



BEYOND BORDERS

Building a Photonics Cluster—From Scratch

The ambitious Mexican Photonics Initiative finds a home for its proposed industry hub.

Stewart Wills

In November 2016, Mexico announced its intention to build a photonics industry capable of competing on the world stage. The occasion was the release of *Towards a Brighter Mexico*—a manifesto and roadmap developed by ProMéxico, a government agency promoting international trade and investment, in partnership with the International Commission for Optics (ICO). The report called for a Mexican Photonics Initiative (MPI) along U.S. and European Union lines; laid out a five-year agenda of

planned efforts in areas ranging from LEDs to petawatt lasers; and argued for the creation, from the ground up, of a Mexican Photonics Cluster to serve as an investment and innovation magnet.

How's the effort going? To find out, OPN talked with OSA Senior Member Eric Rosas of the Centro de Investigaciones en Óptica, an ICO vice president and the chair of the new MPI. Rosas reports that the journey forward for the Mexican Photonics Cluster has passed a key



Panoramic view of Santiago de Querétaro, the capital and largest city of the state of Querétaro, Mexico, home of the new photonics cluster.



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milestone: The selection of a host location. And while building a competitive photonics industry will take more than just a new urban photonics hub, Rosas sees some potential advantages for Mexico in the country's demographics, trade ties and growing manufacturing base.

The road to a roadmap

The plan unveiled in 2016 looks especially audacious because, until now, Mexico has not had a large industry in optics and photonics. That insight struck Rosas with particular force a decade earlier, in 2005, when, as the then-president of the Mexican Academy for Optics (AMO), he assisted in organizing the fifth annual edition of AMO's "Optics in Industry" symposium. "I realized that there *was* no optics or photonics

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industry in Mexico," he says—despite an academic tradition in the subject stretching back 50 years.

In the years that followed, Rosas and others "started knocking at several doors" in the Mexican government, to try to drum up interest in a project to foster a photonics industry in Mexico. The response was hardly enthusiastic—for a number of years, he says, the government provided no feedback at all. Moreover, as governments and personnel changed, the group found that it repeatedly had to make the same pitch again to a new cast of characters. "It was very hard work," according to Rosas.

Ambitious agenda

The persistence paid off in 2014, however, when Rosas received a call from ProMéxico expressing renewed interest in the prospects for Mexican photonics and offering to collaborate on a study. Rosas suggested adding ICO to the project. Two years later, the *Brighter Mexico* report was ready.

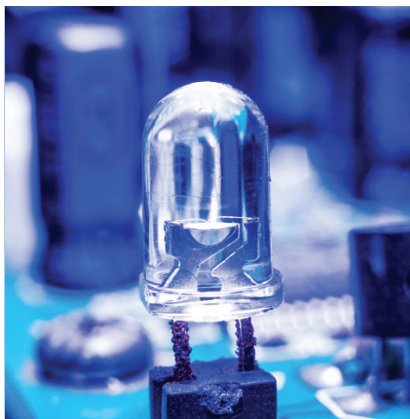
The report did not think small. The Mexican study found a model in previous landmark reports from the U.S. National Research Council that had helped jump-start public-private partnerships elsewhere: *Harnessing Light* (1998), which inspired the creation of Europe's Photonics21; and *Optics and Photonics: Essential Technologies for Our Nation* (2013), which gave rise to the U.S. National Photonics Initiative. And it laid out four specific milestones built around smart LEDs/smart cities,

photovoltaic production and use, wiring up cities with high-quality, domestically produced optical fiber, and designing and producing cutting-edge infrared sensors and a petawatt laser facility.

The plan's keystone, however, lay in the creation of a national photonics cluster—an innovation and manufacturing hub to help drive progress toward all other milestones. Industrial clusters aren't new to Mexico; in the wake of the North American Free Trade Agreement (NAFTA), the country has become home to industrial hubs geared to the automotive and aerospace sectors, among others. But the Mexican Photonics Cluster—and the considerable infrastructure to support it—would be built from the ground up, to create a zone of critical mass for photonics-oriented research and technology transfer. Projected cost: anywhere from US\$4.5 billion to US\$7 billion.

Finding a home

"The project we have right now," says Rosas, "includes a whole urban complex—it's not just some companies and research centers." Beyond the industrial and educational resources that define a cluster, the plan would include schools, cultural facilities and other infrastructure for the people working in this photonic city. All of this would sit on a 9-km² parcel of land. The project also envisions building 11,000 houses for employees on land near the cluster. It thus would have



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Towards a Brighter Mexico: Four Milestones

Here are the targets for 2016-2020 laid out by the first Mexican Photonics Initiative roadmap.

