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Chapter

First Draft

ECONOMIC DEVELOPMENT PLAN FOR THE CONSTRUCTION SECTOR

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1. Executive Summary

This report presents a diagnosis assessment of the construction sector and an analysis of the performance of its components. It is the basis for the analysis of its strengths and weaknesses of each subsector. It will also be used as historic criteria to evaluate industry's performance at different levels. The main findings of this study are highlighted below.

1) The construction sector of Puerto Rico's economy experienced a profound economic contraction during the last six years. Construction's Gross National Product (GNP) decreased an average of 5.6% from fiscal years 2007 to 2012, employment in this segment also decreased by 9.3% during the same period.
2) Public construction accounted for more than 50% of total investment from 2008 to 2012, but has experienced a severe fiscal crisis during the last year. Public financial capacity has been limited by a series of credit downgrades to municipal and state bonds, and new taxes that have had a negative impact in consumer consumption and business.
3) Throughout the world, the construction sector is increasingly concentrated in emerging economies. In 2013, economic growth in emerging countries averaged 5.9%, whereas it averaged 1.9% for developing countries. According to a study by UNCTAD (2013), "FDI flows to developing economies, for the first time ever, exceeded those to developed countries, by some US $130 billion. (p.1)". The construction market in emerging economies is expected to duplicate by the year 2020.
4) In growth terms, countries in the North America Region underperformed relative to the Asia Pacific and West Europe regions during the 2005-2010 periods. However, the Global Construction Perspectives report forecasts that the North America Region will lead the 2011-2020 decade's growth in Construction Gross Product. Said growth owes primarily to nonresidential and infrastructure investment, alongside an emerging recovery on the US housing market. After 2015, the construction market in emerging economies is expected to exceed that of developed countries.
5) Construction investment has intrinsic linkages with multiple sectors in an economy. Under a traditional framework, it can be considered as a derived demand from other industries, and thus dependent upon those sectors' growth to generate economic activity. However, construction investment may be a leading source of growth in economies where gross value added in construction represents an important share of the overall economy.
6) The construction sector in Puerto Rico is organized into ten (10) principal segments (or sub-sectors) of industrial activity. For fiscal year 2012, 83.9% of the Construction Gross Product concentrated within four segments: Residential Construction, Nonresidential Construction, Building Equipment Contractors and Highway, Street & Bridge Construction. Residential Construction was the segment with the highest participation in production, accounting for 29.1% of the total Construction Gross Product, followed by Building Equipment Contractors (21.9%) and Nonresidential Investment (21.2%).
7) A dominant trend in the Puerto Rican Construction Gross Product and its subsectors is that of a profound economic contraction during the 2007-2012 period, with particularly steep declines during 2009 and 2010. These correspond mainly to declines in Residential and Nonresidential Construction, followed by the declines in Building Equipment Contractors.
8) Residential construction was the most important segment in construction, averaging 33.1% of the Construction Gross Product for the 1999-2012 period, and representing 29.1% of the 2012 Construction Gross Product. Its total production volume peaked at 2004, and then began a sustained contraction until 2011, to rise slightly afterwards in 2012.
9) The performance of Puerto Rico's economy is heavily dependent upon the availability of optimal infrastructure. Decaying infrastructure has a cascading effect upon the economy, negatively affecting business productivity, employment, and the overall competitiveness of the economy. Businesses and households, for example, would face higher costs, due to unreliable and/or deficient a) transportation grids, b) maritime and ground shipment systems, c) water infrastructure, or d) electricity costs. These costs consume funding which

businesses could reinvest in their operations, and that households could dedicate in discretionary spending in consumer goods or savings. Thus, the impact of decaying infrastructure – both present and future – is significant. If the investment gap between the actual infrastructure assets and future needs is not bridged, the economy would be exposed to deterioration of its productive capacity.

10) For the 2003-2012 period, the GNP share of construction investment decreased dramatically, especially during the 2008-2011 period. This coincides with the international financial crisis, which severely reduced aggregate worldwide demand. The impact of ARRA funds and local stimulus policies ameliorated this decrease in 2012; nevertheless, construction activity remains at a decade-low, which implies that it has under-performed relative to the rest of the economy.
11) The 2003-2012 decade was characterized by a growing shift from construction investment to machinery investment in the private sector. The crisis in the 2009-2011 period severely impacted construction investment in both public and private sectors, whereas machinery investment contracted at a much more moderate pace. The influx of stimulus policies significantly increased the share of investment in public construction, whereas private sector construction continued to stagnate.
12) Turnover in the construction sector reduced during the recessionary periods (2008-2011), and grew slightly during the year 2012. This growth responded to stimulus policies enacted by both federal and state governments, which generated an upsurge in infrastructure investment, primarily on the public sector. The disappearance of this external funding and the reduction of fiscal spending will negatively impact the construction sector's operational landscape, thus foreboding further contraction in the turnover generated.
13) The share of reported construction workers was at its lowest in 2012, compensated by a marginal increase in the share of Sales & Office occupations. Transportation activity also reduced its share significantly respect to other years. Management's share of employment share persisted at around 10% for the entire period, with the notable exception of the 2009-2010 recessionary period.
14) Between 2004 and 2011, all firm sizes experienced a net negative growth. Firms of more than 1000 employees ceased to operate, while only 1 establishment with 500-999 employees was reported in 2011. On average, firms with less than 10 employees declined at a rate lower than the overall decline for the 2004-2011 period. This can be attributed to larger enterprises undergoing layoffs and thus shrinking their employment size, a finding confirmed by the upsurge in small firms' establishment share during the 2008-2011 period.

2. Introduction

The construction sector of Puerto Rico's economy experienced a profound economic contraction during the last six years. Construction's Gross National Product (GNP) decreased an average of 5.6% from fiscal years 2007 to 2012, and employment in this segment of the economy also decreased by 9.3% during the same period.

Dramatic changes in the composition and structure of investment in construction occurred during those six years. Public investment grew from 43.0% in fiscal year 2007 to 59.0% of total investment in fiscal year 2012; inversely, investment in housing construction decreased from 64.0% to 37.6% during the same period. As a percentage of the GNP, investment in construction was 9.8% in 2007 and 7.2% in 2012; while it was only 6.0% and 6.3% in fiscal years 2010 and 2011.

Public construction accounted for more than 50% of total investment from 2008 to 2012, but has experienced a severe fiscal crisis during the last year. Public financial capacity has been limited by a series of credit downgrades to municipal and state bonds, and new taxes that have had a negative impact in consumer consumption and business.

This report presents a diagnosis assessment of the construction sector and an analysis of the performance of its components. It is the basis for the analysis of its strengths and weaknesses of each subsector. It will also be used as historic criteria to evaluate industry's performance at different levels.

Chapter II presents a comparative analysis of the most important global trends for the construction segment of the economy. This is important to contextualize the analysis, and to support the development of its vision, mission, goals, and objectives.
Chapter III details the diagnosis assessment of the sector and its subsectors, and investment in construction. It starts with an analysis of its economic importance and its structure.
Chapter IV summarizes main findings and conclusions.

3. International Trends

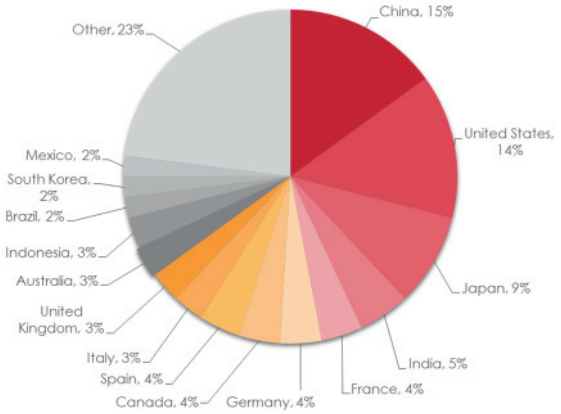
3.1. Global Trends

Throughout the world, the construction sector is increasingly concentrated in emerging economies. In 2013, economic growth in emerging countries averaged 5.9%, whereas it averaged 1.9% for developing countries. According to a study by UNCTAD (2013), "FDI flows to developing economies, for the first time ever, exceeded those to developed countries, by some US $130 billion. (p.1)". The construction market in emerging economies is expected to duplicate by the year 2020.

"Global Construction 2025," a benchmark global study and the third in a series of major global studies of the construction and engineering industry also published by Global Construction Perspectives and Oxford Economics (released in July 2013), "forecasts the volume of construction output will grow by more than 70% to $15 trillion worldwide by 2025." The report "shows the meteoric growth, which outpaces that of global GDP, will be concentrated in three countries - China, the US and India."

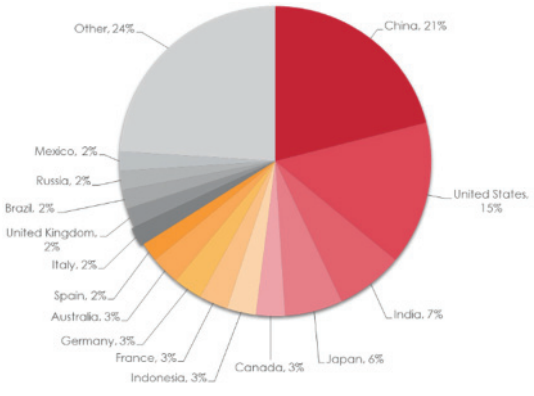
Figures 1 and 2 displays the 15 most important construction markets for 2010 and the 2020 projections. Figure 3 displays the percent contribution to the World Gross Domestic Product in Construction for the main participant economies. As can be seen, nearly 30% of the 2020 world construction investment is expected to come from emerging economies (China, India, Mexico, South Korea, Brazil & Indonesia), while 42% of the growth contribution to world construction investment is expected to come from China, India and Indonesia that same year.

Figure 1: 15 Largest Construction Markets
2010



Source: Global Construction Perspectives and Oxford Economics (2013). *Global Construction 2020.*

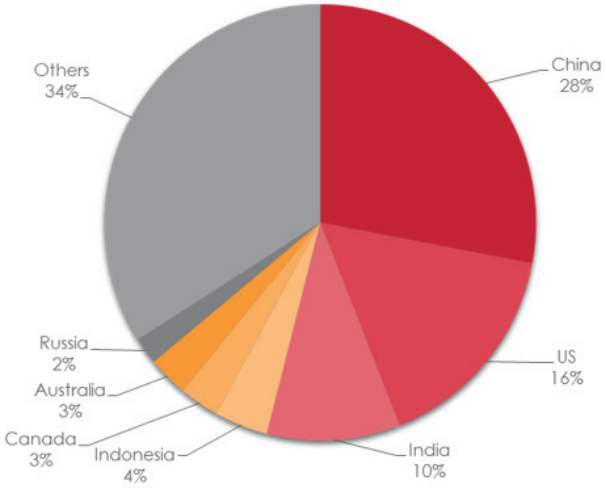
Figure 2: 15 Largest Construction Markets
2020



Source: Global Construction Perspectives and Oxford Economics (2013). *Global Construction 2020.*

Figure 3: Percentage Contribution to World Construction Gross Product

2010-2020

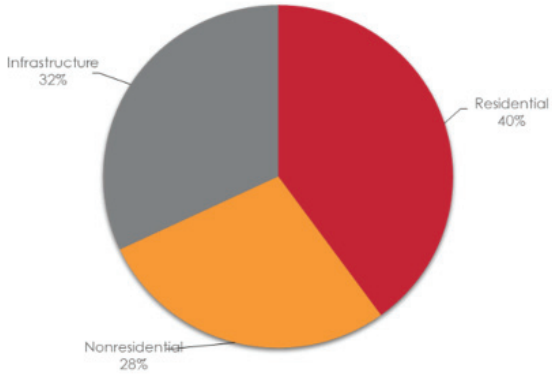


Source: Global Construction Perspectives and Oxford Economics (2013). *Global Construction 2020.*

Figure 4 shows the sectorial distribution in worldwide construction GDP for year 2010. Housing investment is the primary construction sector, followed by infrastructure and nonresidential investment. For the same year, Puerto Rican GDP in infrastructure investment was 3 percentage points (pp) higher than in the world distribution, whereas its residential construction sector represented 3 pp less (see Figure 5).

