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BIG BOSS CEMENT inc.: STIRring UP INDUSTRY COMPETITION IN THE PHILIPPINES[[1]](#endnote-1)

Shweta Pandey, Sandeep Puri, and Babak Hayati wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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In January 2018, the Philippine cement industry changed forever with the entry of a 100-per-cent Filipino-owned cement manufacturing company, Big Boss Cement Inc. (BBCI). When the company decided to set up shop with a cheaper, eco-friendly manufacturing process that promised less carbon emission,[[2]](#endnote-2) not only did the revolutionary move heat up competition, it also gave the National Ecolabelling Programme – Green Choice Philippines (NELP – GCP) initiative a big push. According to industry experts, in a scenario where the Philippine government planned to spend ₱3.6 trillion[[3]](#endnote-3) on infrastructure projects nationwide from 2018 to 2020, and where national demand for cement was expected to grow to 40 million metric tons by 2021,[[4]](#endnote-4) the entry of more players into the mix to meet this enormous requirement signalled the start of the “golden age of infrastructure” in the country.[[5]](#endnote-5)

To ride this cement wave in the Philippines, the Consunji family-led conglomerate DMCI Holdings Inc. also intended to jump into the fray with a potential US$340-million investment to set up a plant in the province of Antique’s Semirara Island, which was famous for its large limestone reserves and where DMCI Holdings Inc. was already mining coal.[[6]](#endnote-6)

Although BBCI’s eco-friendly manufacturing process was in line with the Philippine government directive of reducing greenhouse gas emissions by 70 per cent by 2030,[[7]](#endnote-7) BBCI was not the only company offering a green cement product. Of the industry’s four top players, which included Eagle Cement Corporation (Eagle Cement),[[8]](#endnote-8) three companies—CEMEX Holdings Philippines Inc. (CEMEX), Republic Cement Group (Republic Cement), and Holcim Philippines Inc. (Holcim),—had also rolled out green products.

It was important for BBCI to analyze the macro-environmental and competitive forces relevant in the context of its entry into the cement industry. In an industry already exposed to green products, was it possible for BBCI to differentiate its product based solely on ecological appeal? Would its environmentally-friendly brand promise work? How could BBCI ascertain and counter potential obstacles to its success?

BIG BOSS CEMENT INC.

Henry “Big Boy” Sy Jr., the eldest son and namesake of the Philippines’ richest man, Henry Sy Sr., owned 95 per cent of BBCI, while another businessman, Anthony L. Almeda, was the other key shareholder with a 4.88-per-cent stake. Sy Sr. had a net worth of US$12.7 billion as of 2017 and had been named the richest Filipino by *Forbes* for 10 consecutive years.[[9]](#endnote-9)

Sy Jr. was the vice-chairperson of SM Investments Corporation and chairperson of both SM Prime Holdings Inc. and SM Development Corporation. SM Investments Corporation was the holding company of the SM Group of Companies and had three reportable operating segments (see Exhibit 1). According to BBCI officials, Sy Jr.’s investment in BBCI was in a personal capacity and independent of any affiliation to SM Investments Corporation.[[10]](#endnote-10) Sy Jr., who had graduated with a management degree, had top-level experience in companies engaged in banking, real estate development; construction; mall operation; food and rubber manufacturing; finance; and investment.[[11]](#endnote-11)

Gilbert S. Cruz, an engineer who had worked in businesses situated in Zamboanga, Pampanga, Cavite, and Metropolitan Manila and had several bachelor degrees (chemistry, industrial engineering, and mechanical engineering), was named president of BBCI.[[12]](#endnote-12) Cruz had pioneered ultra-high-strength concrete and self-compacting/consolidating concrete in the Philippines.[[13]](#endnote-13) He had the experience of various concreting projects, such as Malaysia’s Petronas Towers in 1996, Taiwan’s high-speed rail project in 1997, China’s Three Gorges Dam project in 1999, and the Tokyo–Yokohama underwater tunnel project in 1999.[[14]](#endnote-14)

