastructure sector, it is essential to pay special attention to the fragmentation and degradation of ecosystems, with the aim of strengthening and creating technical actions. These actions help to ensure ecological connectivity, through the implementation of wildlife

crossings in road corridors, taking into account the richness of vegetation cover, the strategic ecosystems present in the areas, the degree of vulnerability and risk of flora and fauna, contributing to the protection and conservation of regional ecological corridors and the genetic quality of the species.

In the same sense, it is vital that the environmental offsets established by the respective authorities not only consider the impact on biodiversity, but also include, from the project planning process, actions to avoid, minimise, and correct greenhouse gas (GHG) emissions, and adapt the territory and the community to the adverse effects of climate change.

On the other hand, in order to reduce pressure on landfills, it is important to encourage self-monitoring processes for all solid waste generated, such as disused batteries, lead batteries, packaging and containers, tires, computers, lights, WEEE and construction and demolition waste. These must be delivered to environmental managers that have environmental permits in force, which comply with national environmental legislation. The above forms part of final actions at the source, in the environment and for the proper disposal of these types of waste. Likewise, it is essential to work among the stakeholders of each company to achieve the intelligent management of services and waste and the incorporation of the principles of the circular economy in each of their roles.

It is also important in the generation of employment and especially the inclusion of women, people with disabilities and for gender considerations (LGBTTTIQA+), in the different hierarchical levels of the organisations. Promoting gender equality and diversity in each of the actions to reduce the inequality gap that generally occurs in developing countries but is also still common worldwide.

In this regard, it is essential to involve the community in the area of influence of the projects. This can be in areas such as strategies of education, training, sensitisation and awareness on issues such as environment, society, anti-corruption, gender equality and diversity, general concepts of climate change, the vulnerability of the territory where they are located and the formulation of sustainable initiatives that contribute to the local economy. The ultimate aim is that of reducing social and educational gaps in the regions, to allow the participation of the population as overseers.

With regard to GHG mitigation, it is important to carry out an inventory of GHGs and measure the carbon, water, quality of life, energy, economic and sedentary lifestyle footprint within the framework of consulting activities. Calculations are needed that will make it possible to establish strategies for reducing and offsetting emissions in order to achieve carbon neutrality in the organisations.

This can be done through the implementation of alternative and environmentally friendly energies, clean, efficient and low-carbon technologies, efficient and rational use of natural resources, sustainable mobility, implementation of sustainable transportation systems to reduce the environmental impacts of commuting to work, the effects on the social and labour environment, other mobility to work and air quality in cities.

Thus, it is transcendental to implement alternative energies that allow clean and efficient energy production at low costs. This can be done through the development of techniques and technologies that demand a high use of solid waste, reuse of existing materials and low demand of renewable and non-renewable natural resources, with the aim of reducing CO₂ emissions from energy production.

The establishment of transparency and anti-corruption policies, which lead to the generation of awareness among collaborators need to be in place to avoid the occurrence of corruption cases that may affect the sustainable growth and reputation of organisations and governmental entities.

In turn, with an adaptive approach to the adverse effects of climate change, in road infrastructure consulting processes, I consider important the assessment, evaluation and analysis of climate change scenarios (risks and vulnerability) developed by *the Instituto de Hidrología, Meteorología y Estudios Ambientales* (IDEAM) for the period between 2011-2040 in each of the regions of Colombia. In order to anticipate and propose initiatives and actions according to climate variations and extreme weather events, to cooperate in the consolidation of territories and communities resilient to climate change. Analyses that must be mandatorily included in environmental impact studies in all environmental licensing processes, supervised by the competent governmental entities.

Finally, we need to recognise the great challenge of consolidating consultancies with a sustainable approach. Such an approach incorporates and contributes to sustainable development objectives such as gender equality, affordable and clean energy, decent treatment and economic growth, industry, innovation, and infrastructure, reduction of inequalities, sustainable cities and communities, responsible production and consumption, climate action, life of terrestrial ecosystems, peace, justice and solid institutions.



