Weathering the Storm – Challenges for PR's Higher Education System

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Natural disasters, such as hurricanes, economic disasters, bankruptcy, unmanageable government debt, and economic stagnation, present the opportunity for institutions of higher learning to assess their role as anchors of their communities (Crespo, Hlouskova & Obersteiner, 2008; Skidmore & Toya, 2002). Unfortunately, many of these institutions of higher learning are not prepared and aligned to deal with the devastation caused by widespread damage to flooded buildings, the financial impact caused by loss of tuition income, the significant disruptions on the lives of university students, faculty, and staff, outward migration, and the dysfunction of the daily business of academia.

As one of the most diverse and accessible systems in the world, Higher Education performs an indispensable duty in the formation of future citizens, leaders, thinkers, and entrepreneurs; and plays a transformative role in community and economic development (Abel & Deitz, 2012).

That was precisely the reason why then poor Government of Puerto Rico established the University of Puerto Rico (state university) in 1903. After 114 years, hurricane Maria reminds us that the higher learning sector in Puerto Rico must redefine its strategies and vision and reinvent itself to survive and to contribute to the future of the Island (Matos, 2017). How does Higher Education respond to the challenges resulting from an overwhelmingly massive Category Five hurricane (Matos, 2017).

Overview of PR's higher education

Category	Indicator
Enrollment Private v. Public	Public: 132,124 students Private: 160,109 students
Full-Time v. Part-Time	Full-Time: 81% Part-time: 19%
Degree Completion	Graduate: 19,746 Undergraduate: 30,400
Degree Completion	50,146 students completed degrees
Top Academic Areas based on Degree Completion	Health Professions Administration Culinary Arts and Cosmetology Education
Number of faculty	Public: 5,697 Private: 12,226

Source: Puerto Rico Council of Education, 2017

In 2017, Hurricane Maria devastated Puerto Rico and shattered an already struggling economy and the Island's higher education system (Meléndez & Hinojosa, 2017; Bonilla-Santiago, 2017). Hurricane Maria killed more than 90 people and caused upwards of $100 Billion in damages in Puerto Rico. It also caused the loss of thousands of crops as well as forced thousands to leave the island, millions to lose their homes and many communities to be destroyed (Ferre, Sadurni, Alvarez, & Robles, 2017).

While the loss and devastation of a natural disaster is immediately unbearable with its tremendous attack on human life and natural devastation, disasters offer an opportunity for reinvention, development and innovation (Matos, 2017).

After Hurricane Maria devastated the Island of Puerto Rico in September 2017, the discourse about the impact on Puerto Rico categorized the aftermath as an economic

disaster with serious implications for life and prosperity. Disasters have the peculiarity of exposing the vulnerabilities of a country, especially when the devastation causes loss of life, housing, energy and a collapse of infrastructure (Cowen, 2014). After five months since Hurricane Maria ravished the Island, Puerto Rico is dealing with a reality that has resurfaced the profound issues of poverty, inequality and outdated infrastructure (Melendez-Olivera, 2017).

However, devastation also brings a political environment that, for a short window, provides new conditions for economic and social change (Cowen, 2014; Vallas & Pankovits, 2010). This is the case in Puerto Rico where areas such as health reform, education, job training, housing improvements, and restructuring of the economic base are opportunities that demand an investment of public and private capital.

Furthermore, the international attention, federal aid, private donations, and the work of Puerto Ricans that reside in the United States in helping fellow Puerto Ricans that remained on the island have generated emergency capital that, if managed well, can alleviate the immediate effects of the hurricane and set the island on a new trajectory. (Ferre-Sadurni, Alvarez, & Robles, 2017)

A Higher Education strategy is paramount to forging a new economic model for the Island that is progressive, equitable, sustainable and focused on common prosperity. What makes post-Hurricane Maria so devastating is that Puerto Rico was already going through one of its most challenging economic times. The country struggled with the impact of mounting government debt, bankruptcy, the exodus of private sector anchors, out migration of residents and intellectual capital to the United States, and a collapsing system of K-12 and higher education (Bosworth & Collins, 2006; Federal Reserve Bank of New York, 2012).

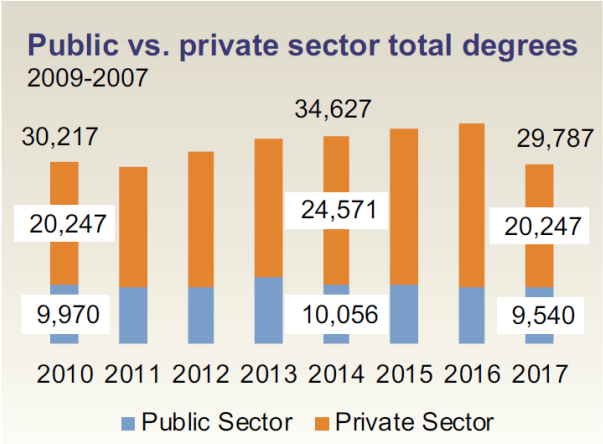
The causes for the economic devastation of Puerto Rico are varied and influenced by elements of a political structure that requires rethinking, an economic model that has hinged on borrowing to cover the government expenditures, a culture of partisan fanaticism that strangles innovation and responsibility, and a neglectful treatment of children and families. In June 2015, the government of Puerto Rio announced the Island would default on its public debt of $74 billion plus $49 billion in unfunded pension liabilities.