Cement-Making Process

The traditional method of cement production involved mining raw materials such as calcium carbonate, silica, alumina, and iron ore, which were extracted from limestone and clay, and crushing and stacking these into a stockpile for grinding. The mix was dried and ground again before cooking in a kiln fed with silica and/or clay, and underwent stages of preheating up to 1,500 degrees Celsius to produce clinker—a basic raw material needed for cement production. Clinker and a certain amount of gypsum were milled together to make cement. Additives gave cement specific properties such as permeability, resistance to sulphate, and higher quality.[[15]](#endnote-15)

The process induced heavy carbon dioxide emissions, which led to the cement industry accounting for around 5 per cent of global carbon dioxide emissions. Government legislation was pushing cement manufacturers to focus on ways to lower carbon dioxide emissions. The combustion of fuels used to heat the kiln (fossil fuels such as coal and oil) accounted for 40 per cent of emissions, the calcination process (heating of limestone) for 50 per cent, and the electricity used to power additional plant machinery and final transportation accounted for 5–10 per cent of the industry’s emissions.[[16]](#endnote-16)

Cement manufacturers were working on methods to use alternative fuels to lower fuel-combustion related emissions; for example, Holcim used alternative fuels such as industrial, agro, and residual waste (e.g., used tires and plastics) for its thermal-power requirements. Thermal energy generated from traditional fossil fuels such as coal represented 30–40 per cent of overall costs for the cement industry. The use of alternative fuels not only reduced manufacturing costs but also helped provide the government with a way to handle and dispose of hazardous waste and location waste. For example, when Republic Cement opted to use alternative fuels such as rice husks, saw dust, and refuse-derived fuel, substituting its fossil fuel requirements, the company not only managed to achieve a lower carbon footprint (an 18–25-per-cent emissions reduction), it also helped Metropolitan Manila address its solid waste disposal problem.[[17]](#endnote-17)

Emissions Reduction

Improving production-process efficiency (i.e., moving from wet to dry kilns) and replacing limestone-based clinker with materials such as coal fly ash and blast furnace slag used for blended cement helped reduce emissions.[[18]](#endnote-18) According to the Cement Sustainability Initiative, the percentage of clinker in the final cement product across the world had decreased from 83 per cent in 1990 to around 75 per cent in 2012, wherein 25 per cent of the cement was a non-clinker mineral with a lower energy requirement.[[19]](#endnote-19) Republic Cement had replaced clinker in its blended cement with carbon-neutral minerals or industrial by-products, as exemplified by its product Republic Portland Plus, which used fly ash, an industrial by-product of the power industry, and had a lower environmental impact, of around 25 per cent.[[20]](#endnote-20) Eagle Cement had built a waste-heat recovery system that generated up to 6.30 megawatts of power from the plant’s waste heat and allowed it to save up to 20 per cent of electricity costs in production—while conserving the renewable fuel supply and minimizing harmful gas emissions.[[21]](#endnote-21)

Product

The various products available in the market included Portland cement (made of clinker and gypsum) and blended cement (made of Portland cement clinker, gypsum, and pozzolan); however, local cement manufacturers promoted blended cement because of its durability, performance in severe weather conditions, sustainable construction (carbon dioxide emissions), and economics.[[22]](#endnote-22) BBCI had plans to roll out Portland cement Type 1B (blended cement that required less clinker) priced at ₱206 per bag, which was within the government price-control range of ₱205–215 per bag.[[23]](#endnote-23) Besides, the process used to produce the clinker did not require a kiln (costing around ₱3–5 billion) and hence required no burning.[[24]](#endnote-24) Clinker had to be imported from countries such as China, Vietnam, Indonesia, and Japan as the Philippines did not have enough capacity to crush and burn limestone into the raw material.[[25]](#endnote-25) According to a BBCI spokesperson, the company’s cement production process would make use of readily available pozzolanic raw materials such as lahar, and almost all types of soils and fillers.[[26]](#endnote-26) The company claimed that it could use any sand the government would allow for its raw material, including beach sand, as sand throughout the Philippines was 93 per cent the same, regardless of its source. BBCI claimed that its process would not only cater to the local cement industry but also decrease air pollution and environmental damage. Further, the company would only incur a cost of ₱2–4 billion, which was lower than the cost of a traditional cement plant (about ₱70 billion).[[27]](#endnote-27) However, the process failed to get an initial approval from the Philippine Board of Investment due to a lack of “proof of concept.”[[28]](#endnote-28)

