

From fear to Resilience

Luis Ernesto Mixco Durán: My Story with Earthquakes

Fascination with Puzzles and Numbers at an Early Age



Sometimes people ask me how it all started... and that's a tough question, because you don't just wake up one day and say, "Yeah, this is my thing." But if I go back to my childhood, I realize there were signs from the very beginning, like loose pieces of a puzzle that now make a lot more sense.

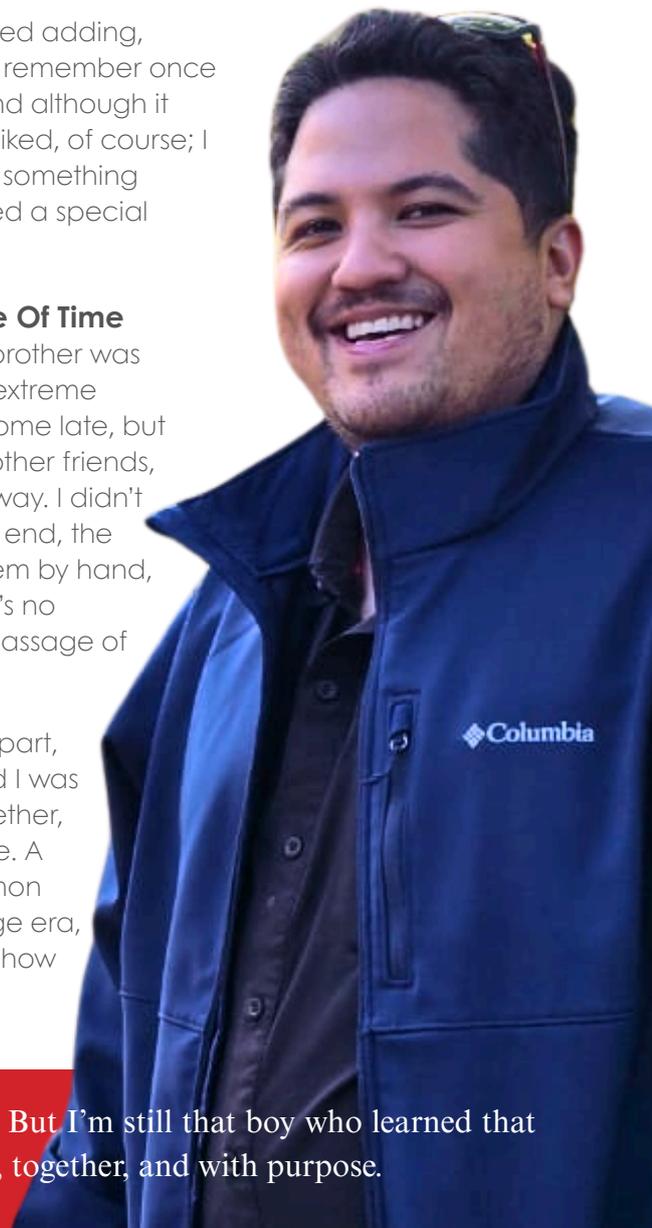
In fact, literally, I was obsessed with puzzles. I don't know how many hours I spent silently putting pieces together, completely focused, as if the whole world disappeared. I loved seeing how, little by little, each piece found its place. I didn't know it at the time, but that patience, that way of observing details, that obsession with seeing the complete picture... it was already training me for many things I apply today in my professional life.

I was also always drawn to numbers. Ever since I was little, I enjoyed adding, subtracting, playing with operations as if it were part of the fun. I remember once being given an abacus as a present, something super simple, and although it makes me laugh now, I really enjoyed it. It wasn't the only thing I liked, of course; I was also a big fan of video games like any 90s kid. But there was something about numbers, how they worked and never ran out, that sparked a special curiosity in me.

Growth and Change: Brotherhood, Memory and the Shape Of Time

There was also the adventurous side. Riding bikes with my older brother was our way of exploring the world. We would take long, sometimes extreme rides... and almost always got scolded by our mom for getting home late, but those trips were epic: we would climb mountains, meet up with other friends, and up there, at the top, we would watch the afternoon fade away. I didn't know how to name it back then, but that feeling, seeing the day end, the colors of the sky, the cloudscapes, like someone had painted them by hand, gave me a mix of nostalgia and wonder that still stays with me. It's no exaggeration to say that's where I learned to contemplate the passage of time.

My brother and I shared everything. We're exactly 1.5548 years apart, yes, I calculated it by hand when I was a kid, that's how obsessed I was with numbers. We went through tough times and joyful ones together, and I think that shaped us with a very particular way of seeing life. A mix of sensitivity and resilience that, in my opinion, is pretty common among those of us who grew up as millennials: in a kind of strange era, with a childhood with barely any technology, but that witnessed how everything began to change at full speed.