Rafael Ardila, Colombia

A civil engineer with more than 12 years of experience in public and private contracting, cost analysis, budgeting, technical specifications, planning, programming, control, coordination, direction, and project management. Rafael is a proactive individual with strategic thinking and leadership abilities in managing solutions that add value to organisational objectives. Within projects, he focused on team growth by implementing good management practices with all stakeholders to achieve the proposed goals.



Julián Martínez, Colombia

Recently graduated student in environmental engineering from *Universidad Sergio Arboleda* in Bogota, Colombia, he has had two exchange experiences. The first was at UNAM, Mexico City, Mexico, and the second was carried out under a scholarship agreement at KTH, Stockholm, Sweden.

He is interested in project management, sustainable energy system analysis, renewable energies and evaluation of the different impacts that these types of projects may entail.

The biggest challenge facing humanity today is to achieve sustainable development, not only at an individual level but also at the government, institutional and company levels. This is important because of resource scarcity, changes in the natural systems and land use have reached points where nowadays several areas around the world are not fulfilling their basic needs and human rights.

But what exactly is sustainable development and what are its main components? Well, it is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN, 2020)¹³. Therefore, it means ensuring resources, quality of life and development for all the upcoming generations. What’s more, sustainable development has three main components which are the components for human existence - social, economic and environmental.

Now, focusing on the engineering and the development of projects, a specific tool to apply sustainable project management is the P5™ Impact Assessment Standard. As it is defined by the (Green Project Management, 2019)¹⁴ the main target “is to identify all sorts of potential impacts, including positive and negative impacts, in relation to sustainability.” Thus, the P5™ standard stands for the three main components of Sustainable Development and two other impact factors.

These factors are people (social sustainability), planet (environmental sustainability), prosperity (economic sustainability), product, and processes. Successfully assessing the impact of each

¹³ United Nations, The Sustainable Development Agenda, 16th March of 2020, ([Click here](#))

¹⁴ Green Project Management, The P5 standard for sustainability in project management, 2019, ([Click here](#))

component will help to close the gap between the project and sustainability, by aligning it with the UN sustainable development goals.

Having said that, given my role and experience as a Joyco engineer in the project evaluation department, the main target is to identify and pursue potential new opportunities for projects that can satisfy the needs of local communities and improve their life quality. Some of the responsibilities are elaborating different technical designs, environmental certificates, budgets and other types of documents to complete the design of the project.

The selection criteria for the project evaluation processes are based on several factors related to indirectly evaluating the components of sustainable project management. Moreover, not only the evaluation department undertakes such activity. All the different divisions of the company seek to achieve sustainable processes in their activities. For instance, the consultancy, auditing, and advisory services consider, in the decision-making, monitoring and control activities, processes that can assure sustainable project management.

An important step in the direction of sustainable project management and the optimal use of resources is the use of circular economy models. The circular economy concept in terms of project management basically means a model that involves reusing, repairing, refurbishing and recycling most of the needed materials for as long as possible. For instance, on road construction, there is a big potential where innovative processes can be implemented to significantly reduce waste.

A good example of this, is the recycling of the construction and demolition waste, where the concrete is separated, demolished and screened, transforming into the sand, gravel, etc.¹⁵ The physical properties of these screened products are of a very similar quality compared to the original product. thus, making it competitive to be incorporated within the process of the construction and maintenance of roads. As engineering companies, we can support and promote the use of these recycled materials through their implementation within the designs and/or in the auditing process by ensuring compliance with the application of these materials.

On the other hand, not only does Joyco focus on sustainable project management but also in other activities sustainability is applied. For example:

- 1) It uses a hybrid work system, in which two days per week employees can work remotely, with the purpose of improving flexibility, work quality, and talent engagement. This creates a better balance between work and personal life. In addition, commuting from work to home is reduced, thus reducing the carbon footprint.
- 2) The selection criteria for office rentals is based on those that have different sustainable certificates and standards, ensuring a better work environment and consequently, increasing talent retention. Also, having efficient environmental management i.e., reusing water, energy-efficient lighting, reducing waste by discouraging the single-use plastic and installing an appropriate classification of the waste system.

