



Shalini Jagnarine-Azan

Assessing disaster-hit healthcare facilities and improving their resilience against future events makes a varied day job for Jamaica-based structural engineer **Shalini Jagnarine**. She talks to Helena Russell about its challenges and rewards.

NEXT TIME YOU ARE MUSTERING ALL YOUR DIPLOMACY in a meeting with an awkward client or doing the umpteenth iteration of a particularly irksome connection detail, spare a thought for the structural engineers whose work takes them to disaster-hit places which lack even the basics such as electricity or a functional toilet.

There's no typical day for Shalini Jagnarine – in the aftermath of natural disasters in the Pan-American region, she might be found chasing up the equipment needed to remove debris from a battered hospital so she can assess the condition of the roof; organising delivery of a shipping container to serve as a temporary store for medical supplies; or stringing tarpaulins over a damaged building so it can be used for treatment.

Finding her way

A career in structural engineering was very much accidental for Jagnarine; she wanted to study architecture but that would have meant leaving her Trinidad home, as it was not an option at the island's university. Initially driven towards pure science as an alternative, she was persuaded by a family friend to consider civil engineering on the grounds it would be a good basis for architecture.

At university, ironically, she was not inspired by her structural engineering lecturers, and it was only after graduation when she joined a small firm in Trinidad that her interest in structures was finally piqued. It crept up on her gradually through the support and inspiration of her boss Clifford Murray, who is still a trusted adviser and friend.

After a couple of years working with Murray on small structural engineering

projects, she decided to pursue a Master's qualification abroad. Again, she was diverted from her chosen path when her applications to study environmental engineering at both McGill University and Imperial College London were turned down. Undaunted, she called Imperial, hoping to persuade them otherwise, and ended up accepting a place on the structural engineering Master's course.

Having made the move to study overseas, Jagnarine planned to seek work in the UK after finishing. Unfortunately, timing was not on her side, and the recession hit just as she graduated in 2008. Although she had managed to secure a job offer, by the time she got her visa the economic downturn had put paid to her plans. She recalls it as a tough time emotionally: 'You spend all these years studying, trying to improve your skills, and when nobody wants you, it makes you feel like

you're not good enough, like you did the wrong thing! It took me a long time to brush that off.'

She returned to Trinidad to work with Murray, but only as an interim measure, having got a taste for life elsewhere. She relocated to Jamaica as a newly-wed, and despite encountering a certain amount of sexism in her search for a job, she found work at Peter Jervis & Associates as a senior structural engineer, where she remained for several years. Although she got a chance to work on larger projects, just as in her previous job with Murray, she was one of only two properly qualified structural engineers in the firm; 'Because of the level of education in Jamaica, most graduates of engineering courses are more like technicians,' she explains.

'I literally got dropped in the deep end. I think I can handle a lot of stress, but I wasn't sleeping well. Sometimes I would wake in the early hours and something would be bothering me, so I would go and crunch a few more numbers just to check things.' Reliability is high up in her list of priorities. 'Deadlines are very important to me and I am my own worst critic, putting a lot of pressure on myself to make sure things are right. There's probably nothing I send out that I haven't checked three or four times.'

This rigour proved invaluable when she decided to become a chartered structural engineer. 'If you want to be the best at what you are doing, you have to aim to be a chartered engineer, there's no other option – even though it's not necessary in the Caribbean in terms of getting a job, or being paid more.'

She recalls IStructE Fellow Esam Al Kelaby coming to the Caribbean to lead a course for those wanting to apply, and subsequently coaching them with sample papers. 'I kept doing more and more practice – I probably did about 10 papers! – and eventually Esam just told me: 'Shalini, you are ready. Don't send me any more papers, just go and do the exam and you will be alright!''

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↑FIGURE 1: Disaster response opened new chapter in Jagnarine's career, assessing damaged structures such as after Hurricane Joaquin in Bahamas, 2015



structural engineering was just a part of a much wider role. The Pan American Health Organization (PAHO) was looking for a structural engineer to support its disaster relief teams and longer-term projects (**Figure 1**) and an IStructE colleague in Barbados recommended her as a candidate.

Jagnarine's first experience, unsurprisingly, proved a baptism of fire; she was posted to the Philippines for six weeks to support disaster relief in the aftermath of Typhoon Haiyan. 'It was like an apocalypse!' she recalls. 'Total, complete devastation. Officially about 6000 people died – unofficially it was probably more like 10 000. It was a very difficult response, because we had nothing – no food, no water, no electricity. But we did what we had to. It's all about trying to re-establish healthcare services as quickly as possible.'

Her role is to assess the type and extent of the damage, and identify what kind of repairs are needed to bring facilities back into use. She not only looks at the immediate measures that are required, but also the medium and longer term, so that proposals can be made for repairs to roofs and other parts of the building, as well as improvements to the resilience of the structure to mitigate against future damage.