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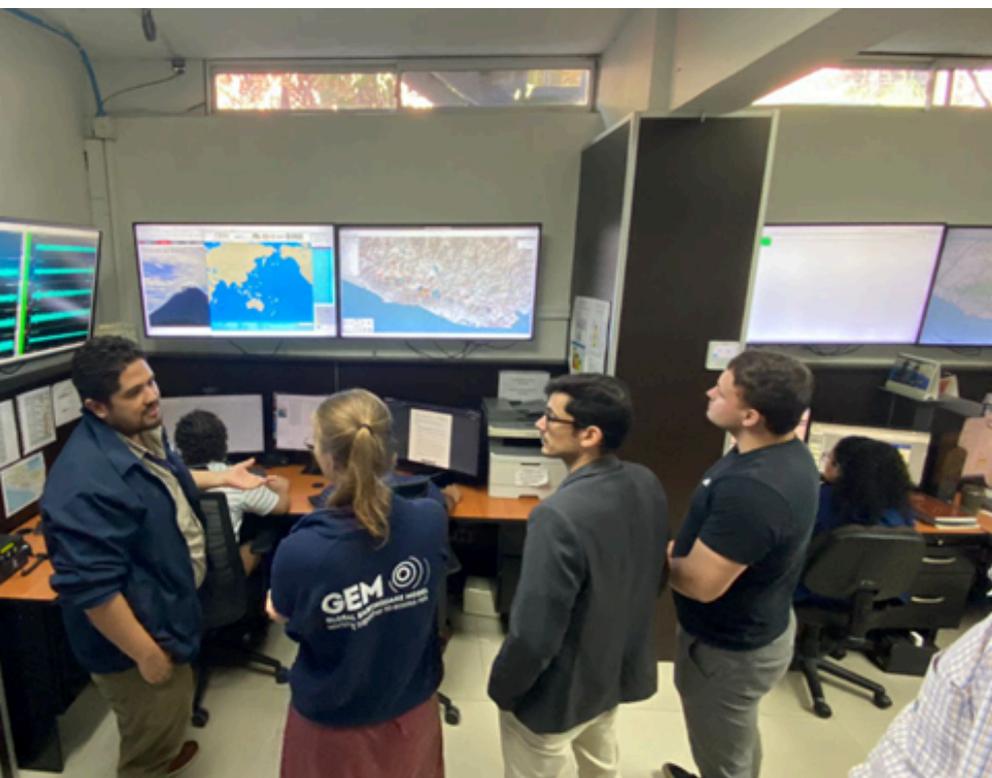


That's why I value remembering. Because when you look back to who you were as a child, you reconnect with what truly moves you. And even though we grow and change, some things never leave, they're just waiting to be acknowledged.

Epicentre of a Calling: the Day Buildings Fell and Fear Found a Voice

I was just 13 years old when the earth taught me its power. On the morning of January 13, 2001, I was on the top floor of a four-story building, taking English classes with my brother. Suddenly, the ground began to shake with a violence I had never felt before. It was a magnitude 7.7 earthquake. For many, it lasted less than a minute. For me, it felt like an eternity. That day, I learned two things: that buildings are not indestructible... and that fear has a sound, the sound of people screaming, walls cracking, and your heart racing.

What came next were the aftershocks, the cracks in our home, and the most painful part: a massive landslide that took the lives of people close to us, including friends and family. That moment left a deep scar. And without realizing it, it marked the beginning of everything.



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Between Beams and Blueprints: Discovering a Duty to Protect

My parents, an architect and a civil engineer, played a key role in my path. They taught me that engineering isn't just a profession: it's service, its responsibility, it's hope. As a child, I accompanied them to construction sites. It was there, among blueprints, scaffolding, and concrete, that I discovered my calling. I realized I didn't just want to build; I wanted to help build a safer and more resilient country. That same spirit also inspired my two brothers, both my older and younger siblings. Even the youngest, despite being just a child, absorbed the world around him. In time, the three of us would all choose the same path: Civil Engineering.

So, I went on to study Civil Engineering. I loved equations, calculations, and structural models. I enjoyed solving problems. But deep down, something kept whispering, "This has to serve a greater purpose than just passing exams. It has to help protect lives." I didn't fully understand it at the time, but I already sensed that good design wasn't just about following codes, it was about saving lives.



From Fault Lines to Frontlines: Teamwork and the Quiet Power of Leadership

In 2010, I began working at the Ministry of Environment. That's where I learned that understanding risk wasn't enough, you had to communicate it, monitor it, and turn it into action. I started as a technician in seismic and geological monitoring, working 8- to 16-hour shifts with limited equipment but with limitless conviction. I automated processes, developed my own tools, and with every step, I got closer to my purpose: protecting people.