In conclusion, the best way to meet the UN sustainable development goals by 2030 is beyond an agreement between all UN nations. It is an agreement between all humans. This agreement requires several things:

¹⁵ IDU, especificaciones técnicas generales de materiales y construcción, para proyectos de infraestructura vial y de espacio público para Bogotá D.C., 2011, ([Click here](#))

- Firstly, a personal commitment so that each person can be able to fully understand all the background behind sustainable development.
- Secondly, we need a change of people's mindset, so that in every performed activity, whether at work or at personal life, one can have greater responsibility and conscience.
- Lastly, it requires adaptation and a change of habits and practices to more sustainable activities.

Overall, this is why sustainable development is the biggest challenge for humanity as it requires changing the way society works. But, at the same time, there is a belief that humanity will in the long run overcome these challenges because it is an evolving part of our nature. Therefore, it is intrinsic for humanity to have the ability and skills to evolve and be able to learn, have a mindset change, and adapt.

BIM, sustainability and FIDIC contracts in developing countries: Finding the nexus



Co-Author – Barasa Ongeti, FIDIC CCM Kenya

Barasa acts as the contracts manager for Raxio Group, a firm that builds and operates a network of tier III carrier-neutral data centres in Africa. He has previously been in the contract consultancy space, where he acted as the contracts administrator for contractors engaged in projects of varying complexity and magnitude from ports and water treatment plants to roads and bridges.

He is a young professional with a civil engineering background. He is accredited by FIDIC Credentialing Limited (FCL) as a FIDIC Certified Contract Manager. He continues his professional development in the fields of design, construction, contract administration and project management of civil infrastructure projects. Always eager to learn, Barasa likes to engage with others on topical issues in the construction industry.



Co-Author – Wafaa Balla Beshir Ahmed, PMP, PMI-RMP, FIDIC CCM

Wafaa is a civil engineer, specializing in contracts engineering and administration and is the contracts section head at TEKNO Consultancy, a leading consultancy firm in Sudan.

Wafaa has been involved in FIDIC activities since 2013. She is a civil engineering graduate from Khartoum University, Sudan. She has been awarded a Project Management Professional Certificate and the Risk Management Professional Certificate from the Project Management Institute (PMI), attended many professional, academic and professional training courses and workshops and is a regular attendee at FIDIC Global Infrastructure Conferences. Recently, she was accredited by FIDIC Credentialing Limited (FCL) as a FIDIC Certified Contract Manager.

She has also been involved in different community development initiatives, with special concentration on the role of the engineer in community and life improvement.

One of the three key values espoused by FIDIC and its member associations across the globe is “to promote sustainability in the infrastructure industry”. Sustainability has been a topic of discourse with varied definitions, more so in recent years. A prevalent definition of sustainability is that attributed to UN World Commission on Environment and Development (UNCED) in the 1987 *Brundtland Report*, which states that the aim of sustainable development is:

“...to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”¹⁶

¹⁶ Gro Harlem Brundtland. (1987). *Our Common Future: Report of the World Commission on Environment and Development*. Oslo: United Nations.

It is generally agreed that there is limited time to reverse the potential damage that is caused by how we have been historically extracting resources from our planet and using them for development. Specifically, the infrastructure industry has been viewed as one of the sectors with significant consumption of raw materials and natural resources. The World Green Building Council reports that the construction industry generates an estimated 39% of the world's carbon emissions. What tools can be used to reverse this?

In recent years, the use of Building Information Modelling (BIM) has emerged as a useful tool that helps the sector to address sustainability issues within the construction industry. While most industry players agree that BIM is now a central part of the construction industry, a universal definition of BIM is hard to come by. One widespread understanding is that BIM is a process to generate and manage digital information related to the geometrical, spatial, and functional characteristics throughout the lifecycle of a construction project.