Figure 4: Worldwide Construction Gross Product, by Type of Investment

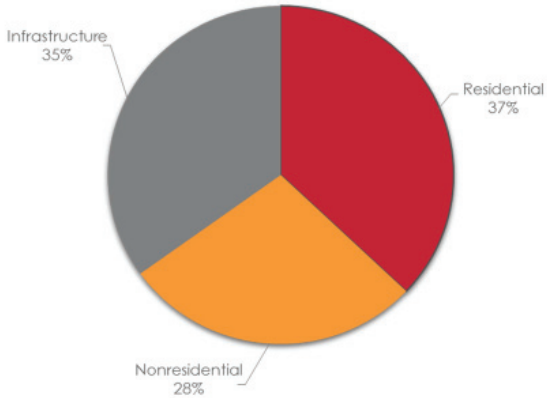
2010



Source: Global Construction Perspectives and Oxford Economics (2013). *Global Construction 2020.*

Figure 5: Puerto Rican Construction Gross Product, by Type of Investment

2010



Source: PR Planning Board (2012). Fiscal years.

3.2. Regional Trends & Puerto Rico

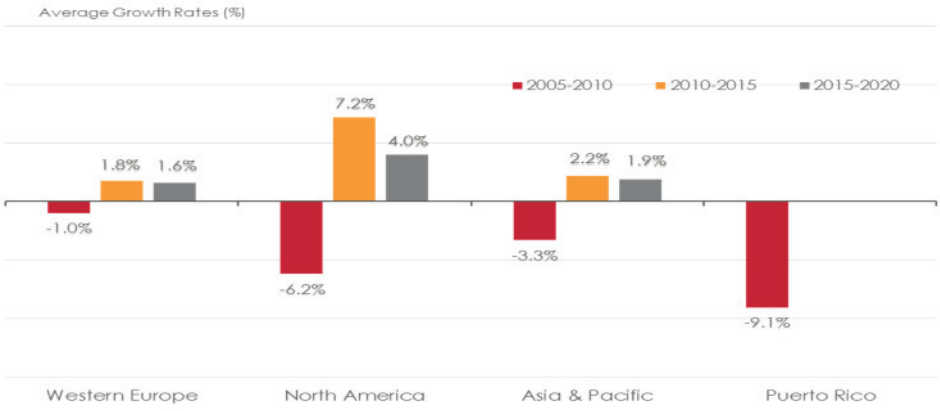
In growth terms, countries in the North America Region underperformed relative to the Asia Pacific and West Europe regions during the 2005-2010 periods. However, the Global Construction Perspectives report forecasts that the North America Region will lead the 2011-2020 decade's growth in Construction Gross Product. Said growth owes primarily to nonresidential and infrastructure investment, alongside an emerging recovery on the US housing market. After 2015, the construction market in emerging economies is expected to exceed that of developed countries.

Puerto Rico had a much worse performance in the 2005-2010 period than any of the measured regions; also, a significant recovery in construction investment is not expected for the subsequent decade, contrariwise to the United States. The weakened structure of the construction investment in Puerto Rico, as will be discussed later, does not reflect a pattern comparable to the North American regional forecasts.

Figure 7 shows the real and projected growth in the worldwide Construction Gross Product. Worldwide housing construction is expected to grow approximately 5.6% between 2010 and 2015, and 4.4% between 2015 and 2020; however, worldwide infrastructure investment has the highest growth prospects for the 2011-2020 decade, with growth rates remaining above 5.0% for the entire period. By contrast, Puerto Rico () presents an extremely weak performance in all its sectors for the 2005-2010 period.

Figure 6: Regional Growth in Construction Gross Product

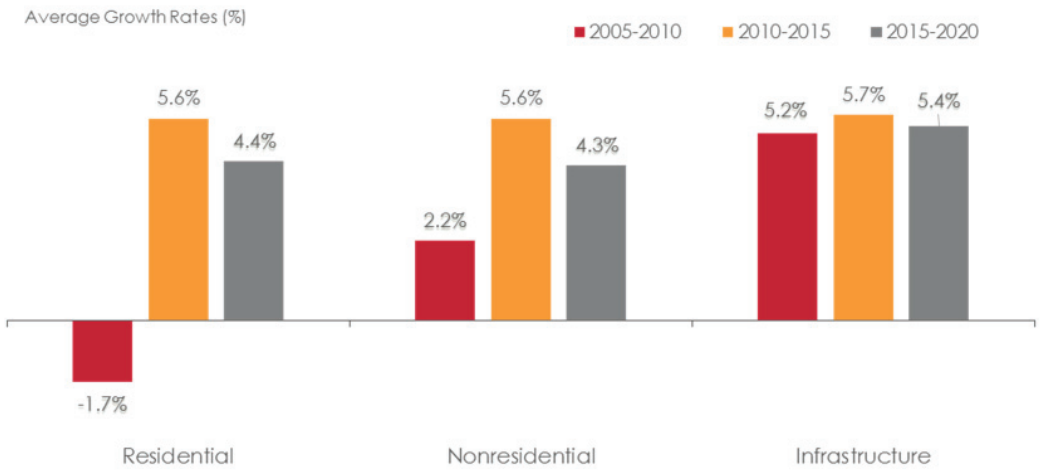
2005-2020



Sources: Global Construction Perspectives and Oxford Economics (2013). *Global Construction 2020.* PR Planning Board (2013).

Figure 7: Growth in Worldwide Construction Gross Product, by Type of Investment

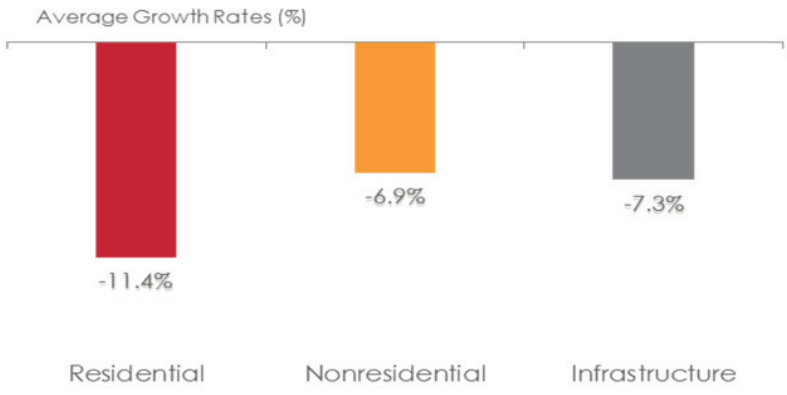
2005-2020



Source: Global Construction Perspectives & Oxford Economics (2013). *Global Construction 2020.*

Figure 8: Growth in Puerto Rico's Construction Gross Product, by Type of Investment

2005-2020



Source: PR Planning Board (2013). In fiscal years. Growths were calculated using the Construction Gross Product at constant prices; in addition, all contractor sub-sectors were apportioned using the relative size of each investment type.

4. Diagnostic Analysis of the Puerto Rican Construction Sector

4.1. Importance of Construction Investment in Economic Activity

Construction investment has intrinsic linkages with multiple sectors in an economy (Osei, 2013). Under a traditional framework, it can be considered as a derived demand from other industries, and thus dependent upon those sectors' growth to generate economic activity. However, construction investment may be a leading source of growth in economies where gross value added in construction represents an important share of the overall economy. According to Lopes, Ruddock and Ribeiro (2002), "…there is a critical level of Construction Value Added/ Gross Domestic Product (at 4.5%) below which a relative decrease in construction volume corresponds directly to a decreasing growth in GDP per capita." Ahearne, Delgado and von Weizäcker (2008) also documented a strong relationship between the property markets and economic cycles.

This relation was concisely summarized by Égert and Martin (2008) as follows:

Once the expansion of the construction sector draws to a close, e.g. owing to a saturation of the real estate market and adequate infrastructure improvements, the resulting contraction of the construction sector may cause a more widespread downturn of the economy. This risk is particularly pronounced if the competitiveness of the export-oriented sector has suffered during the construction-led economic boom and if the economy is not sufficiently flexible to adjust rapidly, e.g. if considerable downward wage rigidity prevents the export-oriented sector of the economy from rapidly regaining its competitiveness (p. 53).

Table 1 presents the most recent employment, income and production multipliers for the New Construction and the Building Maintenance & Restoration sectors. As is shown, both New Construction and Building Maintenance generate a more-than-proportional impact upon employment, income and production value. Therefore, resulting contractions/expansions of the construction sector could significantly impact the overall economy.

Table 1: Construction Sector Employment, Income and Output Multipliers

Puerto Rico – 2002

Industrial Sector	Employment		Income		Output
	Type I	Type II	Type I	Type II	
New Construction	1.78	2.27	2.02	2.61	2.64
Building Maintenance & Restoration	3.04	4.18	2.35	3.03	2.83

Source: PR Planning Board (2002). *Input-Output Matrix.*

Figure 9 presents the statistical relationship between the growth rates in Puerto Rico's real GNP and real Construction Investment.[1] As can be seen, there exists a moderate, positive correlation between the growth patterns, a finding consistent with aforementioned research. From 2001 onwards, the relative share of Construction Gross Product to GNP fell from 17.1% in 1999 to 5.9% in 2011, and only slightly increased to 6.3% in 2012, whereas the share of construction employment to total nonfarm employment decreased from 7.4% in 1999 to 3.4% in 2011, then rose to 3.8% in 2012. Since 2005, the percentage point reduction in construction's product shares outpaced the reduction in employment shares.

[1] *Real = at constant prices, as opposed to nominal (current) prices. The PR Planning Board chain-indexes real GDP at 1954 price levels.*

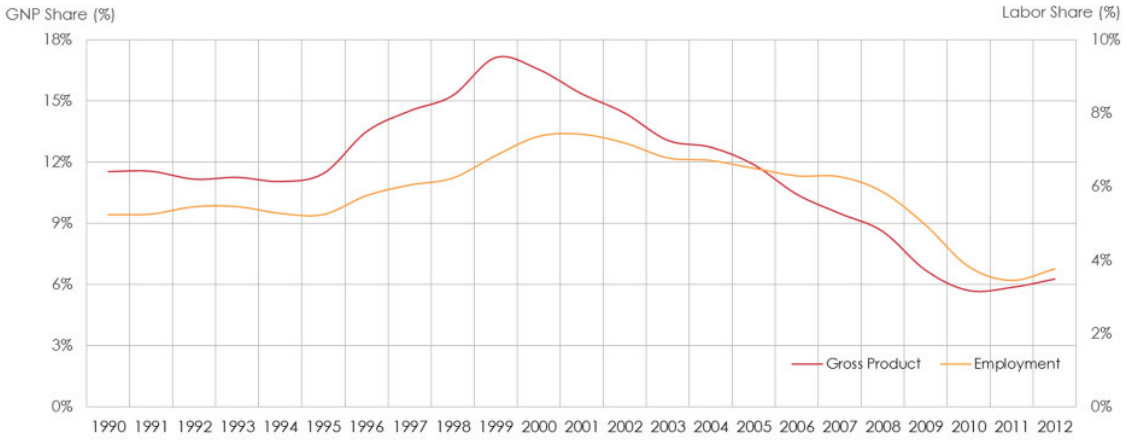
Figure 9: Relationship between GNP Growth and Construction Investment Growth

1990-2012

Sources: PR Planning Board (2013). *Statistical Appendix.* Estudios Técnicos, Inc. (2013). GNP and Construction Investment at constant prices were used to calculate growth rates.

Figure 10: Gross Product and Employment Shares of Puerto Rico's Construction Sector

1990-2012



Sources: PR Planning Board (2013). *Statistical Appendix – Table 3.* PR Labor Department (2013). *Nonfarm Employment – Seasonally Adjusted.* Nominal values were used to compute the Gross Product shares.

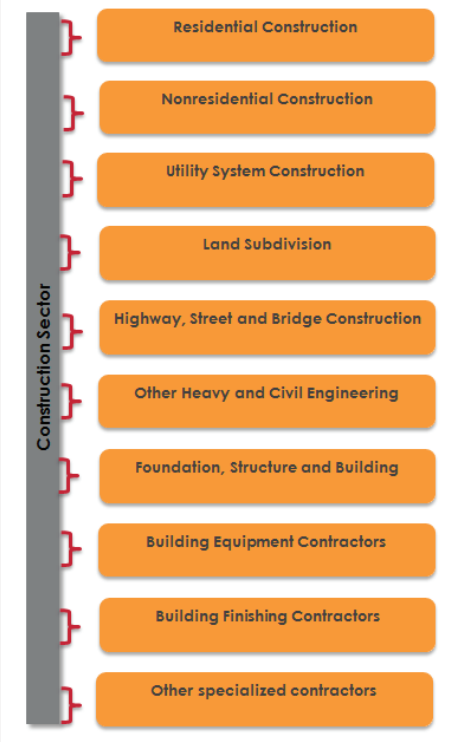
These findings suggest that Puerto Rican construction investment is close to, or already within, the "critical GNP limit" of the construction sector. Taking into consideration the difference between using GNP in Puerto Rico and GDP in the countries examined by Lopes et. al. (2002) should suffice to establish Puerto Rico within the estimated range of 4%-5%, perhaps even less. The necessity of reform in the construction sector is evident, as any other contraction in the sector could potentially weaken the economy further.