**PHILIPPINE CEMENT INDUSTRY**

With a population of about 100 million as of 2015, which was growing at an average rate of 1.8–2.3 per cent annually, the Philippines’ need to improve infrastructure facilities and develop new residential areas had compounded.[[29]](#endnote-29) Foreseeing the massive requirements for doing so, the National Economic and Development Authority announced an increase in government spending on infrastructure from 5.32 per cent of gross domestic product (GDP) in 2017 (₱847.2 billion) to 7.3 per cent of GDP (₱1.84 trillion) by 2022.[[30]](#endnote-30) It earmarked 75 projects for prioritization, approval, and implementation until 2022. Of these, 18 projects, including the Malolos-Clark Airport–Green City Rail Project; New Centennial Water Source Project; Chico River Pump Irrigation Project; Phase 1 of the Mindanao Railway; the New Cebu International Container Port; and the Davao, Bohol, Laguindingan, Bacolod, and Iloilo airports, were approved by the National Economic and Development Authority’s board.[[31]](#endnote-31) The government had committed to investing US$23 billion in tourism infrastructure over six years under the National Tourism Development Plan.[[32]](#endnote-32)

Industry reports estimated that the country’s residential market would account for 33.9 per cent of the construction industry’s total value in 2020, considering that the government intended to give financial aid to middle- and low-income families through various programs such as the Pag-IBIG Affordable Housing Program, Community Mortgage Program, Core Housing Program, and the Abot-Kaya Pabahay Fund Developmental Loan Program.[[33]](#endnote-33) However, a falling peso against the U.S. dollar was likely to lead to a rise in bank interest rates, resulting in higher interest on home loans and hence lower demand for housing.[[34]](#endnote-34) Despite this, the outlook for the construction industry was still positive. The Philippine government had launched a ₱10-billion reconstruction project for the City of Marawi, which had been destroyed in a state-versus-rebel group conflict.[[35]](#endnote-35) Apart from this, a rising expatriate population was fuelling demand for posh condominiums in the Philippines.[[36]](#endnote-36)

Government focus on infrastructure investment, the urbanization of underprivileged rural areas, and housing projects for low- and middle-income groups had encouraged growth in the construction sector, which was expected to reach US$47 billion by 2020. The Asian Development Bank had upgraded the GDP forecast for 2018 from 6.7 per cent to 6.8 per cent, based on the assumption that the government’s infrastructure programs and investment would accelerate large projects.[[37]](#endnote-37)

According to the Cement Manufacturers’ Association of the Philippines (CeMAP), cement sales, including those of imported cement, were rising (see Exhibit 2). By the end of 2016, sales had risen 6.6 per cent to 25.96 million metric tons, of which 1.59 million metric tons were imported.[[38]](#endnote-38) But cement importers needed to pay a minimum capitalization of ₱20 million and a post-surety bond of 10 per cent of the declared value of the imported cement.[[39]](#endnote-39) The gap between demand and local supply was the result of the lower-than-estimated effective capacity of most plants. These plants, which required refurbishments, were more than 20 years old and had a lower than 0.80 clinker-to-cement ratio. Moreover, to meet the Philippines’ growing needs, the cement industry was expected to grow “by an additional 11.5 million tons until 2025,” from its demand of 26.82 million metric tons in 2017.[[40]](#endnote-40) BBCI hoped to account for 3 per cent of the estimated 26.82 million metric tons, as existing players could only accommodate 20–22 million metric tons of the 2017 demand.[[41]](#endnote-41)