The use of BIM is typically deployed throughout project lifecycle phases - design and specification phase, construction and manufacturing and occupancy, maintenance and operation design phase.

At its most elementary level, BIM is concerned with three-dimensional representations of buildings and structures on a graphical user interface. At more advanced levels, there are additional capabilities that have been integrated into BIM and these capabilities are the so-called 'dimensions'¹⁷.

BIM entails:

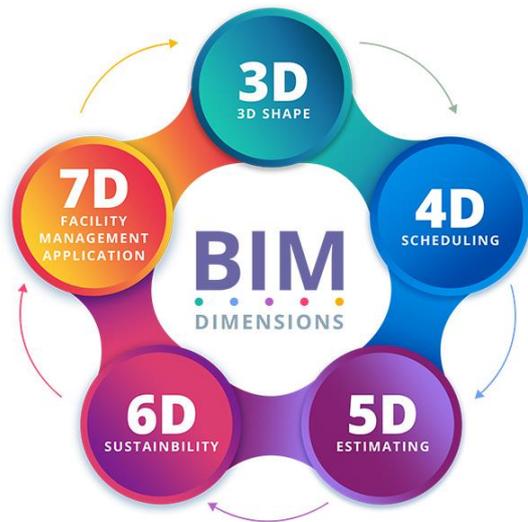
3D is concerned with Spatial and visual representation.

4D is concerned with Scheduling and time aspects.

5D is concerned with cost and value.

6D is concerned with sustainability aspects and lifecycle data.

7D is concerned with Facility Management applications.



The topic of this article is the “6th Dimension” which relates to lifecycle management data and sustainability aspects of construction.

It is well known that the implementation of sustainability requires more detailed analysis, and so also means there is proper information handling and well-managed digitalisation for the construction process. That is exactly where BIM comes into play.

- BIM allows advanced analysis, thus assists designers in achieving sustainable development goals, by creating energy-efficient buildings with a healthy indoor climate.
- BIM allows better coordination between designers and clients and assists them to study multiple solutions and design options.

¹⁷ Image source: <http://biblus.accasoftware.com/en/bim-dimensions-3d-4d-5d-6d-7d-bim-explained/>

- BIM allows for clash detection at the early stages of the project which minimises delays and cost overruns due to miscoordination of the design.
- BIM minimises the amounts of waste and over-ordering, to preserve natural resources and it is maintained by the highly efficient coordination between design, cost estimation and construction in the early stages of the project.
- Using BIM increases the building's value, as it maintains quick access to information and better data storage, for the operation and maintenance of the building. That allows for better planning and synchronisation of repairs.

The above makes a significantly compelling case that BIM will advance sustainability and environmental objectives in construction as its use and advancement continues to evolve.

In most of the developed world, the use of BIM has been widely adopted in infrastructure projects. In fact, some jurisdictions have gone as far ahead as mandating the use of BIM for projects exceeding a certain monetary value. In developing countries, however, the uptake has been much slower. This may be attributed to a combination of factors. For one, the level of digital technologies and internet penetration in developing countries does not allow for the rapid growth of BIM. Other factors are preference for the more familiar traditional processes of design and construction, levels of experience and skill and perceived usefulness of BIM.

Plans are underway at FIDIC to develop technology guidelines and a definition of scope guideline specific to BIM, with the aim of providing further detailed support for construction or building projects involving BIM. In the meantime, a useful guideline is contained in the *Advisory Notes to Users of FIDIC Contracts Where the Project is to Include Building Information Modelling Systems*, which is appended to the 2017 editions of the FIDIC contracts.

With this in mind, this article raises three central themes that should be the subject of focus. First, FIDIC contracts are widely used in developing countries. Second, developing countries have been slower to adopt BIM. Third, developing countries have a large role to play in the sustainability movement. During the development of BIM frameworks, technology guidelines and integrating BIM into construction contracts, the nexus of these three themes should be interrogated.