4.2. Structure of the Construction Sector in Puerto Rico

The construction sector in Puerto Rico is organized into ten (10) principal segments of industrial activity (hereafter referred to as either "sub-sectors" or "segments"). For the fiscal year 2012[2] , 83.9% of the Construction Gross Product concentrated within four segments: Residential Construction, Nonresidential Construction, Building Equipment Contractors and Highway, Street & Bridge Construction. Residential Construction was the segment with the highest participation in production, accounting for 29.1% of the total Construction Gross Product, followed by Building Equipment Contractors (21.9%) and Nonresidential Investment (21.2%).

Figure 11: Structure of the Construction Sector in Puerto Rico

NAICS Subdivisions



Source: Estudios Técnicos, Inc. (2013).

The net income distribution was almost identical to that of the Gross Product, suggesting that the dividends are fairly equitably distributed among segments. Relative to the Gross Product Distribution, Residential Construction held 0.3 pp less, Nonresidential Construction held 0.7 pp less, and Building Equipment Contractors held 1.4 pp more. Highway, Street & Bridge Construction maintained equal shares in Gross Product and net income, while Other Sectors decreased by 0.5 pp in net income share.

[2] *Unless otherwise noted, subsequent years will be PR fiscal years.*

Figure 12: Construction Gross Product in Puerto Rico, by Sub-Sectors
2012

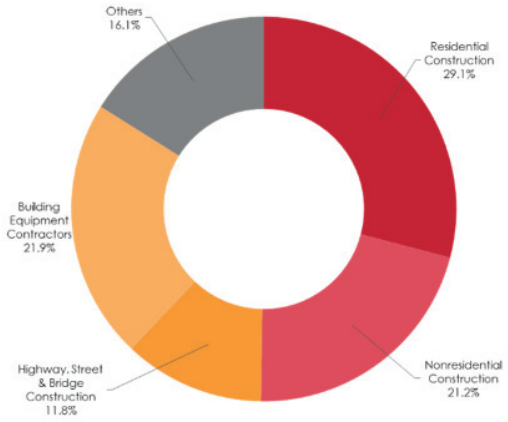
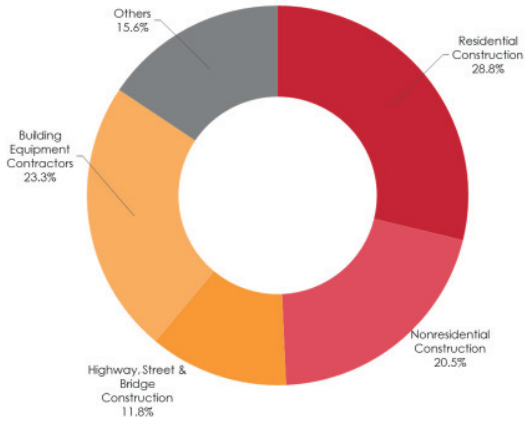


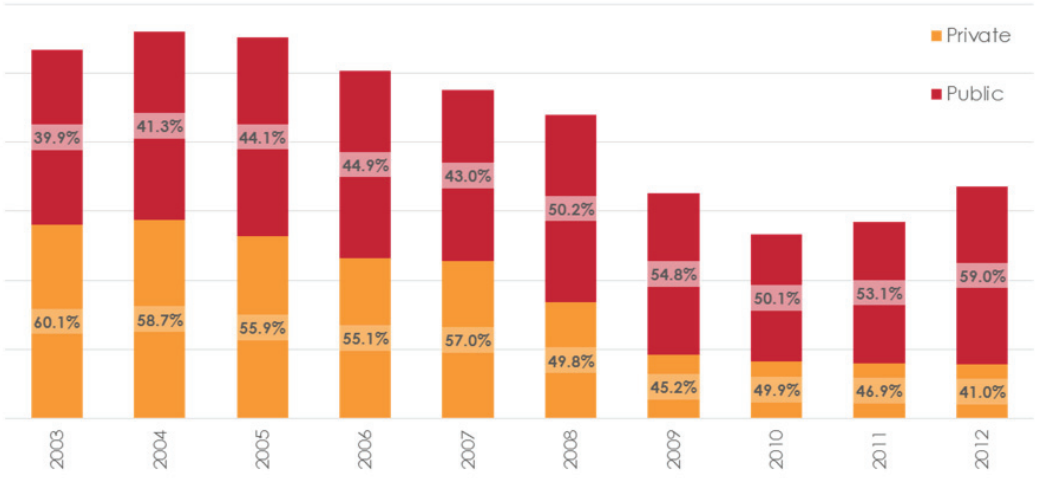
Figure 13: Construction Net Income in Puerto Rico, by Sub-Sectors
2012



Source: PR Planning Board (2013). The 'Others' category includes: Utility System, Land Subdivision, Other Heavy & Civil Engineering, Foundation, Structure & Building Exteriors, Building Finishing Contractors, and Other Contractors.

Between the years 2003 to 2012, the investment share of private construction declined relative to the public investment share. Public construction investment augmented its participation in total investment from 39.9% in 2003 to 59.0% in 2012. With the exception of 2007 and 2010, growth in public investment surpassed total and private investment growth for the 2003-2012 decade.

Figure 14: Construction Investment in Puerto Rico, by Type of Investment
2003-2012



Source: PR Planning Board (2013). *Selected Construction Sector Statistics – Table 1*. To calculate shares, nominal Construction Investment was used.

Figure 15: Construction Investment in Puerto Rico, by Type of Investment

2003-2012

Source: PR Planning Board (2013). *2012 Statistical Appendix – Table 3*. Real values were used to compute growth rates.

4.3. Construction Sector Performance

The following table summarizes Puerto Rico's construction investment by type of investment. Particularly noticeable are the relative stability of Public Investment respect to the Private Investment, and the vertiginous decline in total volume.

Figure 16: Construction Investment by Type

2003-2012

(In Millions of $)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Construction Investment	6,334.6	6,595.9	6,513.6	6,028.6	5,750.1	5,390.5	4,255.8	3,668.5	3,842.0	4,355.6
Private Investment	3,809.2	3,872.8	3,641.1	3,324.5	3,278.7	2,686.8	1,922.9	1,830.6	1,801.7	1,784.9
Public Investment	2,525.4	2,723.1	2,872.5	2,704.1	2,471.4	2,703.8	2,332.9	1,837.9	2,040.3	2,570.7
Housing	2,340.2	2,277.8	2,311.5	2,521.1	2,325.1	1,678.5	1,220.3	1,204.2	927.0	732.2
As % of Total Investment	36.9%	34.5%	35.5%	41.8%	40.4%	31.1%	28.7%	32.8%	24.1%	16.8%
Private Housing	2,106.7	2,066.6	2,062.9	2,217.7	2,101.9	1,540.9	1,099.4	996.1	766.1	670.4
As % of Total Investment	33.3%	31.3%	31.7%	36.8%	36.6%	28.6%	25.8%	27.2%	19.9%	15.4%
As % of Private Investment	55.3%	53.4%	56.7%	66.7%	64.1%	57.4%	57.2%	54.4%	42.5%	37.6%
Public Housing	233.5	211.2	248.6	303.4	223.1	137.6	120.9	208.1	160.9	61.8
Commercial, Industrial and Other Buildings	2,846.4	3,230.2	3,100.2	2,494.2	2,621.6	2,677.4	2,221.8	1,830.6	2,023.9	2,524.2
Private Enterprises	1,702.6	1,806.2	1,578.2	1,106.6	1,176.8	1,145.8	823.5	834.5	1,035.5	1,114.4
Public Enterprises	1,143.9	1,424.0	1,521.9	1,387.6	1,444.9	1,531.6	1,398.3	996.1	988.4	1,409.7
Schools, Roads & Other Public Works	1,148.0	1,087.9	1,102.0	1,013.1	803.4	1,034.6	813.7	633.7	891.0	1,099.2
Commonwealth Government	844.0	743.0	679.7	594.6	393.4	498.8	415.6	353.0	658.1	669.5
Municipalities	304.0	344.9	422.3	418.5	410.0	535.8	398.2	280.7	325.6	429.7

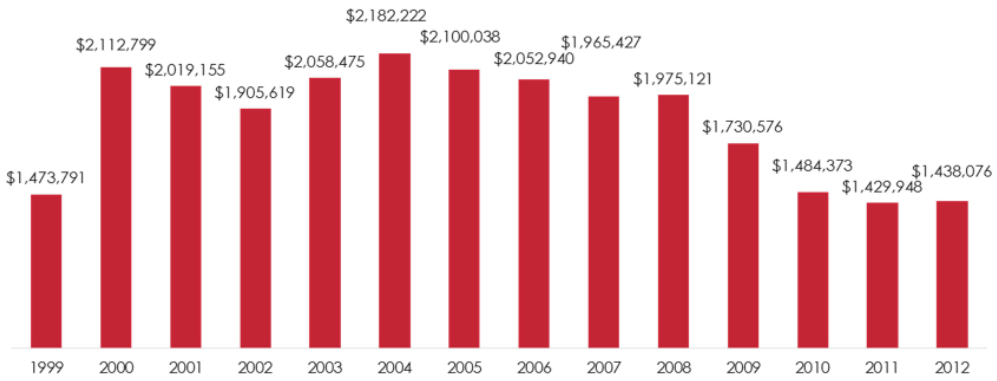
Source: PR Planning Board (2013). *Selected Construction Sector Statistics.*

A dominant trend in the Puerto Rican Construction Gross Product and its subsectors is that of a profound economic contraction during the 2007-2012 period, with particularly steep declines during 2009 and 2010. These correspond mainly to declines in Residential and Nonresidential Construction, followed by the declines in Building Equipment Contractors. The net contribution to growth[3] of these three segments had a magnitude of 8.4 pp in 2009 and 9.5 pp in 2010, while the net contribution of all other sectors combined was only 3.4 pp in 2009 and 3.7 pp in 2010. The steep declines can thus be attributed to a real estate crisis, with dramatic effects in both residential and nonresidential properties. During 2009-2010, looming economic stagnation coupled with a severe bank crisis, resulting in the disappearance of 4 financial institutions on the island. This generated a massive financial slowdown, which translated into far less construction activity than in previous years.

Figure 17: Construction Gross Product

1999-2012

(In $ Thousands)



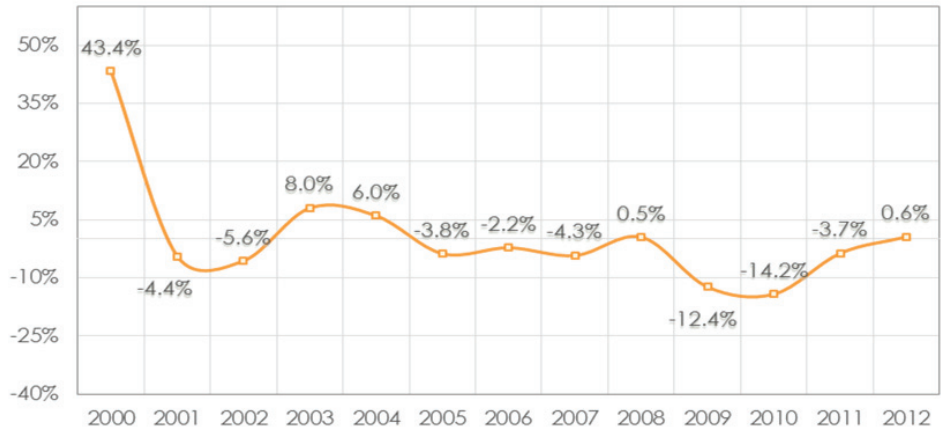
Source: PR Planning Board (2013). *Statistical Appendix – Table 9.*

The 1999-2000 period saw dramatic increases in construction activity, partly due to the approval of Law 89 of 2000, which provided a legal framework for the construction of telecommunications towers; investment in telecommunications was approximately 13.2% of total private investment for that year. Coupled with an expansion in housing construction, investments made by pharmaceutical companies, and the investments made by the electricity co-generators, this resulted in significantly higher levels of construction than in previous years (PR Planning Board, 2013b).