In June 2016, US Congress appointed an oversight board through the Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA) to take over the financial management of Puerto Rico and spearhead the process to regain fiscal sustainability. In the midst of these pre-Maria circumstances, the impact of Hurricane Maria intensified what was already a critical situation in Puerto Rico and placed the island in a survival mode.

Higher Education emerges as an anchor with assets for a new industry

The number of degrees conferred by private higher education institutions in Puerto Rico has steadily grown since 2009, granting more than half of total degrees in comparison to the public higher education system. While the number of degrees remained virtually flat from 2009 – 2011, there were minor increases

from 2001- 2016. For the 2016-2017 year, there was a significant drop in the overall numbers. Post-Hurricane Maria, this number is expected to drop as many institutions had to close and many students either did not attend schools or decided to complete studies in United States universities. For the 2016-2017 academic year, higher education enrolled 227,255 students.



Source: PR Council on Higher Education.

The Higher Education system in Puerto Rico comprises one public university system and a large network of private higher education institutions offering a variety of degrees. The University of Puerto Rico is the state university; receives 68% of its funding from the government of Puerto Rico; and operates 11 regional campuses with Rio Piedras serving as its headquarters and Mayaguez as the STEM campus. Through its Medical School, it also administers the Hospital Universitario (University Hospital) de Carolina Dr. Federico J. Trillas, which serves approximately 58,000 people annually. The faculty at the Medical School plays an important role in providing healthcare for the entire Island through their work with tertiary health institutions and hospitals, including Centro Medico, which is the largest tertiary health provider in the Island. Its programs cover multiple specializations including: medicine, pharmacy, nursing, dentistry, public health and allied health professions. Together with other advanced programs such as social work and psychiatry, the UPR Medical School produces quality health professionals that serve the population in critical areas. (Plan SoS UPR, 2.0, March 2018)

Overview of the University of PR system and student enrollment for 2015-16

University	Undergraduate	Graduate	Total
UPR- Rio Piedras	13,472	3,400	16,872
UPR-Mayaquez	12,283	1,033	13,336
UPR-Bayamon	4,927		4,927
UPR- Arecibo	4,150		4,150
UPR-Humacao	4,037		4,037
UPR-Carolina	3,920		3,920
UPR-Cayey	3,755		3,755
UPR-Ponce	3,630		3,630
UPR- Aquadilla	3,396		3,396
UPR-Medical Science	388	1,889	2,277
UPR-Utuado	1,469		1,469

Source: Puerto Rico Council of Education, 2017

The UPR also houses important partnerships through programs such as Programa de Acceso e Integración Deporte Comunitario (PAIDCO), which leads in the promotion of physical activity and wellness; the Proyecto Enlace Caño Martín Peña, which promotes environmental health for the residents in communities from the G-8; and the alliance with the Ricky Martin Foundation and the Office for Women Rights in promoting education programs for women, as well as combating issues of human trafficking. At the Mayaguez Campus, these efforts include

SIEMPREVIVAS Project, the University Institute for Community Development, the Red Sísmica, the Sea Grant Program and the various offices housing the agricultural extension programs, as well as experimental stations that promote the development of communities, the safety of people and communities in the presence of earthquakes and tsunamis and environmental conversation. (Plan SoS UPR, 2.0, March 2018)

The private Higher Education system has grown substantially in Puerto Rico and receives most of their funding from the combination of Pell grants and tuition revenue from students. On the positive side, most students enrolled in higher education are completing 4-year degrees and the number of students completing graduate degrees at the master's and doctoral levels has been increasing.

Key indicators of the higher education sector in Puerto Rico compared to the United States reveal that Puerto Rico outperforms the rest of the United States in spending on education as a whole and as a percentage of its GDP (6.4% in PR compared to 5.4% in the US) but falls behind in other indicators related to higher education.

Higher Education has been an important cornerstone of Puerto Rico's economy and in particular, has a track record for providing quality academic choices to its students. A report commissioned by the Federal Reserve Bank of New York in 2012 points to a number of features that make Puerto Rico potentially competitive, including: high literacy rates, a labor force that is largely bilingual, a favorable location for business, and Puerto Rico's political association with the United States. These potential advantages are paralleled by severe development areas, such as, underutilization of labor resources, high unemployment, and low labor force participation (Federal Reserve Bank, 2012).

Now more than ever, addressing these challenges are at the core of the future of Puerto Rico and require out-of-the- box, innovative, and integrated solutions that focus on alignment, consistency, and investments on the local human and social capital. Higher Education and the K-12 educational system play paramount roles in ensuring that the competitive edge for Puerto Rico is maximized and that the human and intellectual capital is nurtured, sustained and retained.