A collaborative effort is advised between FIDIC users, the FIDIC sustainable development committee and FIDIC Future Leaders to put in place a framework for the adoption of BIM tailored for developing countries. Due consideration should be taken with regard to the gap in the adoption of BIM between developing and developed nations.

With combined efforts, developing countries will keep up with emerging best business practices in the integration of BIM and sustainability aspects in projects governed by FIDIC contracts.

A brief reflection on the technological adoption of infrastructure delivery in Colombia



Sebastián Santiago, Colombia

As a civil engineer of the *Universidad Nacional de Colombia*, Sebastián has professional experience in project evaluation, costs and budget estimation and execution schedules analysis. He has had experience in bidding processes, contracts supervision, as well as knowledge of programming, data analysis and BIM management.

He has participated as a cost engineer in large infrastructure projects in Colombia such as the PPP project IP *Chirajara – Fundadores*, a contract with an investment of near \$1.16m for the construction, operation and maintenance of an 86 km motorway.

Nowadays he works as a business developer at Joyco SAS BIC and currently is developing an M.Sc. in Construction Management at the *Universidad de Los Andes* with a minor in ITC tools and digital transformation in the construction industry.

It is not a secret that, when evaluating the general efficiency of different economic actors throughout the globe, today's construction industry suffers from a slow adaptation to innovation and technology processes. This puts the sector behind when comparing it to other much more developed industrial sectors such as ICT and advanced manufacturing, among others¹⁸.

Little or no adoption of technology, however, is not endemic to construction. In sectors such as agriculture and mining it is also common to see this phenomenon. Given this, let's consider what all three of the sectors I mentioned have in common. The workforce lacks specialised training, and the industry involves repetitive processes covering large areas of land and require a complex supply chain as well as specialised logistics. In essence, all three subsist from processing, consuming and transforming large quantities of natural resources using processes whose adoption and emergence date back to the establishment of the first civilisations.

Although we live in a modern society, this preliminary diagnosis reflects that the digital age does not yet completely permeate all levels. In other words, there is a wide range of options to explore, strategies to implement, and processes to optimise. As a civil engineer, I believe there is an enormous gap to fulfil by using new technologies when addressing infrastructure project delivery.

Given the fact that most infrastructure projects require a large investment of capital and are not exempt from evading responsibilities related to the fulfilment of sustainable development goals, efficient use of resources and social commitment, some changes need to be implemented in order to, for example, reach zero emissions targets and accomplish high-quality standards related to efficiency. Such a change, however, must be implemented in the way projects are structured, funded, and delivered¹⁹

¹⁸ McKinsey & Company, *Voices on Infrastructure: October 2016 - The digital future of construction*, October 2016.

¹⁹ McKinsey & Company, *Voices on Infrastructure: April 2022 - Capturing the net-zero opportunity with portfolio synergies*, April 2022.

For these ideas to take hold a change in integrating stakeholders and project stages is required. For instance, implementing collaboration scenarios based on mobile and cloud technologies allowing optimisation of planning and removing reworks of a project, combined with building information tech, could help PMOs forecasting scenarios to mitigate associated risks that, in principle, will allow a greater degree of confidence on predicting results.

Proposing best practices aimed at standardisation and better training of staff involved in the construction of large projects are an alternative that in my opinion have great potential in Colombia, especially when considering for example data collected in the global competitiveness report prepared in 2019 by the World Economic Forum, in which it is reported that the average school education in the country is only eight years²⁰. Therefore, encouraging active training and preparation of the workers involved throughout the lifecycle of the projects can ensure that these suffer to a lesser extent from setbacks affecting labour quality and eventually requiring greater resource demand.

Similarly, alternatives within engineering and innovation definitely become the spearhead to propose solutions towards technological transition and decarbonisation of the construction industry. This is one of the biggest challenges, not only for the infrastructure sector but also for the economy in general.

Achieving this transition will involve a move to clean energy that will support current energy demand and thus require large capital investments putting regional economies under high stress due to change. In order to achieve the goal of zero emissions by 2050, dependence and investment in non-renewable energies at some point will likely be reduced or suspended and replaced over time.