[3] *The net contribution to growth is defined as(□ s□_j)¯□g¯j, where (s_j)¯ is the Gross Product Share of a sub-sector j respect to the Construction Gross Product, and (g_j)¯ is sub-sector j's growth rate. The magnitude of this contribution is the absolute value of the net contribution to growth. To group multiple sub-sectors' contributions, we use the equation s_agg= ∑_(i=1)^n▒□s¯ □ g¯□, with corresponding magnitude |s_agg |.*

Figure 18: Growth in Construction Gross Product

2000-2012

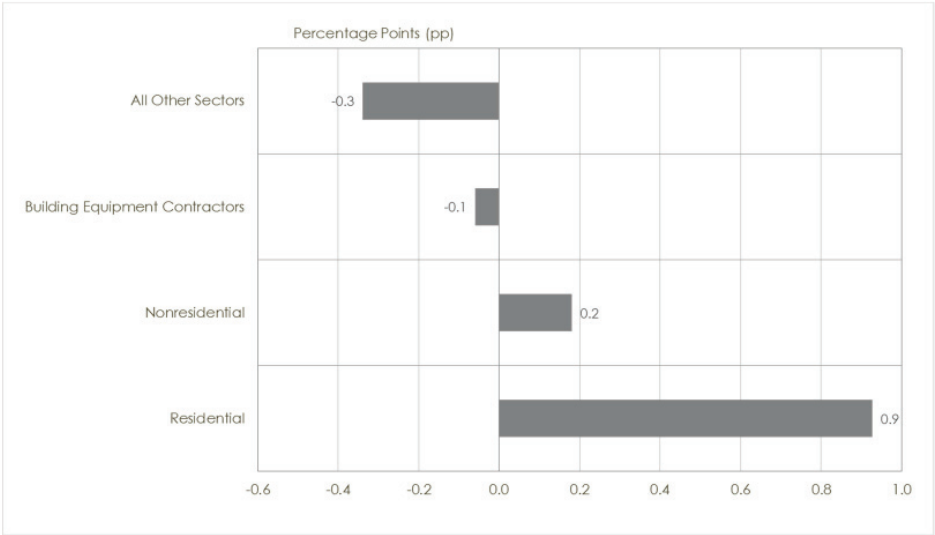


Source: PR Planning Board (2013). *Statistical Appendix – Table* 9. Nominal growth.

The construction sector experienced an overall positive growth in 2012, due to the stimulus policies adopted by the federal and local governments. Building Equipment Contractors, followed by Residential & Nonresidential Construction, experienced positive growth – 6.2%, 3.2% and 1.3%, respectively. Conversely, most of the remaining sectors presented negative growth for 2012. This uneven growth highlights the predominant role of countercyclical fiscal policy for the 2011-2012 recovery; however, unequal growth also lends credence to the unsustainability of sectorial recovery in subsequent years.

Figure 19: Net Contribution to Construction Gross Product, by Sub-Sector

2012



Sources: PR Planning Board (2013a). Estudios Técnicos, Inc. (2013). Nominal values for the fiscal year were used to compute the contributions.

The following section examines the main construction sub-sectors' performance for the 1999-2012 period, both in terms of productivity as well as profitability. Sectors with the "other" classification were largely omitted, as industrial trends would be obfuscated by non-stationary intra-sector heterogeneity.

4.4. Subsector Performance Analysis

4.4.1. Residential Construction

Residential construction was the most important segment in construction, averaging 33.1% of the Construction Gross Product for the 1999-2012 period, and representing 29.1% of the 2012 Construction Gross Product. Its total production volume peaked at 2004, and then began a sustained contraction until 2011, to rise slightly afterwards in 2012. The compound annual growth in Construction Gross Product was -7.3% for the 2004-2012 period, while the sub-sector's average growth was a -7.0% for the 2005-2012 period. In 2012, the sub-sector grew by 3.2% - the smallest positive growth since 2000; this recovery would not be enough to compensate for the substantial declines which occurred in previous years.

Figure 20: Construction Gross Product
Residential Construction – 1999-2012

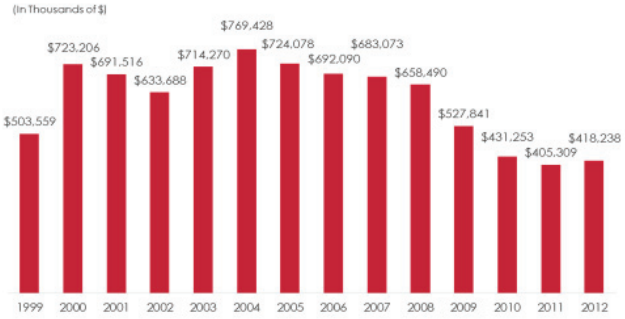


Figure 21: Growth in Construction Gross Product
Residential Construction – 1999-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

Residential Construction also declined in terms of net income, beginning a sustained contraction from 2007 until 2011. For the 2004-2012 period, Residential Construction had a compound annual growth rate of -8.0% in net income, and averaged -7.5% in growth for the 2005-2012 period. Residential Construction reduced its profitability as a result of the demand-side contraction brought upon by an adverse economic climate. The net income of Residential Construction grew by 2.3% in 2012, contrariwise to previous years: nevertheless, this small recovery is unsustainable, in light of the expected recession in upcoming years.

Figure 22: Construction Net Income
Residential Construction – 1999-2012

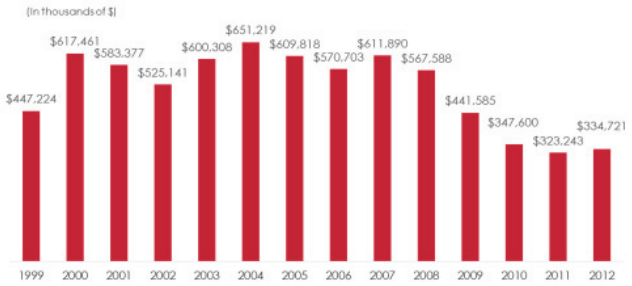


Figure 23: Growth in Construction Net Income
Residential Construction – 1999-2012

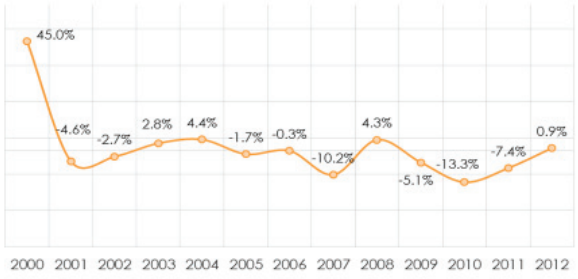
Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.2. Nonresidential Construction

Nonresidential Construction's Gross Product share averaged 20.6% for the 1999-2012 period, and represented 21.2% of the Construction Gross Product for 2012. Similar to Residential Construction, its nominal production value peaked in 2004, then began a sustained contraction until 2011. The compound annual growth for the 2004-2012 period was -4.3%, and its average growth from 2005 to 2012 was -4.1%; this is approximately 3.0 pp less than the decline in Residential Construction for the same periods, suggesting that this sector was more robust to the real estate crisis than Residential Construction investment.

Figure 24: Construction Gross Product
Nonresidential Construction – 1999-2012

Figure 25: Growth in Construction Gross Product
Nonresidential Construction – 2000-2012



Source: PR Planning Board (2013a). Nominal amounts & growths.

Net income in Nonresidential Construction followed a similar pattern, with a peak at 2004 followed by sustained contractions until 2011. A significant peak is seen in 2000, which saw an increase in construction of commercial buildings (PR Planning Board, 2009); these would have had positive effects upon nonresidential construction in that year. As noted before, the contraction in demand produced sectorial reductions in profitability, which further reflects upon Nonresidential Net Income.

Compound annual growth in Nonresidential Construction's net income for the 2004-2012 period was -4.3%, the same growth as in the Gross Product. Its average growth for the 2005-2012 period was -4.2%, slightly steeper than the decline in Gross Product.

Figure 26: Construction Net Income
Nonresidential Construction – 1999-2012

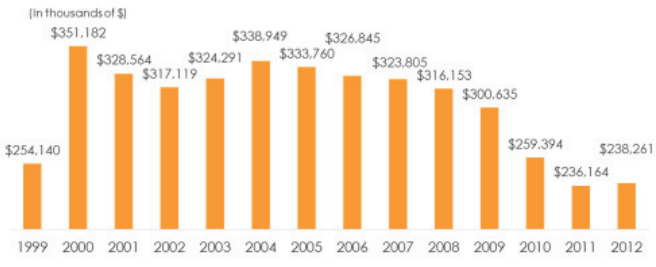


Figure 27: Growth in Construction Net Income
Nonresidential Construction – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.3. Utility System

Utility System Gross Product presented similar declines from 2004 onwards, with two exceptions: a) 2008 and 2009 saw higher volumes of construction than in 2007 (although the downward trend prevails), and b) the production value did not recover in 2012. The sub-sector's average Gross Product share for the 1999-2012 period was 3.2%, and 3.0% in 2012. Compound annual growth in the 2004-2012 period was -5.9%, whereas average growth from 2005 to 2012 was -5.4%.

Figure 28: Construction Gross Product
Utility System – 1999-2012

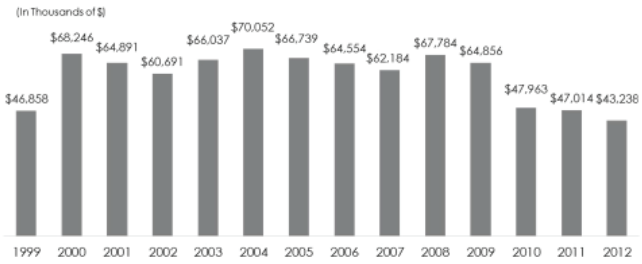


Figure 29: Growth in Construction Gross Product
Utility System – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

Impacts from the federal and local stimulus policies are clearly observed in the Utility System Net Income. 2008 and 2009 clearly stand out as the most profitable years since 1999, with a significant chasm between these and the 2010-2012 production values. For the 2004-2012 period, compound annual growth in net income was -4.6%, and the 2005-2012 average growth was -4.1%. Net income reductions are approximately 1.0 pp lower than the reductions in Gross Product, which can be attributed to capital accumulation by concept of dividends (PR Planning Board, 2013a).

Figure 30: Construction Net Income
Utility System – 1999-2012

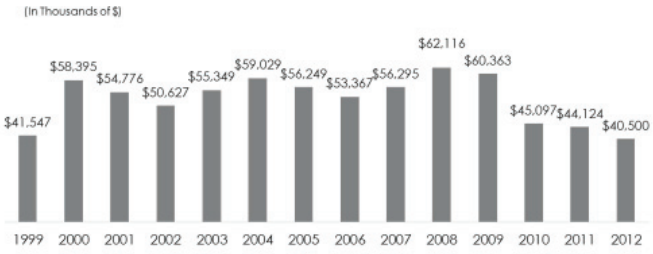
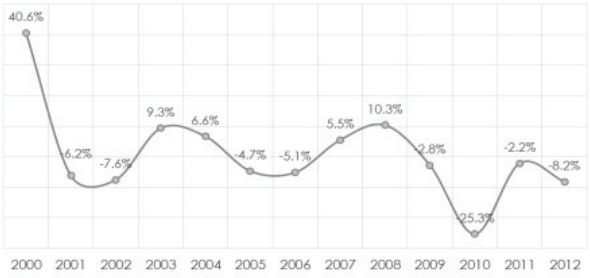


Figure 31: Growth in Construction Net Income
Utility System – 2000-2012



Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.4. Land Subdivision

This sub-sector experienced the largest contraction of all the sectors during the 2008-2012 period. After a peak in production volume for 2006, the Land Subdivision Gross Product fell vertiginously, reaching volumes approximately 45.5% of the 1999 level. Compound annual growth in Gross Product for the 2006-2012 period was -18.2%, and the average growth for the 2007-2012 period was -17.5%. Land Subdivision's Gross Product share averaged 3.2% for the 1999-2012 period, yet fell in 2012 to 1.7% of the Construction Gross Product – a 1.5% drop in relative production share. The accumulated net growth for the 2008-2012 period was -104.5%, meaning that this sub-sector declined by more than half its productive size during these years.

Figure 32: Construction Gross Product
Land Subdivision – 1999-2012

Figure 33: Growth in Construction Gross Product
Land Subdivision – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

Net income for this sub-sector experienced a peak in 2007, and contracted to 45.4% of its 1999 value. The compound annual growth for the 2007-2012 period was -21.9%, and the average growth for the 2008-2012 period was -21.4%. Due to the real estate crisis, this sub-sector has probably outgrown its profitable scale, and will be absorbed by other sectors, especially as the continuing scarcity of demand increases intra-sector competition.