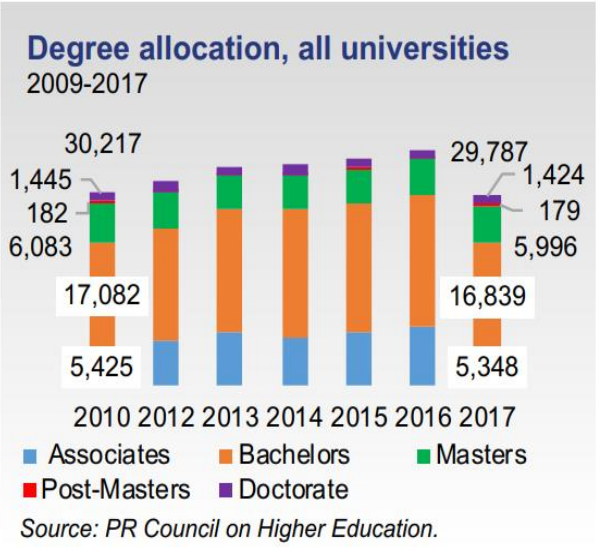
College and universities play a fundamental role in advancing the new knowledge economy and therefore any strategy for economic development must integrate these institutions as important anchors in four core areas: education, innovation, knowledge transfer, and community engagement (Shaffer and Wright, 2010).

Therefore, the Higher Education sector must be at the forefront in providing a comprehensive strategy to address a new economy that produces social and economic development and is grounded on innovation. These imperative demands for colleges and universities to better align educational trajectories to the preK-16 system, as there lays the true potential for making education an extraordinary asset for local economic and social development (Bonilla-Santiago, 2014; Shaffer and Wright, 2010).

Overview of the private higher education system student enrollment for 2015-2016

Universities in PR	Undergrad.	Graduate	Total
Ana G. Mendez System			
Universidad del Turabo	14,170	2,997	17,167
Universidad Metropolitana	11,231	2,405	13,636
Universidad del Este	11,000	1,401	12,401
AGMS Campus	N/A	80	80
Inter-American University System			
Metropolitan Campus	6,314	2,530	8,844
Ponce Campus	4,871	421	5,292
San German Campus	4,031	691	4,722
Bayamon Campus	4,328	122	4,450
Arecibo Campus	3,976	464	4,440
Aquadilla Campus	3,964	241	4,205
Fajardo Campus	1,982	168	2,150
Barranquitas Campus	1,902	74	1,976
Guayama Campus	1,815	115	1,930
School of Law	N/A	769	769
School of Optometry	N/A	231	231
Other Private Universities			
American University	1,343	84	1,427
Conservatory of Music	406	39	445
Escuela de Artes Plásticas y Diseño	555	N/A	555
Centro de Estudios Avanzados PR	N/A	514	514
EDP University of PR	2,623	152	2,775
Evangelical Seminary of PR	N/A	202	202
National University College	10,341	794	11,135
Universidad Central del Caribe	131	315	446
Universidad Central de Bayamon	1,315	350	1,665
Universidad del Sagrado Corazon	4,302	519	4,821
Universidad Politecnica	3,334	870	4,204
Universidad Adventista de las Antillas	1,256	136	1,392
Colegio Universitario de San Juan	1,528	N/A	1,528
Pontifical Catholic University	7,323	2,653	9,976

Source: Puerto Rico Council of Education, 2017



Source: PR Council on Higher Education.

Key higher education indicators PR & US (2016-2017)

Indicator	PR	US
GDP value of whole education sector	6.4%	5.4%
GDP value of higher education	3.6%	4.1%
% of Workforce in higher education	1.8%^**	2.6%**
College Graduation Rate	24.6%***	53.8%****
College Retention Rate	72.0%	74.4%
% of Public Universities to Total Number of Universities	17.0%	35.0%
% of Private Universities to Total Number of Universities	83.0%	65.0%

Source: UNESCO Institute for Statistics, Bureau of Labor Statistics, 2017; ^Puerto Rico Council on Higher Education, 2017; National Center for Educational Statistics, 2017, American Community Survey, 2017; U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS)

This will require rethinking on how the higher education sector evolves as part of the long-term solution and to ensure that educational pipelines from early childhood through college and careers are built and aligned to the labor force (Shaffer and Wright, 2010). Puerto Rico needs a competitive workforce to forge and sustain a new economy and improve the standard of living for its people.

A conceptual model with Higher Education as a community capital asset

Higher Education is the anchor for change and sustainable development. The Community Capitals as Assets Framework informs this vision (Emery, Fey & Flora, 2006). Hence, we focus on eight capitals that are the core of transformative development: financial capital, built capital, human capital, intellectual capital, social capital, cultural capital, political capital, and natural capital. The Community Capitals as Assets framework is used as an analytical tool for evaluating

sustainability performance on the island (Emery, Fey & Flora, 2006). This framework is used widely in regional and community development practice as a tool for identifying assets and integrating them as strategies in a system of sustainability.