Finally, I would like to point out that for real change to be implemented, it is necessary to establish channels of cooperation between actors where goals and agreements can be established. Since the problem cannot be tackled exclusively by private industry and the solutions it can propose, there is a need for constant interaction between state entities and non-governmental organisations to generate clear discussion and regulation, with the objective of having a frame of reference to join efforts in order to achieve objectives of technological adoption and sustainable development.

²⁰ World Economic Forum, The Global Competitiveness Report 2019, Retrieved June 10, 2022, from https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.



Eng Latoya Ouna PE, MIEK, MCiarb – Kenya

A structural engineer and construction contracts expert, Latoya studied civil engineering at the university of Nairobi, Kenya and later pursued her Master's degree in construction law and dispute resolution at the university of Central Lancashire in the UK. She is a member of the Chartered Institute of Arbitrators UK, a corporate member of the Institute of Engineers of Kenya, a professional engineer registered with the Engineers Board of Kenya and a member of the Association of Consulting Engineers – Future Leaders (ACEK-FL). She served as the chair of ACEK-FL for 2020/2021. She is currently a Future Leaders Advisory Council member and a co-opted member of the FIDIC membership committee.

She has over ten years of working experience in contract management in Kenya, working with government agencies, the private sector and international funding corporations.

LaToya believes well-structured, clear, concise construction contracts from the procurement stage are the key to successful infrastructure projects.

Introduction

According to the scientific community, human beings need to reduce carbon emissions significantly to slow down the steady increase of global temperatures that are increasing the likelihood and frequency of extreme weather conditions. Construction contracts thrive on predictability by lowering the risk for all parties involved. Unpredictable extreme climate leads to stakeholders taking comfort in the 'Exceptional Events' clause.

This paper discusses measures to ensure climate change resilient contracts whilst also delivering the required infrastructure. The synergy between the proposed solutions, stakeholder participation and overall willingness to adapt, is encouraged to reduce the risk of disputes and project overruns.

Changing climate - who is to blame?

National Geographic describes climate change as the long-term alteration of temperature and typical weather patterns in a place which could refer to a particular location or the planet as a whole.²¹ Natural processes can also contribute to climate change, including internal variability (e.g. cyclical ocean patterns like El Niño, La Niña and the Pacific Decadal Oscillation) and external forces (e.g. volcanic activity, changes in the sun's energy output, variations in Earth's orbit).²² They further explain that although the climate has continually changed throughout the earth's history when occurring naturally, the process is slow, taking place over hundreds and thousands of years. Unfortunately, the change is happening much faster with the human-influenced climate change.

Nearer home, in 2019, East Africa experienced extreme weather not witnessed in decades. The season featured eight cyclonic storms, with a record-breaking six intensifying to very severe cyclonic

²¹ <https://www.nationalgeographic.org/encyclopedia/climate-change/>

²² <https://climate.nasa.gov/resources/global-warming-vs-climate-change/>

storms and one to a super cyclonic storm, Kyarr. The effects of the cyclones on East Africa were unprecedented, recording the second costliest season in the North Indian Ocean with an estimated damage value of more than \$11.5bn.²³ The severe weather caused insurmountable destruction in infrastructure and deaths around the region, with Sudan, Ethiopia and Somalia bearing the brunt of activity. Flash floods and landslides cut off key areas in Kenya, with many towns, especially in Northern Kenya, being inaccessible.

Fast forward to 2022 and there is still growing uncertainty about the significant impact of a changing climate. It has caused freshwater shortages in South Africa, dramatically altered our ability to produce food in East Africa and increased the number of deaths from floods, storms and heatwaves. These changes singularly and collectively have significantly impacted many industries, including farming, shipping, oil and gas production and construction.²⁴ Succeeding in this harsh environment requires innovative new approaches, a collaborative effort from the scientific community and a broader appreciation for what is at risk.