Figure 34: Construction Net Income
Land Subdivision – 1999-2012

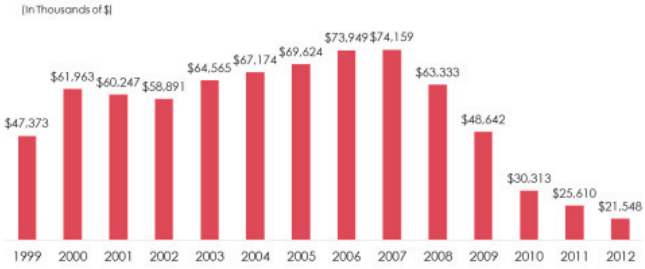


Figure 35: Growth in Construction Net Income
Land Subdivision – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.5. Highway, Street & Bridge Construction

In contrast to other construction sub-sectors, the Highway, Street & Bridge Construction Gross Product has gradually increased in production value throughout the entire 1999-2012 period. Its peak was in 2008, an important year in terms of federal and local transfers to the construction sector; in addition, its production values in years 2009-2011 were similar to those in the 2004-2006 period, and the sub-sector's 2012 production value is the second highest production value for the entire period. Compound annual growth in the 2008-2012 period was -0.6%, and average growth for years 2009 through 2012 was -0.5%. A relatively stable cyclical pattern is noticed within the production growths, which coincides with the election cycle's seasonal behavior. This sector's average Gross Product Share was 8.6% for the 1999-2012 period, yet it stood 3.2 pp higher in 2012 (11.8%), due to it being the only construction sector with an overall positive trend.

Figure 36: Construction Gross Product
Highway, Street & Bridge – 1999-2012

Figure 37: Growth in Construction Gross Product
Highway, Street & Bridge – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

Net income for the Highway, Street & Bridge Construction sub-sector peaked at 2008, with a relatively steeper cycle until 2012. Its compound annual growth for the 2008-2012 period was -1.5%, whereas its average growth for the 2009-2012 period was -1.2%. Federal and local stimulus policies resulted in a circumstantial dividend increase during 2008, which did not sustain for subsequent years until 2012 (PR Planning Board, 2012b).

Figure 38: Construction Net Income
Highway, Street & Bridge – 1999-2012

Figure 39: Growth in Construction Net Income
Highway, Street & Bridge – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.6. Foundation, Structure & Building Exterior

The Foundation, Structure & Building Exterior sub-sector also experienced a peak in 2008, then began a rapid contraction until 2011; it subsequently resumed positive growth in 2012. Its Gross Product share averaged 5.0% from 1999 to 2012, and stood at 5.2% in 2012, or 0.2 pp higher than the average. The 2012 share value was the second-largest in the period for the sub-sector – 0.2 pp below the 2008 share value of 5.4%. Its compound annual growth was -8.3% for the 2008-2012 period, and its average growth for years 2009-2012 was -7.8%. In 2012, this sub-sector generated a production value that was only 3.8% higher than the value in 1999.

Figure 40: Construction Gross Product
Foundation, Structure & Building Exterior – 1999-2012

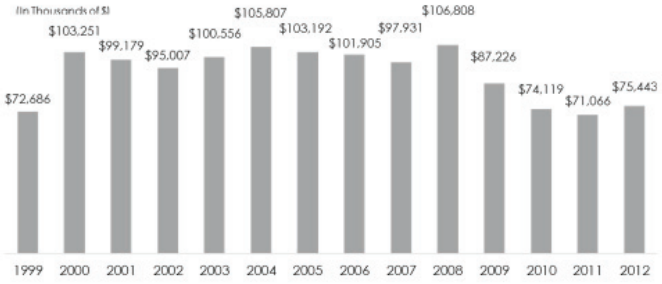


Figure 41: Growth in Construction Gross Product
Foundation, Structure & Building Exterior – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

Net income for Foundation, Structure & Building Exteriors displayed a more pronounced pattern relative to Gross Product. It shows multiple peaks in Net Income, each one at an election year; the highest of these was in 2000, after which two slightly lesser peaks occurred. The 2009-2011 period saw significant contractions, with -22.5% growth in 2009, -19.1% in 2010 and -6.3% in 2011. From the 2000 peak to 2012, the compound annual growth rate for this sub-sector was -3.8%, and the average growth for the 2001-2012 period was 3.0%. In contrast, the 2008-2012 compound annual growth was -10.6%, and the average growth for the 2009-2012 period was -9.8%.

Figure 42: Construction Net Income
Foundation, Structure & Building Exterior – 1999-2012

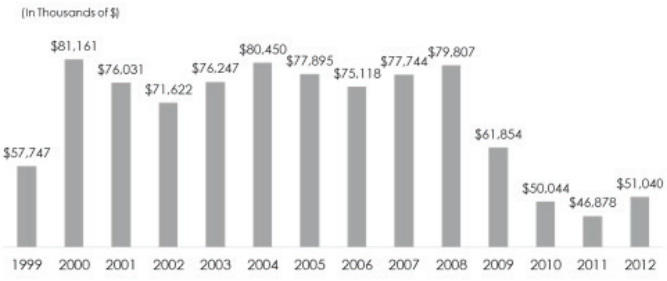


Figure 43: Growth in Construction Net Income
Foundation, Structure & Building Exterior – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.7. Building Equipment Contractors

Building Equipment Contractors comprise the third largest sub-sector in construction investment. For the 1999-2012 period, the Gross Product share of this subsector averaged 19.9%; in 2012, this sector outgrew Nonresidential Construction with a 21.9% share (relative to the latter's 21.2% share that same year). Its peak in 2004 coincides with the Residential and Nonresidential sub-sectors, while its production value continued declining from 2005 to 2012. For the 2004-2012 period, the sub-sector's compound annual growth was -3.5%, while its 2005-2012 average growth was -3.4%. These growth rates were 3.8 pp and 3.6 pp higher than their respective counterparts in the Residential Construction sub-sector, and 0.5 pp higher than the corresponding growths in Nonresidential Construction.

Figure 44: Construction Gross Product
Building Equipment Contractors – 1999-2012

Figure 45: Growth in Construction Gross Product
Building Equipment Contractors – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

While a significant peak in net income also surged in 2004, the highest peak in net income for Building Equipment Contractors was in 2000. This peak can be attributed to the significant productivity upsurge in Residential and Nonresidential Construction for the same year, which created a derived demand for heavy machinery and equipment. The compound annual growth for years 2000-2012 was -2.0%; average growth for years 2001-2012 was also -2.0%. Relative to the 2004 peak, compound annual growth and average growth (for the 2004-2012 and 2005-2012 period, respectively) were both -2.8%. For years 2007-2012, this sub-sector declined by approximately $55.1 million, or 20.3% of the 2012 production value.

Figure 46: Construction Net Income
Building Equipment Contractors – 1999-2012

Figure 47: Growth in Construction Net Income
Building Equipment Contractors – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

4.4.8. Building Finishing Contractors

The Building Finishing Contractors sub-sector remained at a 2.1% Gross Product share for 10 consecutive years. The recessionary period, which produced a severe contraction in other subsectors, caused a temporary increase in this share from 2009 to 2011; in 2012, the share declined again to 2.1%. While the value shares of this sub-sector persisted throughout the entire 1999-2012 period, it experienced an overall contraction after peaking in 2004; the general pattern of this sub-sector's production value mimics that of the Building Equipment Contractors. Gross Product in Building Finishing Contractors had both a compound annual growth and an average growth of -4.8% (for the 2004-2012 and 2005-2012 periods, respectively).

Figure 48: Construction Gross Product
Building Finishing Contractors – 1999-2012

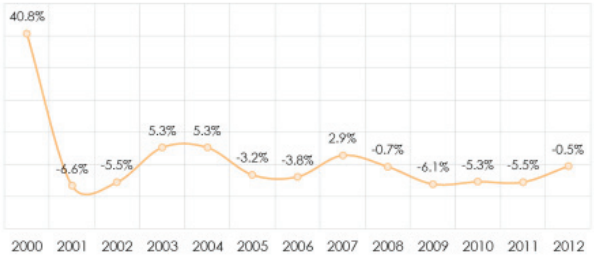
Figure 49: Growth in Construction Gross Product
Building Finishing Contractors – 2000-2012

Source: PR Planning Board (2013a). Nominal amounts & growths.

Net income in the Building Finishing Contractors sub-sector also mimics the behavior of Building Equipment Contractor's net income. It has cyclical, gradually seceding peaks within the island's election cycle, with the exception of a higher peak in 2007 than in 2008. Relative to its highest peak in 2000, the compound annual growth rate for the 2000-2012 period was -2.9%, whereas the average growth rate for the 2001-2012 period was -2.8%. Relative to 2004, the 2004-2012 compound annual growth was -4.3%, and the 2005-2012 average growth was -4.2%. The general cycle displayed by Building Finishing Contractors has steeper declines on average than in the Building Equipment Contractors sub-sector.

Figure 50: Construction Net Income
Building Finishing Contractors – 1999-2012

Figure 51: Growth in Construction Net Income
Building Finishing Contractors – 2000-2012



Source: PR Planning Board (2013a). Nominal amounts & growths.

4.5. Performance of Public Investment in Infrastructure

The performance of Puerto Rico's economy is heavily dependent upon the availability of optimal infrastructure. Decaying infrastructure has a cascading effect upon the economy, negatively affecting business productivity, employment, and the overall competitiveness of the economy. Businesses and households, for example, would face higher costs, due to unreliable and/or deficient a) transportation grids, b) maritime and ground shipment systems, c) water infrastructure, or d) electricity costs. These costs consume funding which businesses could reinvest in their operations, and that households could dedicate in discretionary spending in consumer goods or savings. Thus, the impact of decaying infrastructure – both present and future – is significant. If the investment gap between the actual infrastructure assets and future needs is not bridged, the economy would be exposed to deterioration of its productive capacity.

During the last ten years, public investment in infrastructure, which averaged 78.0% of total public investment (government plus municipalities), increased from $1.9 billion to $2.4 billion between 2003 and 2008; afterwards, it decreased to $1.9 billion in 2012. This decline reflects two factors: the current situation on the level of public debt, which has seriously limited the availability of new funds, and the completion or beginning of large-scale projects.

The proportion of public investment in infrastructure (as % of total public investment) has been declining to worrisome levels. In 1990, it accounted for 6.2% of total public investment; by 2012, it was only 2.9%. Short and medium term expectations, in the face of fiscal tightening and the precarious state of public debt, are that this percentage will not increase to pre-2000 levels. As a medium-term strategy, however, the adoption of public-private schemes may contribute to increase it.[4]

4.6. Real Estate and Rental and Leasing Sector Performance

Real Estate and Rental and Leasing is an industry sector heavily linked to the construction industry; it accounted for 15.8% of the GNP in 2012. As with the construction sector, it has reflected an economic downturn in the past six years; however, it has also experienced structural and demographic changes. In particular, excess supply of commercial and housing units, and changes in demand by type of housing, have generated a "sunk cost" inventory for particular types of residences and commercial lots. This is important, considering that most of this sector's net income comes from individually-owned buildings.

Table 2: GNP and Net Income Distribution for the Real Estate and Rental and Leasing Sector, 2012

Category	Gross Product	%	Net Income	%
Real Estate & Rental	**16,011,452**	**100.0%**	**12,802,013**	**100.0%**
Real Estate	**1,306,903**	**8.2%**	**756,622**	**5.9%**
Rent of Real Estate	1,306,903	8.2%	756,622	**5.9%**
Real Estate Agencies & Brokers	NA	NA	-	**0.0%**
Rental and Leasing	**356,941**	**2.2%**	**85,199**	**0.7%**
Rent and Lease of Automobiles & Equipment	189,601	1.2%	(11,188)	**-0.1%**
Rent of Consumer Goods	99,713	0.6%	57,032	**0.4%**
Commercial and Industrial Machinery & Equipment	67,627	0.4%	39,355	**0.3%**
Individually-Owned Buildings	**14,347,608**	**89.6%**	**11,960,192**	**93.4%**

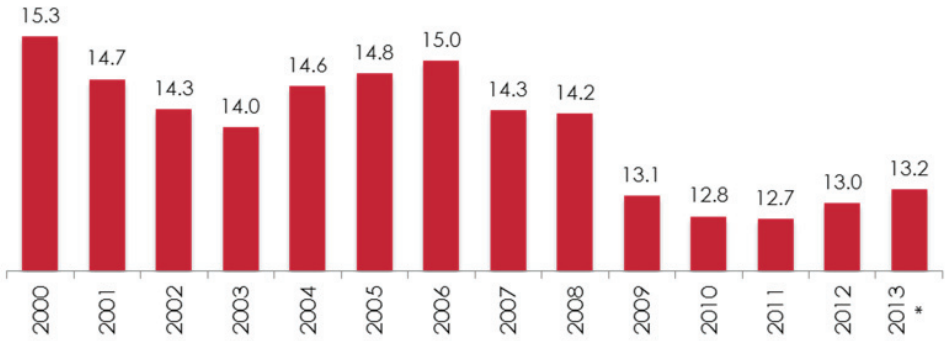
Source: PR Planning Board (2013).