PR community capitals as assets for sustaining a higher education system

Assets	PR Higher Education Ecosystem
Cultural	Sense of Identity, Customs, Cultural Heritage & History, Multicultural experiences- programs, initiatives and events which attracts students from other countries, Religion
Political	Elected Officials, Local and State Government, Federal government grants for Higher education: Federal Pell Grant, Federal Supplemental Educational Opportunity Grant, Stafford Student Loans
Social	National & International Collaboration, Local/State Collaboration, Philanthropy Volunteers, Universities, Non-Profits, Partnerships between private sector, government and other institutions
Human	Community Members: Families and Children; People, Shared Purpose and Value
Natural	Assets in location: Island, Tourism, Natural Beauty, Ocean, Coast, Land for: Playgrounds & Parks, Forests, Agriculture, Growth for new Projects, Biodiversity
Finanacial	Banks, Funders, Grants, Foundations, Local, State and Federal Government, External funding for the promotion of educational activities
Intellectual	Universities, schools, Research, online courses and programs for students, Knowledge, Access and use of technology, distinguished faculty
Built	Buildings-historical, Hospitals/Health Infrastructure, Public Buildings, Transportation, Roads, Public Infrastructure

Source: Emery, Fey & Flora, 2006

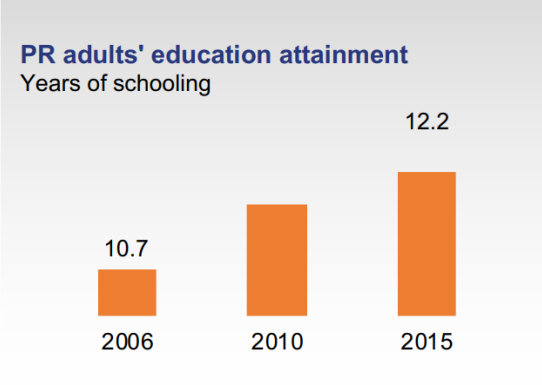
When applied to the higher education sector, these assets provide a compass for identifying strengths and opportunities within the context of the challenges facing Puerto Rico, as follows: (a) Political/Financial capital in terms of income, political connections and financial resources available or with potential to be generated; (b) Built capital refers to the physical infrastructure, such as buildings and technology available for community as well as resources for business development, community building and resources generated through public/private partnerships for development; (c) Human/Intellectual capital as it relates to the skills and knowledge that enables people to work, earn a living and lead in a new economy; (d) Cultural/Social capital in terms of the creation and sustainability of networks and relationships of trust and reciprocity that enable people and organizations to collaborate; and (e) Natural capital as it relates to access to key environmental resources, such as water, agriculture, land, clean air, fisheries, and forests, all within the context of research, development and applied learning. (Brereton & Pattenden, 2007; Emery, Fey & Flora, 2006)

Colleges and universities are important anchors in bridging these capitals to create opportunity, build the capacity of people, and engage the private and public sectors, and foster innovation and change. In any economic model with potential for success, the role of higher education institutions in knowledge creation, knowledge transfer, community revitalization, and human capital development must be placed front and center.

The Higher Education sector as an asset

The Higher Education sector occupies an important role in the economic stability of the Island. Education in Puerto Rico has long been considered a gateway to upward social mobility for individuals from lower socio-economic backgrounds, and as a way of improving social advantages. With the increase in the number of young people entering the university, the higher education system has reached a saturation point for several decades.

The expansion witnessed in participation rates over the last few decades has largely been achieved by a modest broadening of the base of the undergraduate population in terms of social class. It was not long ago that Puerto Rico was making great strides in educating its citizens. According to a Brookings Institute study (2006) from 1960 to 2000, “the average schooling of Puerto Ricans 25 years or older increased from 6.2 years to 11 years: an achievement unmatched by any other country in the world”. (Ladd, & Rivera-Batiz, 2006) The level of educational attainment of Puerto Ricans in the Island has steadily increased in the last decade.



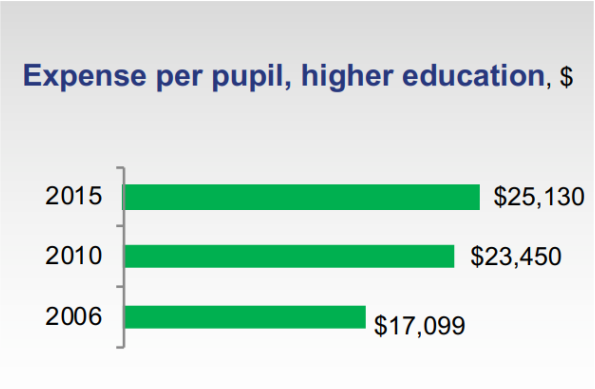
Source: PR Department of Education

The level of schooling of Puerto Ricans exceeds that of the best educated countries in Latin America and is one year below the U.S. level at 12.5 years. (Collins, Bosworth, & Soto-Class, 2006) This is the kind of indicator that compares favorably with the Organization for Economic Cooperation and Development (OECD) countries and places Puerto Rico in a competitive position.