FIDIC Exceptional Events clause

In 2017, FIDIC replaced the name “force majeure” with “exceptional events”. However, sub-clause 18.1 excluded any event of “exceptionally adverse climatic conditions” from the definition of what constitutes an exceptional event. Instead, it supplied the contractor with the avenue of claiming for extension of time in the case of an event of “exceptionally adverse climatic conditions”²⁵. As climate change increased exposure to extreme weather events, contracting parties were likelier to invoke this clause to avoid liability where conditions outside their control have occurred.²⁶

De-risking construction contracts in the face of a changing climate

We can achieve climate resilient contracts through innovation and adaptation. Engineers should remain at the forefront of innovation, developing climate-resilient building materials and technologies that reduce our carbon footprint. These include materials that can withstand exceptional weather, such as heatwaves, wildfires, floods, hurricanes and typhoons.

Construction contracts should factor in pre-emptive construction methods, simple approaches such as tighter building envelopes and more robust materials and cutting-edge technologies like floating platforms.²⁷

An essential key to meeting those challenges is critical environmental intelligence. Just like the intelligence of the security world, intelligence in the environmental arena combines data, analysis, modelling and assessment.²⁸ Knowledge of extreme weather events early enough reduces risk and increases foreseeability in construction contracts. Foreseeability provides certainty of the project’s projected cash flow, EOT claims and most importantly, project duration.

²³ https://en.wikipedia.org/wiki/2019_North_Indian_Ocean_cyclone_season.

²⁴ <https://www.dorsey.com/-/media/files/newsresources/publications/2017/force-majeure-and-climate-change-what-is-the-new-normal.pdf?la=en> Force majeure

²⁵ FIDIC Conditions of Contract 2017 – Redbook

²⁶ <https://www.mccarthy.ca/en/insights/blogs/canadian-era-perspectives/impacts-climate-change-foreseeable-or-unforeseeable-drafting-force-majeure-clauses-era-climate-uncertainty>

²⁷ Adam Higgins, 2018 <https://connect.bim360.autodesk.com/climate-change-resilient-construction>

²⁸ (3) (PDF) *Predicting and managing extreme weather events*. Available

from: https://www.researchgate.net/publication/258706164_Predicting_and_managing_extreme_weather_events [accessed Feb 25 2020].

Climate change is uncharted territory for humanity and adaptation is key to our survival. To adjust to these conditions, innovation geared to achieve net zero should be accessible to all in the construction/infrastructure supply chain. Whilst change can be difficult initially, efforts should be made for inclusivity, from the government to the those working on projects. In return, all stakeholders should be open minded and quick to adapt.

Are FIDIC contracts a solution for public projects in Mexico?



Juan Pablo Sandoval, Mexico.

Juan Pablo Sandoval is a Mexican lawyer specialising in construction. He gained his law degree from Universidad Iberoamericana, Mexico City, obtaining the San Ignacio de Loyola Medal, as well as the Excellency Award for the score he obtained in the national official test. He has a post-graduate degree in arbitration from the Escuela Libre de Derecho and the ICC. In 2020, Juan Pablo also attended the Construction Law Summer School given by Informa-Connect and the University of Cambridge.

He has a wide range of experience in litigation and arbitration in both sectors, national and international and has participated in international web panels organised by ALDEC – the Latin American Association for Construction Law; and is an active member of the Division 1 (Litigation and Dispute Resolution) and Division 8 (Construction Law) of the American Bar Association (ABA), publishing frequently in “The Dispute Resolver Blog” from the Division 1 of the ABA.

He is also a key member of the dispute resolution team in COMAD, S.C, a law firm specialising in construction law where he became junior partner in 2021.

Public projects in Mexico aim to fulfill the population’s rights established in the constitution. For example, in order to grant to the citizens, the right of health and a dignified social secure service, the state shall build modern hospitals and medical centers, with qualified professionals and with high technology.

In fact, there is constitutional disposition (article 134 of the Mexican constitution), that establishes that the resources used to grant citizenship rights, shall follow the principles of efficiency, transparency and integrity.