No CeMAP report of the cement industry was available after 2016 because the association had halted the collection of sales data in August 2017 following an investigation into CeMAP, Holcim, and Republic Cement by the Philippine Competition Commission for alleged violations of competitive practices.[[42]](#endnote-42)

As part of global initiatives to reduce emissions, the Philippine government, too, was promoting green products and had rolled out the NELP – GCP to veer consumers towards buying environmentally-friendly products by labelling and declaring products “green” on the basis of clean manufacturing practices.[[43]](#endnote-43) Besides this, the new companies BBCI, CEMEX, Republic Cement, and Holcim all had their products certified as “green” by the NELP – GCP.

**MAJOR PLAYERS**

As of 2016, the top four companies—Holcim, CEMEX, Republic Cement, and Eagle Cement—accounted for 80–82 per cent of total clinker and cement domestic production.[[44]](#endnote-44)

Holcim was the market leader with the largest cement-production capacity— 8 million metric tons as of 2016 (see Exhibit 3). The competition was becoming more intense, with each of the four competitors rolling out initiatives and investments to increase production output by 2020 (see Exhibit 3). The Philippine cement industry’s production capacity was estimated at 28.63 million metric tons as of December 2016, based on nameplate capacities of integrated cement manufacturing and grinding plants.[[45]](#endnote-45) Industry reports placed the number of cement plants in the country at 18 (16 integrated and two grinding plants), with the plants of the top four players spread across the Luzon, Visayas, and Mindanao regions (see Exhibit 4).

Holcim Philippines Inc.

Holcim was a member of the LafargeHolcim Ltd. group, a world leader in the construction materials industry, with a presence in 80 countries and over 80,000 employees.[[46]](#endnote-46) The company was formed in 2000 after the merger of three companies—Bacnotan Cement Corporation, Davao Union Cement Corporation, and Hi Cement Corporation—and the subsequent acquisition of the Alsons Cement Corporation in 2002.Holcim manufactured, sold, and distributed cement, dry mix mortar products, and clinker. The company and its subsidiaries had four production facilities (see Exhibit 4), one grinding mill, three ports, and several storage and distribution points across the Philippines.[[47]](#endnote-47) Its investments in several sustainability initiatives, such as a continuous emissions monitoring system—to watch gaseous and dust emissions in real time—and being a founding member of the World Business Council for Sustainable Development, reflected the company’s commitment to reducing emissions by 20 per cent by 2010.[[48]](#endnote-48)

CEMEX Holdings Philippines Inc.

CEMEX, a subsidiary of CEMEX Asian South East Corporation, was a global building-materials company and had a presence across 50 countries. Its products included ordinary Portland cement, masonry or mortar cement, blended cement, and ready-mix concrete. As of March 31, 2016, the company and its subsidiaries owned two cement plants (see Exhibit 4), one ready-mix concrete plant, one admixtures facility, and several land distribution facilities and shipping terminals across the Philippines.[[49]](#endnote-49) Apart from developing green products, the company was also involved in several corporate social responsibility and skill-developing initiates. In 2014, it conducted a free 33-day masonry skills training program—Experto Ako!—where over 200 masons were taught about proper cement application and equipment, values formation, and teamwork.[[50]](#endnote-50) Besides this, CEMEX had partnered with the local government and non-profit organizations in the aftermath of Super Typhoon Yolanda to help rebuild and rehabilitate affected communities in the northern part of Cebu province.[[51]](#endnote-51)