Throughout its history, Puerto Rico has invested in education as it has always represented the best strategy for sustaining the Island and progressing into the future. A highly educated workforce was in part a significant incentive for US companies, especially pharmaceutical and high-tech companies, like Hewlett Packard, to establish operations on the Island.

Universities, such as the University of Puerto Rico Mayaguez Campus and the Polytechnic University became important developers of human and intellectual capital and have been effective in preparing productive workers with the necessary levels of competency and skill to thrive in the private sector and STEM focused industries.

The significance of this human asset is reflected in the investment per student at Public Institutions of Higher Education in Puerto Rico (mostly the University of Puerto Rico (UPR)). In 2010, UPR invested $23,450 per student. Although this number is significantly lower than the investment per student at public research universities in the U.S. ($43,250) for the same year, it must be understood that the difference reflects the higher GNP per capita of the U.S. relative to Puerto Rico.



Source: PR Council on Higher Education

Despite its many challenges and economic limitations, education in Puerto Rico is treated as an important asset for building the economy and for preparing its future workforce. The changing economic outlook compounded by rising poverty rates and the outflow migration of people have contributed to a steady educational decline as early as 2006. According to the Brookings Institution 2006 Report on The Economy of Puerto Rico, "the K-16+ education system was not delivering the well-trained workforce that Puerto Rico needed."

In order for Puerto Rico to compete in the knowledge economy of the 21st century, it "needs to make an infusion and investment into the economy and Puerto Rico needs to grow." As the Report from Brookings indicates, the solution to this challenge is not only investing more in education, but also restructuring higher education and aligning K-12 education to make the systems more efficient, competitive, innovative and effective.

The current economic situation places a high priority on investing in higher education. (Bram, Martinez & Steindel, 2008) However, funding for higher education is at an all-time low. In order to place higher education within the context of economic development, it is important to review the dominant sectors of the Puerto Rico economy in terms of production and income.

The manufacturing sector represents 47% of total production but only 8% of jobs contributing $50 billion to Gross Domestic Product (GDP) in FY 2016. (PR Planning Board, Economic Report to the Governor, 2016) The manufacturing sector, which once was the predominant industry in Puerto Rico, has undergone fundamental changes over the years as a result of increased emphasis on higher-wage, high-technology industries, such as pharmaceuticals, biotechnology, computers, microprocessors, professional and scientific instruments, and certain high technology machinery and equipment.

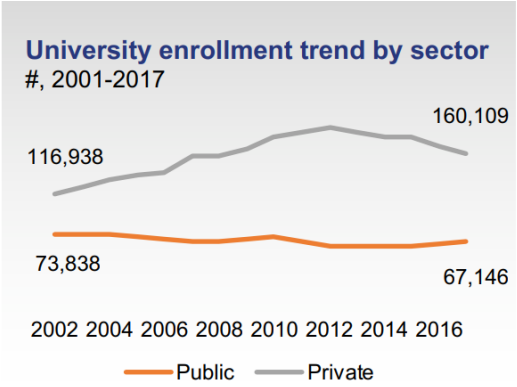
(Burtless & Sotomayor, 2006) This sector has weakened even further as a result of the end of the phase-out of Section 936 of the U.S. Tax Code (which stipulated the tax benefits for US domestic corporations operating in Puerto Rico), the net loss of patents on certain pharmaceutical products, the escalation of manufacturing production costs (particularly labor and electricity), the increased use of job outsourcing, and, currently, the effects of the global economic decline and the recent US Tax and Jobs Act of 2017.

Despite these challenges, manufacturing still dominates the other sectors in terms of production. The service sector, which includes insurance, real estate, wholesale and retail trade, transportation, communications and public utilities, and other services, follows with a contribution of $38.7 billion or 37% of PR's GDP in 2016. (Government of Puerto Rico, 2016)

The economic decline that escalated in 2006 has continued on a steady downfall through 2017 and it has naturally impacted the higher education sector. Enrollment in private universities declined by half a million students, almost 11.85%. (Matos, 2017)

The roots for this decline stem from deep economic stagnation, changing demographics for the island and a government leadership that has neglected the sector as a

viable contributor to community and economic growth. (Bosworth & Colling 2006)



Source: PR Council on Higher Education.

Post-Hurricane Maria conditions have worsened due to the devastation of Built Capital (infrastructure, energy, ports, telecom,) and the exodus of Human Capital (people, students, businesses and faculty members). Recently, Governor Ricardo Rossello's administration articulated the importance in forging partnerships with these institutions for the overall economic recovery of the Island. Companies like "Microsoft, Lufthansa, Bacardi, Medtronic, Amgen and Sartorious have invested for a long time in Puerto Rico and have made a commitment to Puerto Rico. Others, including Tesla and Google, are investing in the island's recovery - from innovation to renewable energy - which helps revitalize the future of Puerto Rico". (Irfan,2017)

Impact of Hurricane Maria on Higher Education institutions

After it struck, Hurricane Maria exacerbated the already fragile infrastructure of the higher education system in Puerto Rico, with the largest effects in terms of physical damages to university properties and research stations and the decrease in student enrollment and migration to the mainland United States. The aftermath has altered the course of academic instruction and research throughout the island as students and faculty adjust their schedules and plans. The uncertainty of students returning to Puerto Rico to complete their studies and the significant financial losses have left the university structure in flux as administrators determine how to revise the academic programs.