Even though the regulation for public projects in Mexico can be considered clear and strict, there are some issues that in general are considered to delay the projects but may not always actually be as simple as they first seem. For example, where the purpose of a project may be considered political, the likelihood is the project is developed in a hurry, overlooking the quality issues and the harmed party is citizens, who supposedly are to be beneficiaries.

Formalities in public projects (and in almost every administrative procedure) make every phase of the contract slow. A good example in public projects in Mexico is that there is always a person with higher hierarchy that needs to approve every step of the project. Then the time it takes to get the ‘boss’s signature’ for a specific purpose can last several days and even weeks. Thus, a simple procedure that should take a few days to be solved, a public project can delay for weeks.

Another thing that obstructs the flow in public projects in Mexico, is **the common rotation of public officers and the change in administration**. As mentioned above, for instance the public necessities are used by the current administration with politic hues. Thus, if a specific project is not delivered during the administration that started it, the most probable scenario is that the new administration will not assist the project as it should.

Lastly, (but not less important) in general the contracting authorities manage the methods and **time of payments**. So, it is common for the contracting authorities to extend the time to pay upon the argument of reviews of invoices, estimations, etc.

Having these topics in mind, the question is - are FIDIC contracts the solution?

Some of the tools that FIDIC contracts provide would fill the opportunity windows to have quality projects delivered on time

The concept of the **engineer** is a tool that would help public projects to have a flow with less interruptions. Indeed, it is common to see in public contracts an “external supervision” or a “project manager” which concept is close to the engineer one. The “external supervisor” or the “project manager”, however, are in the end external contractors so they suffer the same obstruction as the rest of the contractors. Also, these concepts are commonly, “on the side of the client”, so they cannot be considered in a similar way as the engineer.

The engineer on the other hand, if used correctly, would be a good solution since they can be appointed from the beginning as well as their fees. The engineer will act as an independent manager and will help ensure that the communication between the parties flows amicably, having a key role in the next concept - dispute boards.

Dispute boards are a very useful tool that can provide solutions for several disputes in construction. Some jurisdictions, like Peru, Chile and United States have taught us the benefits in both, time and costs that dispute boards can provide to construction. In fact, dispute boards will solve the two main topics of construction disputes: time and costs.

Regarding time, dispute boards can help public projects to solve technical disputes in an expedited manner. First, because ideally the parties do not lose time appointing the dispute board members since they are appointed at the beginning of the contract. Second, because the timeframes to notify the dispute, the lapse for the other party to reply and the time for holding the hearings is much more reduced and are also stated already in the contract.

In connection with finances, such boards can also save money as the parties’ fees are already stated in the contract and are considerably smaller than arbitrators’ fees.

Also, using dispute boards will avoid the scenario where the parties file a huge and complex arbitration with several topics to be solved. On the other hand, dispute boards will assist the disputes one by one for the benefit of the project.

In conclusion, FIDIC contracts provide several tools that can represent savings in time and money that can have a positive impact in Mexican public projects.

Specifically, implementing concepts as the engineer and dispute boards in large public projects will result in projects delivered on time and with less (or no) controversy between the parties, which consequently leads to more and better services for citizens.

It is true that the implementation of FIDIC contracts will not magically solve all the issues in large public projects, but doubtless they would bring positive results in a desirable time.

About FIDIC

FIDIC, the International Federation of Consulting Engineers, is the global representative body for national associations of consulting engineers and represents over one million engineering professionals and 40,000 firms in more than 100 countries worldwide.

Founded in 1913, FIDIC is charged with promoting and implementing the consulting engineering industry's strategic goals on behalf of its Member Associations and to disseminate information and resources of interest to its members. Today, FIDIC membership covers over 100 countries of the world.

FIDIC Member Associations operate in over 100 countries with a combined population in excess of 6.5bn people and a combined GDP in excess of \$30tn. The global industry, including construction, is estimated to be worth over \$22tn. This means that FIDIC member associations across the various countries are worth over \$8.5tn.



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