Employment in the sector also reflects the economic downturn. It has decreased considerably since 2009, although the last two years have experienced a recovery to 2009 levels. On the other hand, salaries continued a downward trend since 2005, yet surpassed their 2005 levels in 2012.

[4] *A similar recommendation had been made for US states, regarding the current situation of infrastructure and federal government's budgetary constraints. See American Society of Civil Engineers (2013), Failure to Act: The Impact of Current Infrastructure Investment on Americas Economic Future (http://www.asce.org/failuretoact).*

Figure 52: Employment in Real Estate and Rental and Leasing

2000-2013



Source: US Bureau of Labor Statistics (2013). Data are up to October 2013.

Figure 53: Monthly Salary for the Real Estate and Rental and Leasing Sector

2000-2012

Source: PR Planning Board (2013). *Statistical Appendix – Table 14.* Data corresponds to the employee compensation item.

The real estate sector comprises different economic activities. Among them are: a) the sale/rent of properties, b) property administration, and c) financing. In turn, it is not only affected by economic changes, but also by demographic and social factors that can become endemic – and may pose even greater challenges in the medium-to-long term. We follow with a brief analysis of some of these factors.

4.6.1. Housing Sales

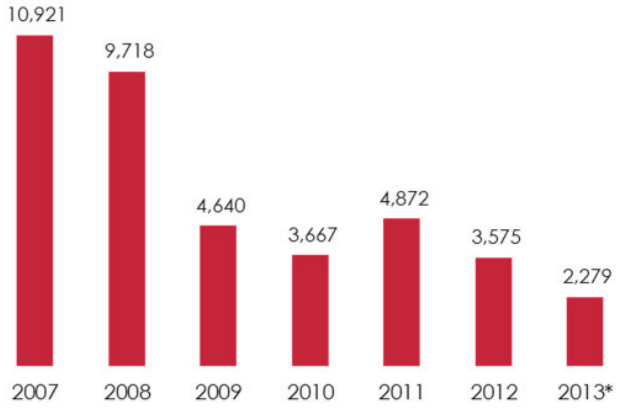
As with other economies, one of the most dramatic downturns in recent years has been the housing market slump. As well as circumstantial factors, housing sales have faced other particular problems, notably migration, the banking sector crisis, and financial issues of developers and contractors.

After the 2007 historic sales level of 10,922 new housing units, a downward trend has accentuated, particularly since 2009; sales have not been able to regain previous levels since that period (Estudios Técnicos, Inc., 2013). Between

2006, and the third quarter of 2013, housing sales have diminished at an average yearly rate of 16.3% -- which represents 8,000 units less.

Figure 54: Annual Volume of Housing Sales

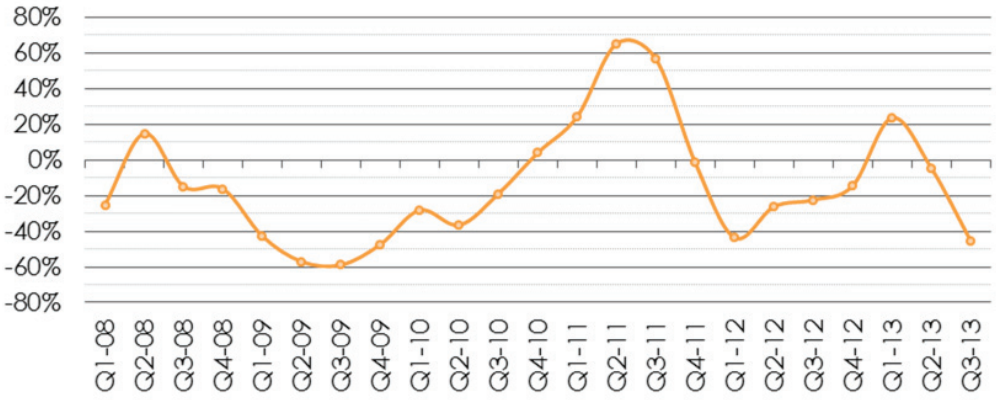
2007-2013



Source: Estudios Técnicos, Inc. (2013). *Construction & Sales Activity Report*. Data for 2013 up to the third quarter only.

Figure 55: Inter-annual Growth in Housing Sales

Quarterly – 2008 to Q3-2013



Source: Estudios Técnicos, Inc. (2013). *Construction & Sales Activity Report.*

Incentive programs were adopted during the last three years to stimulate housing purchases: until September 2012, $1.2 billion were paid and/or approved for these purposes. While these programs have positively affected the market, they have been mostly utilized to purchase used housing units. This has contributed to reduce inventories, but has not helped reduce the housing stock constructed during the housing boom (OCFI, 2013). Most of the new and used housing units are in the $60,000-$199,999 price range, as shown in Table 3.

Table 3: Sales Volume by New/Existing and Price Segment

2012

Price Segment	New	Existing	Existing-to-New Ratio
< $60,000	274	19	14.4
$60,000 - $124,999	3,879	675	5.7
$125,000-$199,999	3,248	928	3.5
$200,000-$249,999	640	214	3.0
$250,000-$399,999	636	315	2.0
$400,000-$999,999	205	158	1.3
$1,000,000+	22	28	0.8
Total	8,904	2,337	3.8

Source: Office of the Commissioner of Financial Institutions (2013).

The unsold housing stock, both new and used, poses one of the most important challenges to the housing market. It is quite large, due to the monthly addition of foreclosed units to this excess supply. As of September 2012, approximately 6,476 units were considered 'delivery-ready' (see Table 4).

Table 4: Constructed Housing Inventory, by Price Level

2012

Price Level	Volume	%
< $200,000	4,425	68.0%
$200,000-$499,999	1,794	28.0%
$500,000 +	257	4.0%
Delivery-Ready Units (September 2012)	6,476	

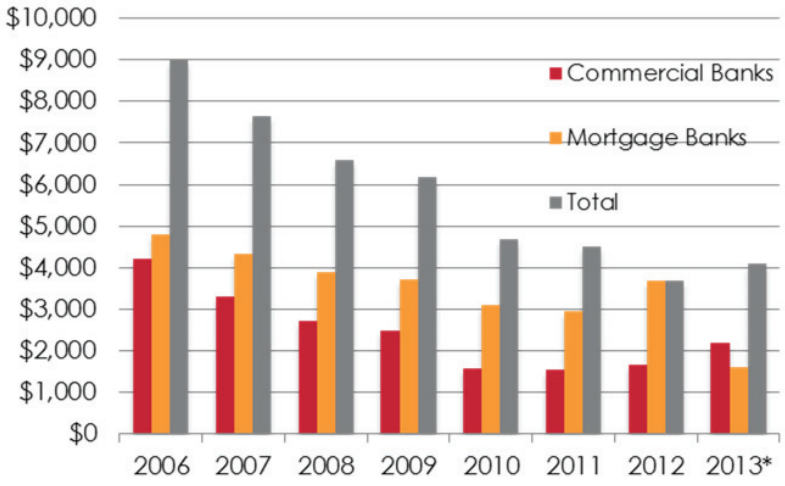
Source: Estudios Técnicos, Inc. (2013). *Construction & Sales Activity Report.*

4.6.2. Mortgage Originations

New originations of mortgage loans have followed a downward trend, consistent with the economic and banking situation experienced during that time. In 2010, the financial crisis forced the closure of four banks in the island, and generated overall more restrictive credit policies. In 2006, new mortgage originations were $9.0 billion, which then plummeted to $3.8 billion in the third quarter of 2013. Comparatively, this is a slightly higher level than in 2012, but it pales in comparison to the 2006 level.

Table 5: Annual Volume of New Mortgage Loans Originations

2006-2013



Source: Office for the Commissioner of Financial Institutions (2013). Data for 2013 up to the third quarter only.

4.6.3. Vacant Housing

A problem confronted both by the sector and at the social level, is vacant housing. According to data from the Puerto Rico Community Survey (PRCS), the number exceeded 70,000 units. Table 6 summarizes the findings for vacant households and available housing property.

Table 6: Summary of Vacant Housing by Characteristics

2010-2011

Vacant Housing Characteristic	2010	2011	% change 2010-2011
Total	**246,987**	**270,236**	**9.4%**
For Rent	25,623	28,195	10.0%
Unoccupied for Rent	3,707	3,889	4.9%
For Sale	22,460	25,589	13.9%
Sold, not occupied	8,714	8,579	-1.5%
For recreational, temporary or occasional use	57,724	63,443	9.9%
For migrant workers	233	279	19.7%
Other vacant	128,526	140,262	9.1%

Source: Puerto Rico Community Survey (2012).

4.6.4. Housing Needs

In addition to the vacant housing, lack of adequate housing – particularly affordable housing for the low-to-medium income population – also poses a problem. The population segment of 65 years and over has the highest population growth rate, yet has an income 20% below the Puerto Rico median income. There is an urgent need for adequate housing in certain zones to satisfy their housing, health, and recreational needs.

Table 7: Summary of Housing Needs

Characteristics of Housing Demand and/or Needs	
Inferior-quality housing units	110,398
Families with income less than $20,000, with over 30% in housing expenses.	160,627
In waiting lists for public housing	9,814
Low-income families qualifying for federal assistance within 5 years.	9,500
Informal housing units	Thousands
Affordable housing units for extremely-low-income individuals	16,630

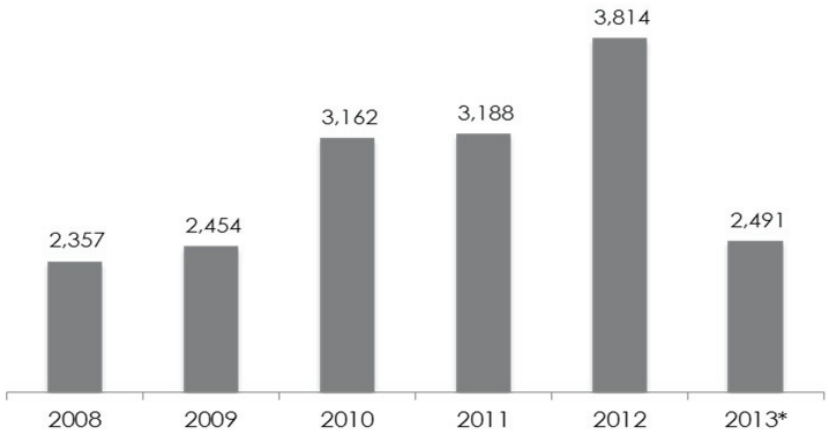
Source: Estudios Técnicos, Inc. (2013).

4.6.5. Mortgage Foreclosures and Housing Stock

The number of housing units in foreclosure has consistently risen during the last five years. Mortgage foreclosures, though only temporarily, add housing units to the unsold inventory. The number of foreclosed units during the first six months of 2013 was 2,491; at this pace, they are expected to surpass the 2012 level at the end of 2013.

Figure 56: Foreclosed Housing Units (Number)

2008-2013



Source: Office of the Commissioner of Financial Institutions (2013). Data for 2013 up to the third quarter only.

4.6.6. Real Estate Market Conditions

The main characteristic of this market is a high rate of unoccupied commercial space, in its different segments. Office space has a vacancy rate of 18.0%-22.0%, with 2.8 million square feet of vacant space. Storage space, whilst highly de-occupied, also has the problem of obsolescence respect to the PR economy. Commercial spaces have historically high vacancy rates, and a necessity of new developments to accommodate high-end retailers. The rehabilitation of unused commercial space for other purposes remains an area of opportunity for the construction market.