The University of Puerto Rico, Puerto Rico's largest public university system with 11 campuses across the island, suffered almost $120 million in losses. The Humacao campus alone experienced $35 million in losses, including damage to athletic fields and academic buildings. (Colón Dávila and Figueroa Cancel, 2017)

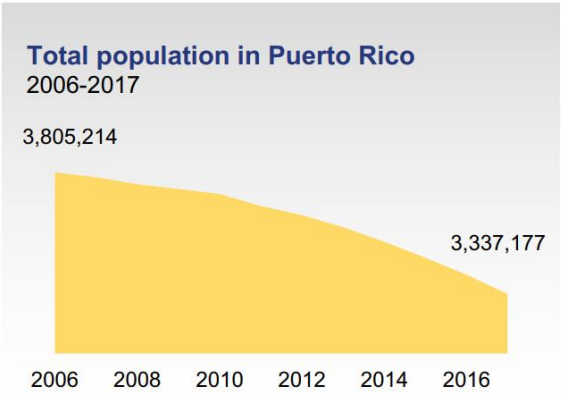
The Rio Piedras campus, located in the municipality of San Juan, had significant damage of natural capital (forest, vegetation, green spaces, and trees,) along with collections of law library books and student residential and science buildings. (Rodríguez, 2017)

Other campuses, including Arecibo, the School of Medical Sciences, Carolina, and Bayamon, experienced loss in electricity and damages to labs containing animals and plant life. (Colón Dávila and Figueroa Cancel, 2017) Other universities experienced widespread damage as well. The Universidad Sagrado Corazon in San Juan lost electricity for 40 days, which affected labs, computers and recording studios.

In order to save the academic year, Professors assigned special projects, moved night classes to the weekends and extended the length of the academic calendar. (López

Alicea, 2017) Sistema TV, a PBS affiliate housed at the Ana G. Mendez University and was disconnected when the hurricane struck (Noticel, 2017) and as yet, has not reopened. The hurricane produced widespread disruption in all of university operations throughout the island, creating massive disturbances and delays in the academic trajectory of students.

According to the Center for Puerto Rican Studies at the City University of New York, between 17,000 and 32,000 students between the ages of 18 and 24 will leave Puerto Rico, a dramatic increase from the annual average for the past three years of 9,700. (Korn, 2017) As of December 1, 2017, the University of Puerto Rico reported that it lost over 1,500 students (Duany, 2017), representing a 2% drop in total student enrollment (Agencia EFE, 2017), most of whom transferred to mainland universities, including several in Florida, New Jersey, New York, Connecticut, Rhode Island, Louisiana, Texas, and California, who have offered in-state tuition rates, scholarships, and other financial assistance. (Duany, 2017) Candidates eligible for graduation decreased from 58,600 to 57,700 at the UPR Rio Piedras campus, which experienced significant damage from the storm. (Agencia EFE, 2017)



Source: US Census Bureau

Student transfers to the mainland are a critical drain to the human and intellectual capital of the university system. As the island slowly recovers, it is still early to determine how many students will return to Puerto Rico to either complete a degree or utilize a degree obtained at a mainland institution to improve economic and social conditions on the island.

Incentives and programs to entice students to return will have to be conceptualized. Five months after Hurricane Maria struck, 28% of Puerto Ricans still lack electricity (Mazzei, 2018) and approximately two-thirds of the population are at a severe risk of drinking contaminated water. (Panditharatne, 2017)

These numbers continue to rise as recovery has been very slow. By all accounts, the response from the federal government has been inadequate and neglectful, particularly around the provisions of clean drinking water, hot meals, and adequate shelter. (Konyndyk, 2017) FEMA assistance, along with local municipal support for housing and relocation, is already dissipating for families migrating to the mainland. The recent U.S. Tax Cuts and Jobs Act approved by US Congress in December 2017 poses another challenge to investment by US companies by operating in Puerto Rico as foreign companies or Controlled Foreign Corporations (CFCs). Worldwide, CFCs are subject to a 12.5% tax on intellectual property.

This could discourage companies from establishing a presence, recruiting university students, and partnering with faculty on innovative business approaches. (Mazzei, 2017) There is some hope, however, as the recently proposed U.S. budget included $17

billion to provide relief to Puerto Rico. (Mazzei and Williams Walsh, 2018)

The structural provisions of the recent legislation, though, could hurt employers' abilities to make long term contributions to the economic wellbeing of the workforce and accelerate growth on the Island. The new reality of Puerto Rico poses challenges to the Island's assets in the higher education system.

Trends impacting Higher Education

Mega trends impacting the future of many universities around the globe also shape the future of the Puerto Rico higher education system.