In 2012, while working full-time at the Ministry, I decided to pursue a Master's in Business Administration. I was still trying to figure out how to align my career in civil engineering with a broader purpose, and I thought that understanding how organizations work, how to manage, plan, and lead, could help me get closer to it. It was tough. The MBA classes were in-person and held at night, which meant I often had to leave my monitoring shifts early, rush to the university, and then return to the office afterward to finish my duties. But I made it through. That experience taught me lessons that I still carry with me: the value of teamwork, the importance of organization, and the quiet power of leadership.



I'll never forget reading Blanchard's Situational Leadership model, those four stages left a mark on me. From being an enthusiastic beginner, to a disillusioned learner, then a capable but cautious performer and now, striving to become that independent achiever, the stage I'm still working toward today.



A Door in a Wall: Discovering GEM and Openquake

In 2014, I stumbled upon GEM (Global Earthquake Model) while browsing online forums. It felt like discovering a door in a wall I thought was solid. I was fascinated by OpenQuake. For the first time, science didn't feel like a black box, it was transparent, accessible. I started testing it with data from El Salvador, posting anonymously in forums. That's when I began connecting with a global community committed to change.

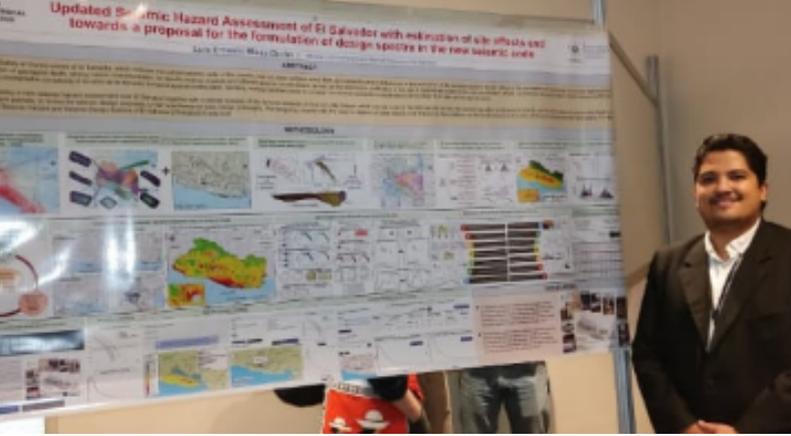
In 2017, I had the opportunity to study in Japan, one of the cradles of seismic engineering. My master's thesis focused on evaluating the seismic vulnerability of masonry school buildings using fragility curves. And for the first time, I used a probabilistic seismic hazard assessment generated with GEM tools. That experience shifted everything. I saw clearly that science, context, and human purpose could, and should, be united.

Open Tools, Shared Goals: Strengthening Risk Assessment Across Borders

Returning to El Salvador in 2019, I found a country still working with outdated hazard models. I didn't hesitate: I proposed new assessments using our own data and open tools like OpenQuake. I spoke with my supervisors, shared what I had learned, and gradually we started applying new approaches in projects financed by the World Bank and the IDB.

Even though I couldn't directly participate in the CCARA (Caribbean & Central America Risk Assessment) project because I was in Japan, I contributed by classifying strong-motion data by source and site, data that later proved essential for selecting the right GMPEs (Ground Motion Prediction Equations) for our region.





Soon after, I was invited by the University of Costa Rica to share our experiences using OpenQuake and to discuss ground motion model selection. Seeing how far they had advanced confirmed that we were not alone. We were part of something bigger, a regional vision that was starting to take shape.

The FORCE project – A Turning Point in Risk and Policy

FORCE (Forecasting and Communicating Earthquake Hazard and Risk) project wasn't just a technical initiative, it was a before and after. For the first time, we developed a complete, open national seismic risk model, with both probabilistic and deterministic scenarios.



One of the most impactful achievements was the development of future seismic risk projections, integrating socioeconomic trajectories and urban growth. I had never worked on anything like that. It was powerful to see how the way we build, live, and plan today directly affects the risk future generations will face.



This tool became a key argument to engage decision-makers, support our new seismic building code, and prove that risk reduction isn't just technical, it's political, economic, and human.



A Beacon in the Chaos: An Interactive Seismic Risk Dashboard for Emergency Response

Another milestone was the creation of an interactive seismic risk dashboard for emergency response. It allows us to quickly estimate economic and human losses after an earthquake, prioritize resources, and direct aid where it's most needed. In a country like ours, where every minute counts after a quake, this tool is literally a beacon in the chaos.