Table 8: Real Estate Performance Analysis, by Market Segment

Market Segment	Status	Outlook
Office Space	Vacancy Rate: 18%-22%	Saturation
	Vacant Space: 2.8 mill sq. feet	
	Average Rent down, but steady in high-quality buildings	
Warehousing Space	High vacant space	Possible development opportunities in more modern, logistically-oriented complexes.
	Obsolescence	
Commercial Space	Historically high vacancy rates, but stable at ~ 8%	New development needed to accommodate high-end retailers (e.g. CVS, Walmart, etc.)
Street-Front Commercial Space	Highly affected, with excess space	Low sales and high foreclosures for the following years.
Accomodation & Lodging Space	Recovery ensuing with ADR and occupancy growth	Continued possibility of new developments

Source: Estudios Técnicos, Inc. (2013).

4.7. Summary of Findings and Conclusions

The main findings of this report are:

1) Construction is positively related with economic growth. Investment in infrastructure generates a more-than-proportional impact upon employment, income and output. This is due to the strong sector linkages in the economy, as construction can be considered a derived demand from other industrial sectors. Recent performance of Puerto Rico's construction sector indicates that the economy is at a critical level of sector underperformance, below which any decrease in construction activity is associated with further economic contraction. The sector's GNP share decreased from 9.5% in 2007 to 6.3% in 2012, and its labor share declined from 6.3% in 2007 to 3.8% in 2012.
2) Worldwide, the construction industry is increasingly concentrated around emerging economies. By 2020, nearly 30.0% of global construction gross product and 42.0% of the contributions to world construction investment will be made by emerging economies. Emerging markets are projected to double their size within a decade, accounting for approximately 55.0% of 2020's global construction output.
3) The North American region underperformed in construction investment during the period 2005-2010. However, they are expected to outpace other regions in growth for the 2011-2010 decade. Contrariwise, Puerto Rico's outlook is defined by severe contraction, with all its investment sectors underperforming for the 2005-2010 period.
4) The role of public investment is increasingly important in Puerto Rico's construction sector. In 2012, public investment accounted for 59.0% of total construction investment, and (excepting 2007 and 2010) public construction investment surpassed both private and total investment in growth for the decade 2004-2013.

5) Construction Gross Product in Puerto Rico experienced a strong descent during fiscal years 2007 to 2012. In 2012, it experienced a slight stabilization due to a moderate increase in Residential, Nonresidential, and Building Equipment Contractors' Gross Product.
6) The construction sector in Puerto Rico is divided into ten main sub-sectors (or segments) of economic activity. In 2012, 83.9% of the Construction Gross Product was concentrated in Residential Construction, Nonresidential Construction, Building Equipment Contractors, and Highway, Street and Bridge Construction. Residential Construction continues to be the largest sub-sector, although its relative share has decreased significantly during the 2004-2013 decade.
7) Nonresidential Construction experienced less severe declines during the 2004-2013 period, which increased its relative participation in the Construction Gross Product. Highway, Street and Bridge Construction grew by 8.0% and 1.3% during years 2011 and 2012, respectively; its Gross Product share increased from 7.6% in 2006 to 11.8% in 2012.
8) Building Equipment Contractors increased their Gross Product share from 19.3% in 2006 to 21.9% in 2012, outgrowing Nonresidential Construction that year. Its contraction pace has been much slower than in other sub-sectors.
9) Real Estate and Rental and Leasing, a sector with high degree of linkages to the Construction sector, accounted for 15.8% of GNP in 2012. It reflected an economic downturn similar to Construction, but also suffered a number of structural and demographic challenges unique to it. Large inventories of vacant commercial and residential space, and changes in the population composition and income characteristics of the housing demand have stalled further recovery, and remain significant challenges for upcoming years. This is especially significant, considering that most of this sector's net income comes from individually-owned buildings.

5. Performance Indicators for the Construction Sector

Puerto Rico's performance in the Construction Sector can also be measured using indicators of internal dynamism and market size. These correspond to metrics established in Vilnius (2008), and serve as correlates of firm expectations and microeconomic decision-making. The following sections outline each metric alongside its expectations, and analyze the performance and outlook of Puerto Rico's construction sector in light of these metrics.

5.1. GNP Share of Domestic Construction Investment (%)

An important performance indicator for construction investment is its GNP share, which measures the sector's dynamism respect to the overall economy. An increase in GNP share implies that the construction industry outperformed the overall economy in growth, and a contraction implies under-performance. It is a viable indicator, since the nature of the construction industry implies that a marginal increase in contracts will result in significantly larger monetary amounts, and thus impacts in construction investment are more visible in the share distribution of GNP than other industries. Additionally, due to the high volume of linkages between the construction sector and the rest of the industrial sectors, the economic effects associated with an increase in construction GNP shares are correspondingly more significant.

For the 2003-2012 period, the GNP share of construction investment decreased dramatically, especially during the 2008-2011 period. This coincides with the international financial crisis, which severely reduced aggregate worldwide demand. The impact of ARRA funds and local stimulus policies ameliorated this decrease in 2012; nevertheless, construction activity remains at a decade-low, which implies that it has under-performed relative to the rest of the economy.

The prospects for an increase in construction GNP share remain bleak, due primarily to the overall reduction in public sector demand, and the increase in taxes upon individuals and corporations, which imposes further constraints on consumption. The significantly higher number of business and individual foreclosures, the demographic deterioration in the island, and lack of countercyclical fiscal policy will make any recovery scenario improbable for at least two years.

Figure 57: GNP Share of Construction Investment

2003-2012

Source: Puerto Rico Planning Board (2013). *Statistical Appendix*. Data provided by this source is In Fiscal Years.

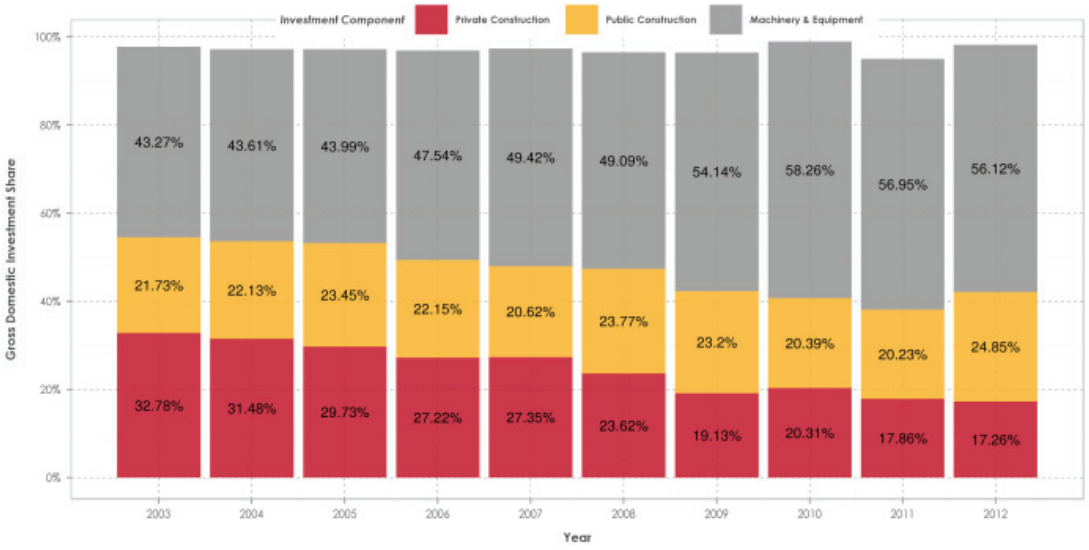
5.2. Share of the Construction Sector in Gross Domestic Investment

Another indicator of construction sector performance is its relative share in total domestic investment. A greater share in total investment implies that the sector is expanding its market and/or operations within the economy, and a smaller share indicates sector-wise contraction. Investment shares measure a sector's dynamism relative to other investment activities; this is in contrast to GNP share analysis, which measures the relative performance of the sector in the economy. Investment share analysis also includes relative contribution to growth in total investment, as well as the composition of construction investment in terms of public and private sector shares – a greater level of detail than is possible with GNP shares alone.

The 2003-2012 decade was characterized by a growing shift from construction investment to machinery investment in the private sector. The crisis in the 2009-2011 period severely impacted construction investment in both public and private sectors, whereas machinery investment contracted at a much more moderate pace. The influx of stimulus policies significantly increased the share of investment in public construction, whereas private sector construction continued to stagnate.

Figure 58: Gross Domestic Investment Distribution[1]

2003-2012



Source: Puerto Rico Planning Board (2013). *Puerto Rico Statistical Appendix.*[1] Excludes the Change in Inventories.

The outlook for the construction sector's dynamism heavily depends upon economic recovery across important sectors, such as manufacturing and the public sectors. Both of these remain quite weakened due to debt and tax constraints, as well as the expiration of patent protections and a significant drop in the sales volume of new housing units. While the potential for restoration of existing buildings cannot be ascertained from available data, the increased adaptability of construction to this segment could prove beneficial for growth.

5.3. Growth in Turnover (Net Income)

An important indicator of firm performance is its profitability. Profitability is based upon two main factors: technical & allocation efficiency, and opportunities for growth. As new technological developments become available and a firm attains more efficiency, its turnover should naturally increase over time. Economic growth should also impact firm turnover positively, as the increased optimism widens the opportunities for expansion and the demand for construction activity rises. The construction sector's yearly growth in turnover reflects the internal and external restructuring of firms to cope with a changing economic landscape.

Turnover in the construction sector reduced during the recessionary periods (2008-2011), and grew slightly during the year 2012. This growth responded to stimulus policies enacted by both federal and state governments, which generated an upsurge in infrastructure investment, primarily on the public sector. The disappearance of this external funding and the reduction of fiscal spending will negatively impact the construction sector's operational landscape, thus foreboding further contraction in the turnover generated.

Figure 59: Growth in Net Income of the Construction Sector

2003-2012

Source: Puerto Rico Planning Board (2013). *Puerto Rico Statistical Appendix.*

5.4. Employment Distribution by Occupation

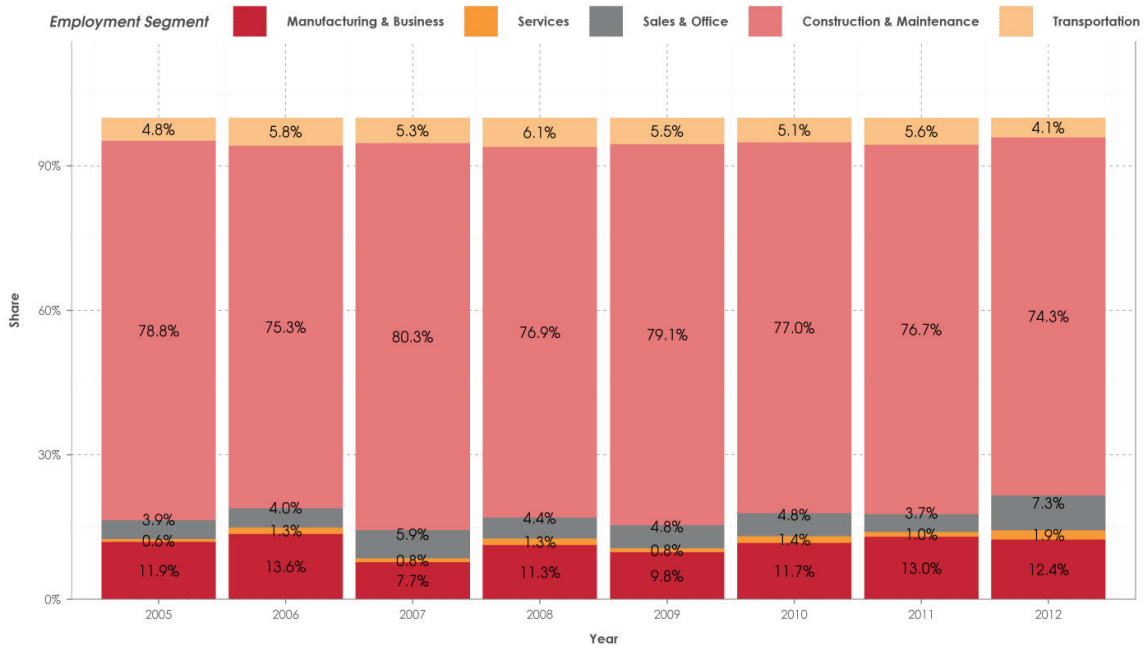
Employment distributions proxy industrial activity and firm expectations, and also give insight into the productive structure of a sector. Growth in production employees is directly linked to firm growth, although a decrease may also be due to capital implementation on the value chain. Sectors with high growth expectations will also experience upsurges in management labor, as more workers are required to operate and supervise operational expansions. The share of service-related jobs is inversely related to technological shifts, and thus is a measure of the sector's capital usage. Also, service shares tend to be positively correlated with increased economic activity. In the construction sector, sector growth directly reflects upon production employment, due to the majority of the workforce being production employees. However, other segments may experience dynamism; these reflect the economic expectations of the sector, as well as internal restructuring to cope with the changing business environment.