Therefore, Puerto Rico higher education leaders need to rethink the place of education in preparing the future workers, entrepreneurs, innovators, and retraining the current workforce given the new challenges of the post Maria devastation and economic crisis. Some of these trends are related to labor market shifts and the rise of automation. There will be a demand for specific skills, and it is expected that the workplace will undergo a dramatic transformation that demands for people to master workplace-ready skills, including creating spaces and programs to train workers in technical and skilled manual work, i.e., electricians, plumbers, and chefs, which are trades that are the hardest to automate.

Retraining and reinventing the approaches to prepare people in many other occupations, such as law, accounting, routine computer programming, journalism, and data processing is also essential to prepare people for fields that have already being disrupted by global trends. (Finegold, David, 2018) The trend is for the market to develop more entrepreneurial and resilient students who will be willing to reinvent themselves multiple times in their educational trajectory. Another trend deals with the economic shifts toward emerging markets in that enrollment worldwide in higher education has experienced an expansion in middle income nations interested in STEM fields, especially in countries, such as, Brazil, Russia, India, China, South Africa, and others in Latin America. Higher Education leaders should start looking for ways to reach out to students globally. We need to increase more global collaboration and partnerships to address the geographical isolation of the island and put Puerto Rico at the table with collaborators and competitors.

The growing disconnects between employer and college experience which will require higher education institutions as well as K-12 systems to maximize its focus on technology integrations, proficiency, blended learning, and augmenting the development of joint ventures and institutional partnerships. With the increase in migration to the mainland, growth in urbanization and the shift toward cities, universities in Puerto Rico might consider creating hubs where partners and collaborators come together from all over the world to enable education for all and use their different talents and expertise to help restore PR's trajectory to prosperity.

Puerto Rico needs to become globally engaged to attract multisector cooperation from higher education to industry, professionals, business and students. As resources, spending and budgets become less accessible, Higher Education will have to share resources and utilize emerging technologies like massive online courses

incorporating the concept of "utilizing globally but assessing locally". (Holmes, Trevol, 2015)

We need to envision education as a lifetime experience and acknowledging that investing in basic skills, such as reading, writing, critical thinking and creativity are necessary for developing and sustaining the human assets that are essential for the future of Puerto Rico. Faculties in all fields in the various universities, public and private, need to play a key role in PR's future, including Schools of Education that are charged with preparing the future K-12 educators that will shape and prepare generations of future college student, entrepreneurs, scientists, and workers.

Challenges and assets for addressing higher education

Challenge	**Opportunities**
Lack of innovative approaches for creating new businesses and for attracting high tech companies to establish operations on the Island. This is crucial to building the demand for jobs and for strengthening the economic tax base of the country.	The universities play a paramount role in advancing innovation through new technologies, new processes, new products, and new ideas that can be catalysts for rebuilding the local economy and for connecting Puerto Rico to the global economy. University faculty and talented students can leverage their strengths in knowledge creation to generate economic benefits. The Higher Education sector can support the private sector through knowledge transfer that is deployed through worker training, capacity building for management, help in incubating start-up businesses and development of industrial parks and small business incubators.
An ineffective K-12 system that is failing to prepare students that are ready for college and career. Puerto Rico's public education system is broken, inadequate and a contributor to inequality.	Higher education can be a catalyst for transforming the way in which K-12 education is delivered in Puerto Rico in a variety of ways, including: working with the Department of Education in restructuring and reinventing the organization, governance and structure of schools. The new proposal to establish charter schools is an important strategy as it has worked well in some of the most compromised urban school systems in the United States and was in fact, an important factor in rebuilding New Orleans' educational system post Katrina.
There is a lack of alignment between the K-12 and college sectors, including birth through college pipelines.	Higher Education is also an important resource in transforming teachers and school leadership preparation. Teachers and principals are at the core of good schooling and hold the keys for transferring teaching and learning. Puerto Rico has an opportunity to adopt programs that place education students in classrooms as part of the required teaching clinical experiences under the supervision of talented faculty and outstanding teacher mentors. Teacher Residencies like the Boston Residencies could serve as models for replication.
The labor force in Puerto Rico needs retraining and new training and preparation to be a viable resource.	The Higher education sector must be able to adapt and customize its educational range to the needs of the country. Edward Glaeser of Harvard and Albert Saiz of the University of Pennsylvania conclude that "generating new technologies locally does not seem as important as having the capacity to adapt them" (Glaeser and Saiz, 2003). The university needs to assess its teaching and learning focus to ensure that they can align the role of knowledge creation through research and technology transfer with that of knowledge transfer through education and human resource development. Workforce development is crucial and in the spirit of developing a cohesive higher education sector, the role of the junior colleges needs to be revisited as they should play an important role in developing 2-year programs that lead to certificates and that prepare students to enter the workforce as well as to continue into a four-year degree. Academic program development needs to be aligned to the needs of industry and business to ensure that training leads to jobs and that companies can get the human capital that is necessary to thrive and be competitive in the business sector. Training programs should be consolidated into a single entity to ensure alignment and usefulness. One example comes from Georgia Tech and its Enterprise Innovation Institute.