Republic Cement Group

Republic Cement & Building Materials, Inc.; Republic Cement Iligan, Inc.; Republic Cement Mindanao, Inc.; and Republic Cement Services, Inc. comprised the Republic Cement Group, a joint venture between Ireland-based company CRH and local conglomerate Aboitiz Equity Ventures. CRH was a Fortune 500 building-materials company listed on the London Stock Exchange and the Irish Stock Exchange, and Aboitiz Equity Ventures, a public holding company of the Aboitiz Group, was a Filipino business group listed on the Philippine Stock Exchange. It had major investments in power, banking and financial services, food, infrastructure, and real estate. Republic Cement was involved in multiple sustainability initiatives; four of its key initiatives were for (1) people and communities (health, training, affordable housing, ethics, and compliance); (2) climate-change mitigation (reducing carbon dioxide emissions and the amount of clinker in cement, using alternative fuels, improving heat efficiency, and reforestation); (3) environmental responsibility (water conservation, bio-diversity, and particulate matter); and (4) blue innovation (discovering and promoting ecologically-sound solutions, processes, and products).[[52]](#endnote-52)

Eagle Cement Corporation

Eagle Cementwas majority-owned and managed by Chinese Filipino businessman Ramon Ang, who was the president and chairman of San Miguel Corporation. He owned a hotel and over 100 acres of prime real estate.[[53]](#endnote-53) San Miguel Corporation was among the largest and most diversified conglomerates in the Philippines. It contributed about 5.1 per cent of the country’s GDP (as of 2015) through its operations in beverages, food, packaging, fuel and oil, power, and infrastructure.[[54]](#endnote-54) It manufactured, marketed, sold, and distributed cement products and by-products and had two wholly-owned subsidiaries—South Western Cement Corporation and KB Space Holdings Inc., a land holding company. While South Western Cement Corporation manufactured and sold cement and its by-products and owned mineral rights in Malabuyoc in the province of Cebu, KB Space Holdings Inc. owned several parcels of prime commercial land in Mandaluyong City.[[55]](#endnote-55) Eagle Cement had a cement production facility in Barangay Akle, Bulacan (see Exhibit 4), and a grinding and packaging facility in Limay, Bataan.

**THE WAY FORWARD**

BBCI operated a testing facility in Mandaluyong capable of a monthly production of 5,000 bags of cement.[[56]](#endnote-56) It was in the process of building a facility with an output capacity of 1.5 million bags of cement per month in Porac, Pampanga. Commercial operations were expected to start there in March 2018.[[57]](#endnote-57) BBCI planned to invest around ₱4 billion for two additional plants (both in Luzon) to increase its monthly capacity to 10 million bags of cement, and another plant was planned at Zambaonga Peninsula.[[58]](#endnote-58) Even as BBCI aimed for capacity expansions, it needed to identify and address potential obstacles to its success and decide how to manage them. Considering BBCI was not the only company to launch “green” cement to reduce emissions or to be involved in environmentally-friendly initiatives, it was necessary for the company to set itself apart from the others by its product’s eco appeal. It was also essential for BBCI to ensure that its segmentation, targeting, and positioning strategies were well aligned with its environmentally-friendly brand promise, for it to emerge as a market leader.

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EXHIBIT 1: SM INVESTMENTS CORPORATION operating segments

|  |  |
| --- | --- |
| **Area** | **Subsidiaries (Category)** |
| Retail | The SM Store (non-food)  SM Markets, WalterMart, Alfamart (food) |
| Property | SM Prime Holdings Inc. (malls, residences) |
| Financial Services | BDO Unibank Inc. (investment banking, wealth management, credit cards, insurance, leasing, remittances)  China Banking Corporation (serving small and medium-sized companies’ investment needs) |

Sources: “Our Company,” SM Investments Corporation, accessed January 18, 2018, www.sminvestments.com/our-company; “Company Information: SM Investments Corporation,” PSE EDGE, accessed January 18, 2018, http://edge.pse.com.ph/companyInformation/form.do?cmpy\_id=599.