FORCE also allowed us to update our exposure model and strengthen inter-institutional collaboration. I designed an ArcGIS Survey app based on GEM's taxonomy so each institution could carry out its own inventory. These are the tools we need: practical, replicable, and appropriate.

Science, Friendship, and the Journey Still Ahead

Working with the GEM team has been more than technically enriching, it has become a professional friendship built on respect, learning, and a shared vision. And the best part: it's still growing.

But the story doesn't end here. In fact, I believe we've only laid the foundation for deeper, more sustainable change. During FORCE, we started exploring time-dependent seismic hazard, especially for subduction zones, a step that opened new questions and opportunities.

There's much more to do. I'm now working with GEM to help develop a new ground motion model tailored to our national context and to expand our understanding of risk in critical infrastructure systems. We also need to incorporate earthquake-related hazards like soil liquefaction and landslides, areas where GEM is already advancing, and where we can align our efforts with that broader, multidisciplinary vision.

Shared Knowledge, Greater Impact

Today, when I see the risk dashboard ready for emergency response, or watch new technicians use OpenQuake in our offices, I know something has shifted. We still have a long way to go, but we are no longer alone. We are part of a global community that believes data saves lives, that shared knowledge multiplies impact, and that a country can change its destiny when it decides to face it head-on.

In the end, this is more than a profession. It's a personal story that became a shared mission. It's the belief that science must serve life, and that memory, when honored, becomes fuel for transformation.



Embracing Change: As the Earth Moves, So Must We

I may have grown, changed, studied, and travelled far. But I'm still that boy who learned that the earth moves, and that we must move with it: wisely, together, and with purpose. Today, this journey has also taken on a new dimension. I'm now a father. And every decision I make, every risk model I work on, every code I help revise, every training I give, has a new layer of meaning.

My daughter is still small, but one day I hope she understands why I do what I do. I hope she remembers me not just as an engineer, but as someone who tried to make our country safer, someone who faced challenges with perseverance, humility, and hope. My greatest wish is that she grows up knowing that science is not just about numbers and models, but about people. That even in the face of uncertainty, dedication and kindness can truly make a difference.



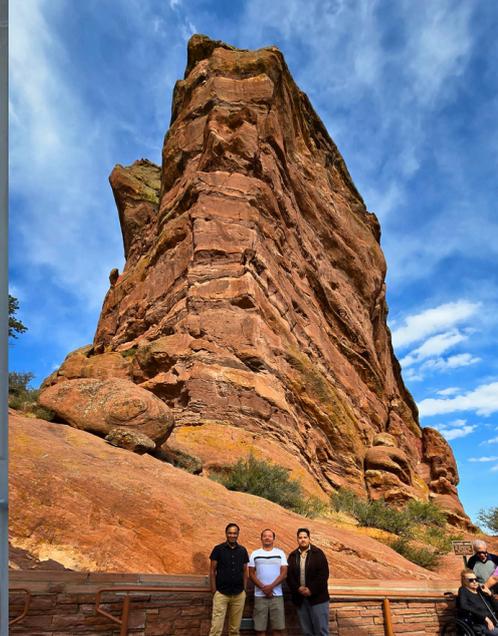
Living with Risk: What We Remember, We Prepare For

Finally, I hope this story serves as a reminder that we live on seismic land, and that memory must stay alive. Earthquake preparedness shouldn't begin only after a disaster; it must be woven into our daily decisions, into our building codes, and into the way we imagine the future. If this story can inspire other professionals, young people, or decision-makers to take action, then it has already fulfilled its purpose.

Because, as Mahatma Gandhi once said, "In a gentle way, you can shake the world."

Grazie Mille!





A Q&A with Luis Ernesto Mixco Durán

Luis Ernesto Mixco Durán obtained his Civil Engineering degree from the Universidad Centroamericana José Simeón Cañas (UCA) in El Salvador. He holds a Master's degree in Natural Disaster Management, with a specialisation in Seismic Engineering, from the National Graduate Institute for Policy Studies (GRIPS) in Tokyo, Japan, as well as a Master's degree in Business Administration from UCA.

His expertise includes geological hazard monitoring, seismological research, seismic hazard and risk modelling, calibration of instrumental intensity maps, generation of structural fragility curves, and characterisation of strong ground motion.

He currently serves as a seismologist at the Natural Hazards and Resources Observatory within the Ministry of Environment, where he contributes to advancing seismic risk assessment and updating seismic design provisions.

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About the GEM Impact Stories

Earthquake risk remains abstract and highly technical, and there are significant risks that due to poor or limited understanding of it, policymakers and the public at large may not be able to fully take advantage of existing and future information that can either help create better or enhance existing earthquake risk reduction and management strategies, especially at the local and national level.