Puerto Rico Higher education system housing has collapsed along with basic services and a loss of safety and hopes for prosperity.	Higher education is critical in addressing issues of community development in a number of ways. Universities occupy strategic real estate in communities across the island. Therefore, they need to be involved to ensure that they are part of the community life that surrounds their campuses and that they create opportunities for community-university exchanges, including sharing of facilities, boosting local business and engaging in promoting and preserving the cultural life. Universities also are responsible for training those that work with communities including teachers, social workers, and public administrators, among others. With this in mind, it is of paramount importance for the higher education sector to revisit how teaching and learning is delivered to better prepare workers for the public and third sectors. In addition, strategies such as Americorps should be explored to expose students to service learning, co-ops and experiential learning as part of their training. This is a win-win as the student benefits and the community also benefits.
The Higher Education system in Puerto Rico lacks a management information system that is updated. The system now is inefficient, overly dependent on government subsidies and has not caught up with the new realities of operating the institutions as enterprises.	The system needs to be structured to capitalize on the diversity of strengths of the various institutions, both public and private. A Higher Education Consortium should be in place to facilitate the kind of articulation that is necessary. The tuition costs for the public university needs revision and adjustment. A system of scholarships should be in place to assist the neediest students. However, scholarships should be accompanied by a requirement for students to remain working in Puerto Rico for at least five years. The concept of internationalizing the academia should be a strategic element to raise the level of talent as well as income. This can be done by promoting, marketing and aggressively recruiting international students to come study in Puerto Rico. These students pay a higher tuition rate and cover their costs. Further, partnerships with universities in the US and other countries should be forged to allow for joint academic offerings.
Puerto Rico's economy has been hit hard and the path to a failing economic model started decades ago and has reached a breaking point. The political debacle of the status of Puerto Rico is a critical element. However, the country needs to create two pathways—one that reinvents its economic model in spite of the political relationship of annexation with the US and one that is developed under a new set of political conditions whether the island becomes a state or reaches higher sovereignty.	Higher education is equipped with the talent and research prowess that is necessary to incubate innovation. Since innovation begins with research, universities can secure the resources and develop the conditions and mechanisms to engage its best faculty in purposeful research that leads to business development. Higher education should be a partnership with government and the private sector in Puerto Rico to create business clusters, industrial parks and launching efforts that are built in the concept of "knowledge economies". Four areas of development are at the core of facilitating this transformative change in the role of the university: 1) attracting and retaining a cadre of talented and prominent faculty; 2) engaging university leadership that can think "outside the box" and that conceive a university that is an anchor for building the future trajectory of the country; 3) the physical infrastructure needed for research and development, such as labs, research parks and classrooms; and 4) the type of flexibility and facilitative environment that frees up the university to commercialize research outcomes. This approach needs to encompass collaboration among all institutions of higher education and therefore, a country-wide mechanism for collaboration and sharing needs to be in place.

Conclusion:

In sum, the Puerto Rico Higher Education system must become part of the new emerging economy and serve as a catalyst for transforming the island through new technologies and resilient power networks partnering with private industry to modernize infrastructure, implement broadband across the Island, and upgrade research facilities and rebuild a new education system.

A stronger Puerto Rico with a thriving economy will create huge opportunities. The old model for economic development efforts

that is centered only on financial incentives, infrastructure development, land and capital development, and labor policy, among others, needs to be transformed to meet new challenges. The new paradigm for economic development is to make the shift to a "knowledge first" approach that builds on higher education's capacity to connect with all sectors that are invested on economic development. (Romero, 2011) In the short-term, the Federal commitment to jumpstarting the economic growth in the island has been crucial to help Puerto Rico turn its economy around. (Klapper, Lewin & Quesada Delgado, 2009)

Congress would benefit from implementing a comprehensive economic program, remove some of the disadvantages imposed on Puerto Rico under the current political arrangement, and eliminate some long standing inequitable and discriminatory policies. A thriving, educated Puerto Rico benefits the US economy. Within the constraints posed by its political status, Puerto Rico needs to craft a long-term local economic development strategy. This strategy should consist of sectorial, horizontal, and institutional policies to promote Puerto Rico's capability to progressively move into higher value-added activities. (Romer, 1990)

Post Maria, Puerto Rico now faces significant fiscal distress, deficits, crime, population decline, and economic crises. However, Higher Education Institutions on the island have available talent, skill and intellectual and human capital available to refocus its training to address the economic crises.

As mentioned earlier, the Prek-12 system is essential, and Schools of Education need to be strengthened and be highly selective when choosing entrants. These graduates will teach pre-K, K to 12 students of the future Puerto Rico and there lies the Island's biggest resource. Therefore, we need to align the Island's talent with the needs of the economy now more than ever.

The road to recovery and solvency is going to take time and it requires a reinvention of training in new industries and an infusion of investment in capital and opportunities in emerging markets, tourism, agriculture, energy, ports, telecom, manufacturing, transportation, housing, education, and the human and social capital available around the globe.■

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