LEDs. Achieve urban lighting with Smart LEDs to improve efficient energy use in an Urban Operating Systems (UOS) environment.

Solar. Mexico will achieve an energy efficiency increase (use and production) through photovoltaic cells to produce electricity and efficient liquid fuels.

Fiber. Achieve urban connectivity with high-quality national fiber optics, and thus enable the corresponding industry in the country.

Advanced tech. Mexico will design and produce 2-20 μm photonic sensors, as well as developing an ultra-high-intensity laser (petawatt), and will control the quality of the processes through appropriate certifications.

a rather different character from areas called “photonics clusters” in other countries and regions.

On 16 May 2017, a nonprofit organization, Clúster Mexicano de Fotónica A.C. (CMF), came together to provide the mechanism for driving the photonics cluster forward. Three of Mexico’s 31 states, México, Nuevo León and Querétaro, soon expressed an interest in hosting the cluster. On 30 January of this year, the state of Querétaro finally got the nod to host the photonics hub.

Why Querétaro? Rosas points out that the state has a favorable location in north-central Mexico, with strong transportation connections to the country’s other manufacturing areas, established infrastructure and

supply chains, and a number of universities. Perhaps more important, the state already hosts clusters related to automobiles, aerospace and biotechnology—all important users of photonic technology.

Moving forward

With the locale for the cluster now set, the work of siting, funding and building can commence. At present, CMF is working with the Querétaro government to define the specific parcels of land on which the cluster will sit, after which detailed design of the cluster and its related infrastructure will begin.

Assembling a funding package to build the cluster could prove more complicated. Rosas notes that CMF is keen to attract funding that does not require government

planning, to increase the level of private investment and to give the cluster “more freedom to operate.”

Hence, while the Querétaro government will provide land and some additional amenities, CMF plans to fund the bulk of the project from other sources. One opportunity, according to Rosas, lies in humanitarian funds from worldwide non-governmental organizations (NGOs). Because of the benefits in jobs, housing, environmental quality and living standards that the cluster will provide for the Mexican popula-

tion, he explains, it qualifies as a development project. Rosas says that CMF is already in detailed talks with an NGO in Mexico, representing a U.S.-based holding, to explore a possible vehicle for such funding.

Rosas notes that some of the most important companies in Mexico have already committed to a presence in the cluster. Another key to the plan, he adds, is to attract a leading photonics-focused university from the United States or Europe to set up shop in the Mexican cluster. Rosas observes that when the Querétaro aerospace industry cluster was established a number of years ago, the University of Arkansas decided to set up a new campus in the cluster and offer programs geared to that industry. A similar effort in the photonics cluster, he maintains, could bring “a deeper approach to engineering in this industry” to complement the more academic approach of Mexican institutions.

Rosas acknowledges that the *Brighter Mexico* report’s initial

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timeframe—with a target date of 2018 for the cluster—was optimistic. Work will start this summer on a second-edition roadmap that embodies a five-year timeline to build the cluster, revises other milestone dates and better incorporates the viewpoint of industry. But “the main recommendation, to have an ecosystem to innovate in optics and photonics,” says Rosas, “will remain the most important action” in the updated plan.

Demographics and trade

Mexico, of course, isn’t the only society chasing the growth offered by a healthy photonics industry; the *Brighter Mexico* report itself notes the public-private partnerships moving photonics forward in other countries and regions, especially in

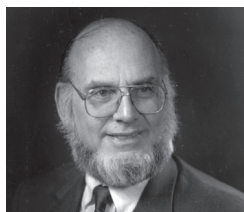
the United States and Europe. But while Mexico has its work cut out for it in building an industry that can compete in that milieu, Rosas believes the country has a number of advantages.

One could lie in the country’s demographics. “For the next 30 to 40 years,” Rosas points out, Mexico will have “a lot of young people going into their very productive part of life.” That “demographic bulge,” he argues, is something “that’s not available to most of the regions of the world,” and could offer a strong talent pool just as the Mexican photonics industry is starting to grow. Rosas also notes that, since the signing of NAFTA, the Mexican manufacturing sector has expanded, amassing significant

experience that could be leveraged in the photonics business.

Finally, despite some recent cross-border political sniping on Mexican-U.S. trade, Rosas remains bullish on the North American market, and on Mexico’s strong interconnections with the U.S. and Canadian economies. Cooperation within that trade bloc, he maintains, could help to benefit the entire region, particularly in light of competition from Asia. Right now, “we are consuming the technology, but not manufacturing or producing it,” says Rosas. “That’s something that we need to change—we need to be the most important region in this industry.” **OPN**

Stewart Wills is OPN’s editor and content director.



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