Typhoon Haiyan was classified as a WHO 'level three' emergency – one of the few that the region has ever seen – based on the extent of devastation, and the fact that everything was impacted:



telecommunications, water, electricity and so on. 'This classification enabled the regional unit to call for assistance from around the world, to mobilise a whole lot more resources, call on other units such as UNICEF, UNHCR and so on, and seek a lot more funding,' Jagnarine explains.

'Again, it's one of those situations where stress is something you have to be able to cope with. You're seeing a level of devastation and human suffering that you have never seen before – and you still have to be able to function. We would get up at 5 or 5.30am, breakfast would be a handful of almonds, or a

↑FIGURE 2: Post-hurricane retrofit of central medical supply store in Dominica to withstand future events

slice of toast with peanut butter and some prunes; every day. You just have to deal with it – get out there and get the job done. We worked from 6am until 11pm every day, and had to do an internal report every day to the headquarters in Manila, and a public report that would be sent to the rest of the agencies for distribution to funding agencies. It was important to identify something that you could achieve each day, and make sure all the logistics were covered to enable it to happen; get vaccines to a vaccination hub; re-establish telecoms to a facility and so on.'

CAREER MILESTONES

- 2005** Graduated from University of the West Indies St Augustine, Trinidad with BSc in Civil and Environmental Engineering
- 2005** Joined CG Murray Ltd as graduate civil/structural engineer
- 2008** Graduated from Imperial College, London with MSc (Merit) DIC in General Structural Engineering
- 2009** Joined CG Murray (Trinidad) as associate civil/structural engineer
- 2010** Joined Peter Jervis & Associates (Jamaica) as consulting senior structural engineer
- 2011** Qualified as a professional engineer in Jamaica
- 2013** Became a Chartered Member of the Institution of Structural Engineers (IStructE)
- 2013** Joined Pan American Health Organization as chartered structural engineer/disaster risk reduction specialist
- 2015** Qualified as a professional engineer in Trinidad
- 2018–19** Chair of IStructE Caribbean Regional Group
- 2019–21** Board member and trustee of IStructE
- 2022** Awarded the IStructE Keith Eaton International Award
- 2022** Became a Fellow of IStructE



In the first weeks of disaster response, the focus is on emergency repairs to keep the elements out of buildings and keep floodwater at bay. Donor funds for emergencies can only be used for things like tarpaulins, not for permanent repairs to buildings. ‘You wouldn’t get to buy timber or galvanised sheets or such like,’ Jagnarine explains.

‘We re-establish services – bring a generator in, buy fuel and get the electricity going again. Clean-up is a big thing – dealing with debris and so on is a huge part of disaster relief that doesn’t often get considered,’ she adds.

Resilient facilities

In 2017, Jagnarine was involved in relief efforts on the island of Dominica, following Hurricane Maria. While it wasn’t classified category three due to the island’s relatively small population, the

capital was impacted, losing all water supply, and had no electricity for a year afterwards. The PAHO subsequently worked with another NGO to coordinate retrofitting and repairs to 14 healthcare centres on the island, making them functional, and increasing their resilience to future events.

Jagnarine designed a new central medical supply store for the island (Figure 2); a simple building with a cylindrical shell roof that was quick to build, had geometry that was easy to understand, and could withstand hurricanes and earthquakes.

Sometimes it’s necessary to challenge traditional procedures. Jagnarine recalls going to site to check on construction of one of her designs, and being asked about the size of the timbers. ‘The builders said, ‘these are really big, are you sure you wanted to use these? We

↑FIGURE 3: Smart retrofit of Princess Alice Hospital, Grenada to improve structure’s resilience to extreme natural events and climate change

usually use smaller ones.’ We were standing up on the scaffolding and I just said, ‘yes, well have a look around you, are any of those roofs still there?’

In addition to her disaster response work, Jagnarine is just coming to the end of a 10-year programme to develop a ‘smart hospital’ approach, which has been applied to the retrofit of more than 50 facilities in the region (Figure 3 and 4). The purpose of the programme is to ensure that healthcare facilities are resilient if such natural disasters recur, and also that they are adapted to deal with other climate challenges.

‘We need to ensure that hospitals are safe and that they are green,’ says Jagnarine. ‘For example, that the predicted rise in temperatures/frequency of droughts does not make it impossible to use the facility because it’s too hot, or they don’t have any water. We make simple changes such as installing rainwater harvesting and PV panels, adding insulation, improving ventilation, and so on, to make them more resilient to climate change.’

In addition to this, her team has produced illustrated technical documents that explain to local builders how to properly design and detail roofs to resist category five hurricanes – a loading way above what is in the current codes.

With this work coming to an end, Jagnarine feels herself ready for something different, but is waiting for fate to step in. ‘I’ve been here 10 years and I think I’m ready for the next challenge, except I don’t know what that is!’ she says candidly. ‘I do like humanitarian work and the fact that it benefits people immediately. If I had to do massive commercial projects, I wouldn’t find it as gratifying. But life tends to just happen to me – I am like a piece of driftwood that goes with the flow. Something will come up, right? Or I will take a holiday.’



↑FIGURE 4: Smart retrofit of home for elderly in Richmond, Grenada



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