The share of reported construction workers was at its lowest in 2012 , compensated by a marginal increase in the share of Sales & Office occupations. Transportation activity also reduced its share significantly respect to other years. Management's share of employment share persisted at around 10% for the entire period, with the notable exception of the 2009-2010 recessionary period.

The reduction in construction employees is directly linked to a reduction in sector demand, while the increase in sales & office employees suggests an internal restructuring towards increased competition: in light of a declining demand, firms may employ more resources towards attracting a greater share of the available market, which increases inter-firm competition. A trend towards a sales-oriented labor force could emerge, in light of the shrinking demand for housing and public construction.

Figure 60: Employment Distribution of the Construction Sector

2005-2012



Source: US Census Bureau (2014). *American Community Survey, 2012: Industry by Occupation for the Civilian Employed Population 16 Years and Over* [Table S2405]. In calendar years.

5.5. Business Establishment Dynamics

Business dynamics outline the underlying structure of an industrial sector. Firms of different sizes establish differing wage-setting and labor conditions while competing, which results in heterogeneous investment behavior and resource allocations. Economic cycles also affect firms differently depending on their size, and hence the resilience and dynamism of an industrial sector is directly linked to firm size. While firm-level data is not available for Puerto Rico, establishments in the construction sector share a high correspondence between firms and establishments, and thus can be used as a proxy of business dynamics at the firm level.

Between 2004 and 2011, all firm sizes experienced a net negative growth. Firms of more than 1000 employees ceased to operate, while only 1 establishment with 500-999 employees was reported in 2011. On average, firms with less than 10 employees declined at a rate lower than the overall decline for the 2004-2011 period. This can be attributed to larger enterprises undergoing layoffs and thus shrinking their employment size, a finding confirmed by the upsurge in small firms' establishment share during the 2008-2011 period.

These findings suggest that the construction sector has shrunk in size and scope, with virtually zero large-scale establishments for 2011. The recession heavily impacted large-scale contractors, bringing about an enormous decrease in overall construction employment and wages. In response to a significantly diminished demand, firms have increased their competition for market share, which will probably result in less establishments for subsequent years. This will further consolidate the industry's adaptation to small and medium-size construction, which optimizes the scarce demand by reducing the minimum efficient scale of production.

Table 9: Construction Sector Establishment Dynamics

2003-2011

Number of Construction Establishments, by Employment-Size Class

	Total establishments	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000 or more
2003	2738	1370	452	325	322	158	83	19	7	2
2004	2778	1390	429	329	349	160	88	24	5	4
2005	2920	1425	494	388	339	151	91	21	8	3
2006	2956	1443	537	347	344	164	87	25	6	3
2007	2911	1400	512	378	349	163	83	19	5	2
2008	2716	1282	517	342	334	139	77	16	7	2
2009	2487	1260	442	319	281	113	54	11	6	1
2010	2277	1181	444	286	225	92	37	8	3	1
2011	2130	1158	387	240	218	78	41	7	1	0

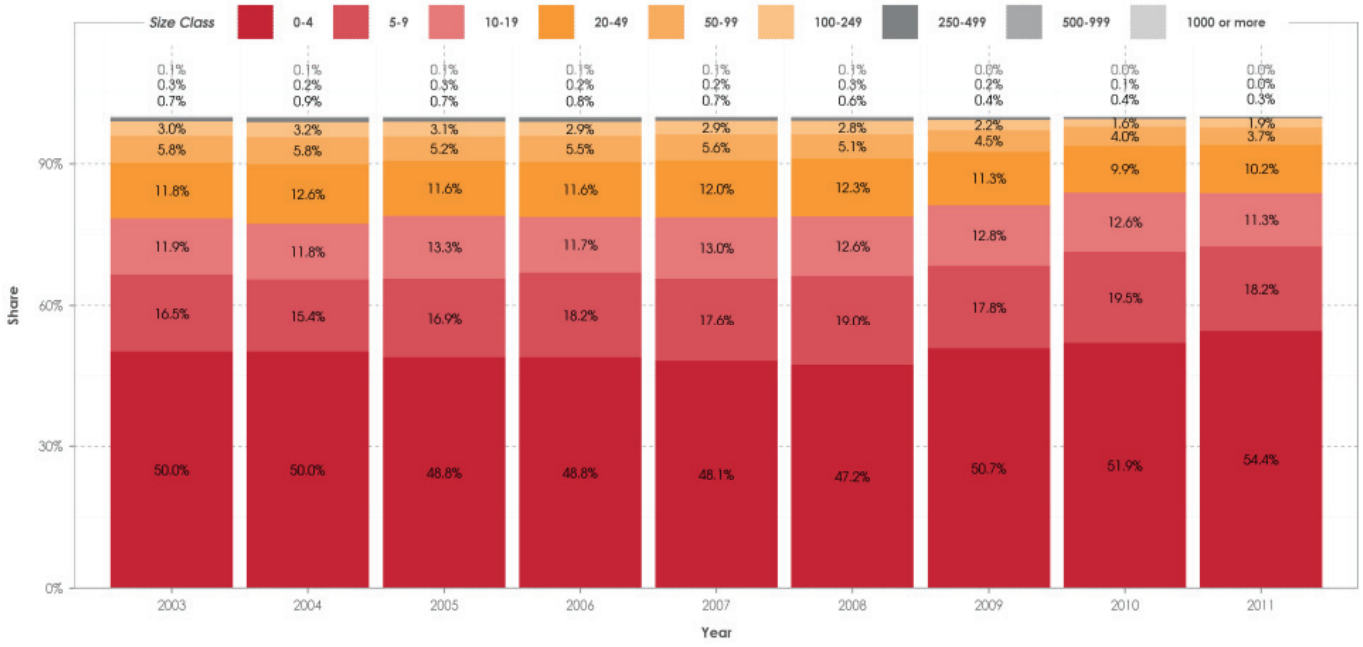
Change in Construction Establishments, by Employment-Size Class

	Total establishments	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000 or more
2004	40	20	-23	4	27	2	5	5	-2	2
2005	142	35	65	59	-10	-9	3	-3	3	-1
2006	36	18	43	-41	5	13	-4	4	-2	0
2007	-45	-43	-25	31	5	-1	-4	-6	-1	-1
2008	-195	-118	5	-36	-15	-24	-6	-3	2	0
2009	-229	-22	-75	-23	-53	-26	-23	-5	-1	-1
2010	-210	-79	2	-33	-56	-21	-17	-3	-3	0
2011	-147	-23	-57	-46	-7	-14	4	-1	-2	-1
	Total establishments	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000 or more
Net Change, 2004-2011	-608	-212	-65	-85	-104	-80	-42	-12	-6	-2
As % of Average Establishments	-22.9%	-16.0%	-13.9%	-25.9%	-33.9%	-59.1%	-59.0%	-72.0%	-112.5%	-100.0%

Source: US Census Bureau (2014). *County Business Patterns*

Figure 61: Establishment Distribution of the Construction Sector

2003-2011



Source: US Census Bureau (2014). *County Business Patterns.* In calendar years.

6. SWOT Analysis

6.1. SWOT Analysis for the Construction Sector

In light of the previous performance analysis and diagnostic assessment, a number of trends are readily apparent:

1) The construction sector is shifting from new construction to the restoration/rehabilitation of already-existing spaces. The most important sub-sectors in the industry face considerable challenges in selling and obtaining sustainable demand for new construction; meanwhile, the available vacant housing and commercial spaces is growing, and the demography in Puerto Rico is shrinking. In addition, the population composition has progressively shifted to new cohorts, which have different income and demographic characteristics and may not participate in the currently-available housing inventories.
2) There are significant misallocations between the available housing inventory and the needs of the Puerto Rican population. A large faction of households can be classified as inferior-quality; there is a significant waiting list for public housing, and a sizeable inventory exists with 'delivery-ready' construction.
3) Commercial space is at a slowdown. The lack of sustained recovery, and the large amount of vacant space, limits growth opportunities in construction to rehabilitation and reconstruction. The adoption of new technologies and modernization of facilities remains a viable segment for construction.
4) Public sector activity is likely to shrink. The government's finances have been severely strained due to the prolonged recession, and the subsequent fiscal tightening in order to ameliorate the financial gaps may further weaken the economy, particularly public construction investment.

In order to cope with these challenges, the construction sector must adapt more rapidly to the limited set of opportunities available in the market, and expand to attend the necessities unmet by the shrinking public investment. In light of the performance indicators above, we identify key strengths in the island's construction sector to attend these factors:

6.1.1. Strengths

1) Diversity of Contractors – there exists a large and varied labor force in this sub-sector, which can perform infrastructure projects of heterogeneous scale and complexity. As firms in this sub-sector expand in the different market niches, they may enable construction activity for other sub-sectors.
2) Large volume of vacant space – while this signifies a contraction in new construction activity, it also increases the potential for rehabilitation, restoration and modernization. Reutilization of office space to more appropriate uses will improve urban planning, and reduces the available inventory with significant social and economic collateral effects. It also reduces the costs associated with new construction.
3) Smaller scale of construction firms – the gradual reduction in size of construction establishments helps make the most of available demand, and provides a more decentralized, competitive environment for firm growth. A more competitive environment may help sustain greater innovation; however, it also limits the usage of scale economies to reduce costs, and may lead to between-sector cannibalism.

6.1.2. Weaknesses

Some key weaknesses of the sector are:

1) Rising costs – these limit profitability and competitiveness, and may also contribute to lack of reinvestment opportunities. In particular, significant increments in regulatory requirements compose a significant additional cost upon the sector, as it would involve infrastructure reimplementation and may curtail usage of cheaper techniques/ materials.

2) Many sub-sectors dependent upon public demand – the continued contraction in public infrastructure investment may spell significant reductions in these sub-sectors.
3) Low prospects for large-scale construction – this increases competition among smaller projects, as larger contractors may not obtain the contracts necessary to make their scale of operations sustainable. Larger contractors in general would require far more construction projects operating than their smaller counterparts, and in absence of sufficient demand, they may find it increasingly difficult to compete.

6.1.3. Opportunities

Besides the restoration of existing spaces, a number of niches may also provide opportunities for growth:

1) Renewable Energy – Puerto Rico has a very oil-reliant infrastructure, and increased pressure upon the public utility have led to significant price increases in electricity and/or water costs. Readapting firms with renewable energy can help reduce their long-term energy costs and modernize their infrastructure. It remains a viable market, in view of the significant policy framework aimed at establishing a renewable energy portfolio in the island.
2) Affordable housing for particular population segments – the demographic transition Puerto Rico faces can become an area of opportunity for restoration and capital improvement. Adapting infrastructure to cater particular segments of housing need – namely, elders and single mothers – not only expands the opportunities for construction investment; it also fulfills significant desirable social objectives.
3) Tourism – Projects such as the redevelopment of Roosevelt Roads, the completion of the Convention Center District and Bahía Urbana provide the bases for development of tourism-related activities. Puerto Rico has the facilities, staff and location to become a major medical tourism destination. Likewise, it has the potential to develop eco-tourism in both the island municipalities of Vieques and Culebra, as well as many other locations.

6.1.4. Threats

A number of threats can significantly reduce the already-weak construction sector. Key ones are as follows:

1) Rising costs – An increase in long-term interest rates may negatively impact housing demand. In addition, the possible increment of federal minimum wages may further strain an already-weak sector.
2) Continued economic stagnation – any further contraction in the economy would severely impact public investment and discretionary consumption.
3) Informal construction activity – it is a threat to public safety, as well as toxic competition to formal contractors; it is largely spurred due to the stagnant economy, but its effects are negative both on economic and social bases.

6.2. SWOT Analysis by Sub-Sector

The following tables provide analyses of each sub-sector's strengths, weaknesses, opportunities and threats. These take into account the economic needs assessment and the context upon which each sub-sector operates. Exceptions were the contractor sub-sectors, which largely converged in strengths and weaknesses, and thus were evaluated as a single group. Once again, groups that included all-inclusive categories were not evaluated, since their heterogeneity makes it extremely difficult to ascertain particular strengths and/or weaknesses.

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