**EXHIBIT 2: CEMENT PRODUCTION, IMPORTS, AND DEMAND ('000 METRIC TONS),**

**2009–2016**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Production** | **Imports** | **Demand (Local Sales + Imports)** | **Change (%)** |
| 2009 | 14,865 | 1 | 14,470 | 9.48 |
| 2010 | 15,900 | 1 | 15,450 | 6.77 |
| 2011 | 16,063 | 30 | 15,625 | 1.13 |
| 2012 | 18,907 | 0 | 18,395 | 17.73 |
| 2013 | 20,150 | 0 | 19,604 | 6.57 |
| 2014 | 21,305 | 4 | 21,305 | 8.68 |
| 2015 | 24,046 | 314 | 24,360 | 14.34 |
| 2016 | 24,370 | 1,590\* | 25,960\* | 6.57 |

Source: Cement Manufacturers’ Association of the Philippines Inc. (CeMAP), *2015 Annual Cement Industry Report*, 2015, accessed January 25, 2018, http://cemap.org.ph/downloadables/PDF/cemap2015.pdf; \*Philippines News Agency, “Cement Demand to Double by 2021 with Infra Boost,” *The Manila Times*, June 20, 2017, accessed January 18, 2018, www.manilatimes.net/cement-demand-double-2021-infra-boost/333791/.

**EXHIBIT 3: PRODUCTION CAPACITY ('000 TONS) FOR KEY CEMENT MANUFACTURERS**

|  |  |  |
| --- | --- | --- |
| **Company** | **2016** | **2020** |
| Holcim Philippines Inc. | 8,000 | 12,000 |
| Republic Cement Group | 7,000 | 10,000 |
| Cemex Holdings Philippines Inc. | 5,700 | 7,200 |
| Eagle Cement Corporation | 5,100 | 9,100 |
| **Total** | **25,800** | **38,300** |

Source: Global Cement Staff, “Holcim Philippines to Bring on Extra 2Mt/yr through Debottlenecking,” *Global Cement*, May 26, 2017, accessed January 25, 2018, www.globalcement.com/news/item/6155-holcim-philippines-to-bring-on-extra-2mt-yr-through-debottlenecking; Danessa Rivera, “Republic Cement to Raise Capacity,” *The Philippine Star*, September 18, 2017, accessed January 25, 2017, www.philstar.com/business/2017/09/19/1740381/republic-cement-raise-capacity; Iris Gonzales, “Cemex Plans Additional Capacity in Philippines by 2019,” *The Philippine Star*, June 20, 2016, accessed January 25, 2018, www.philstar.com/business/2016/06/20/1594537/cemex-plans-additional-capacity-philippines-2019; Eagle Cement, “Eagle Cement Breaks Ground on its P12.5-B Integrated Cement Plant in Cebu,” November 22, 2017, accessed January 25, 2018, www.eaglecement.com.ph/article/eagle-cement-breaks-ground-on-its-p12-5-b-integrated-cement-plant-in-cebu/5.

**EXHIBIT 4: REGION-WISE DISTRIBUTION OF KEY CEMENT PLANTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Region** | **Island Group** | **Regional Centre** | **Cement Plants** |
| Ilocos (Region I) | Luzon | San Fernando | Holcim Philippines Inc.: La Union Plant, Bacnotan  San Miguel Yamamura Packaging Corporation: Northern Cement Corporation Plant, Pangasinan  Mabuhay Filcement Inc.: San Fernando |
| Central Luzon (Region III) | Luzon | San Fernando | Eagle Cement Inc.: San Ildefanso, Bulacan  Taiheyo Cement Corporation: San Feranando  Republic Cement Group: Bulacan, Norgazaray  Holcim Philippines Inc.: Bulacan  BBCI:Porac, Pampanga |
| Calabarzon (Region IV-A) | Luzon | Calamba | Republic Cement Group: Batangas Plant and Teresa Plant  Cemex Holdings Philippines Inc.: Solid Cement Corporation at Rizal |
| Bicol (Region V) | Luzon | Legazpi | Goodfound Cement Corp.: Albay |
| Central Visayas (Region VII) | Visayas | Cebu City | Republic Cement: Danao Plant  Cemex Holdings Philippines Inc. (APO Cement Corporation): Tina-an, Naga City, Cebu |
| Northern Mindanao (Region X) | Mindanao | Cagayan de Oro | Republic Cement Group: Iligan Cement plant  Holcim Philippines Inc.:Lugait Plant |
| Davao Region (Region XI) | Mindanao | Davao City | Holcim Philippines Inc.:Davao Plant |
| Zamboanga Peninsula (Region IX) | Mindanao | Pagadian | Big Boss Cement Inc.: Plant II (Planned), Zamboanga Peninsula |

Source: “Cement Plants Located in Philippines,” CemNet.com, accessed January 30, 2018, www.cemnet.com/global-cement-report/country/philippines.

Endnotes

1. This case has been written on the basis of published sources only. Consequently, the interpretation and perspectives presented in this case are not necessarily those of Big Boss Cement Inc. or any of its employees. [↑](#endnote-ref-1)
2. Ted Cordero, “Henry Sy Jr. Goes into Cement Business,” GMA News Online, January 11, 2018, accessed January 18, 2018, [www.gmanetwork.com/news/money/companies/639384/henry-sy-jr-goes-into-cement-business/story/](http://www.gmanetwork.com/news/money/companies/639384/henry-sy-jr-goes-into-cement-business/story/). [↑](#endnote-ref-2)
3. ₱ = Philippine peso; All currency amounts are in ₱ unless otherwise specified; US$1= ₱51.41 on January 30, 2018. [↑](#endnote-ref-3)
4. Philippines News Agency, “Cement Demand to Double by 2021 with Infra Boost,” *The Manila Times*, June 20, 2017, accessed January 18, 2018, www.manilatimes.net/cement-demand-double-2021-infra-boost/333791/. [↑](#endnote-ref-4)
5. “Labor, Cement Shortages Threaten Infrastructure Momentum,” *The Philippine Star*, November 28, 2017, accessed January 20, 2018, www.philstar.com/business/2017/11/28/1763368/labor-cement-shortages-threaten-infrastructure-momentum. [↑](#endnote-ref-5)
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10. Ted Cordero, op. cit. [↑](#endnote-ref-10)
11. “BBCI Executive Profile: Chairman – Henry Sy, Jr.,” Big Boss Cement, accessed January 22, 2018, http://bigbosscement.com/management-team/. [↑](#endnote-ref-11)
12. “BBCI Executive Profile: President – Engr. Gilbert S. Cruz,” Big Boss Cement, accessed January 22, 2018, http://bigbosscement.com/management-team/. [↑](#endnote-ref-12)
13. Ibid. [↑](#endnote-ref-13)
14. James Humarang, “Concrete Technologist Launches Greenest Cement Company in PH,” *Tech and Lifestyle Journal*, January 16, 2018, accessed January 22, 2018, http://techandlifestylejournal.com/big-boss-cement-initial-announcement/. [↑](#endnote-ref-14)
15. “Manufacturing Process,” Lafarge, accessed January 22, 2018, www.lafarge-na.com/wps/portal/na/en/2\_2\_1-Manufacturing\_process. [↑](#endnote-ref-15)
16. Madeleine Rubenstein, “Emissions from the Cement Industry,” May 9, 2012, accessed January 22, 2018, http://blogs.ei.columbia.edu/2012/05/09/emissions-from-the-cement-industry/; Peter Edwards, “The Rise and Potential Peak of Cement Demand in the Urbanized World,” *Cornerstone*,accessed January 30, 2018, http://cornerstonemag.net/the-rise-and-potential-peak-of-cement-demand-in-the-urbanized-world/. [↑](#endnote-ref-16)
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18. Madeleine Rubenstein, op. cit. [↑](#endnote-ref-18)
19. Peter Edwards, op. cit. [↑](#endnote-ref-19)
20. “Climate Change Mitigation,” op. cit. [↑](#endnote-ref-20)
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