Sustainable Building Industry in Phoenix, Arizona

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Abstract

This article serves as a brief analysis of the sustainable building industry in Phoenix, Arizona. The process begins by illustrating the need for this type of development by discussing the benefits, the financial feasibility, and the overall need for these types of buildings in the larger context of our world. Phoenix, Arizona’s market, environment, and population are then briefly introduced and discussed. The project incorporates both qualitative and quantitative components; including case studies of a diverse set of green buildings in Phoenix from several different asset classes, as well as in-depth discussions with industry professionals who played roles in these projects.

The study aims to discern what works with regards to sustainable building in Phoenix and what does not. Quantitative data is used to understand building features, compare resulting energy savings, discuss the economics of each of the projects, and justify their overall success from a financial perspective. Qualitative data is used to understand and discuss the motivations of each of these projects as well as any additional information that industry professionals bring up. The understanding of the success of these projects is meant to inspire future developers in Phoenix, Arizona, and perhaps other markets, to pursue sustainable building as a means of producing higher quality, more prosperous development projects.
Introduction

Real estate development is the process in which built environments are constructed. Unfortunately, far too many modern real estate development projects are being completed without consideration for sustainable design and planning. On a global scale, buildings account for between 20-40% of energy consumption in developed countries, now exceeding other major sectors such as transportation and industrial projects (Perez-Lombard, Ortiz, and Pout 2007). There is no question that development is essential for human survival; however, this issue of excess resource consumption and in turn, harm to the environment, is something that developers and designers can greatly reduce through new, energy-efficient building technologies and strategies. We currently have many of the technologies widely available that are capable of greatly reducing the impacts of our built environment, but their proliferation is lacking.

At its core, real estate development, especially private development, is a business. The goal of any successful business is to be as profitable as possible while operating under some essential moral and ethical concepts. In the building industry, the standard idea is that construction and operating costs must be kept affordable, and leasing rates kept high in order to turn a profit for the business, which is true in most cases. However, the constant chase for lower costs and higher returns on investment, compounded with the construction industry’s general intolerance for change and risk, results in many ignoring the possible benefits of implementing sustainable development methods. Existing research shows that sustainable features are often more cost effective and profitable in the long run than traditional building methods (Goering, 2009). This research shows that sustainable development has been proven to be quite feasible in most cases. Depending on numerous factors, research done by Kubba (2010), shows that sustainable buildings cost somewhere between 0-7% in additional costs to construct. However,
they save between 30-50% in energy cost (8-9% lower in terms of total operating costs), have higher rental rates (increased rental charges by 3% and increased occupancy rates by 3.5% on average), as well as commanding up to 15% higher prices on resale (Kubba, 2010).

‘Sustainability’ is considered many different things by many different groups, but one of the most agreed-upon definitions comes from the Brundtland United Nations World Commission on Environment and Development (1987) as reported by (Ethical Foundation, 1994):

“sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This definition helps explain sustainability with a wide lens that can be adjusted to accommodate for countless realms in today’s world. Within the building industry, three of the primary considerations in terms of sustainability are energy efficiency, water consumption, and transit-oriented design (Kern, Antoniolli, Wander, Mancio, & Stumpf González, 2016). These three aspects have been proven to be implemented into new developments with relative ease, and are a great benefit to the environment, community, and even finances of the property. A successful sustainable new real estate development should ideally be considered in all aspects of the Three Pillars of Sustainability (Social, Environmental, and Economic), and this research project will focus in on some examples of those particular cases in Phoenix, Arizona.

Sustainable design is not simply a one-size fits all approach to building development. Something that works on the East Coast or even in California will not necessarily work in Arizona; and even within Arizona, there are countless different markets and environments where different strategies are necessary. That is why it is important to perform a market study and analyze examples that have been successful in Phoenix and understand what aspects make them successful. First, this process requires the meaning of “sustainability” in the context of
development in Phoenix, Arizona to be defined, and then the meaning of “success” among those projects in order for them to be targeted for this study. Examples of a diverse set of Leadership in Energy and Design (LEED) certified, Energy-Star certified, Transit Oriented/Walkable (using WalkScore.com), and water-smart buildings will be collected, analyzed, and justified as to whether they have been deemed successful or not. The next step will be to reach out to the key players throughout the development process of these buildings, whether it be the developer themselves, the contractors, lenders, government officials, etc., to gather commentary on these particular projects and understand any trends or characteristics of these successful examples that may help bring more successful projects in the future.
Methodology

This study will rely on a combination of qualitative and quantitative research methods. This project is fairly complex and requires not only an understanding of the physical built environment and the financial forces behind each project, but also the attitudes and motivations behind the companies and people driving these projects forward. The overall goal is to create a valuable Market Study of the Sustainable Building Industry in Phoenix, Arizona which will require large amounts of qualitative data. I will create a set of criteria on which to determine what my definition of a “sustainable” project is and then compile a non-probability sample of “sustainable” projects in the Phoenix area to study, preferably with included a variety of types, styles, sizes, and owners.

The first step of the process of completing a Market Study of the Sustainable Building Industry in Phoenix, Arizona is to develop a set of criteria on which I will determine whether a project is deemed “sustainable” or not. I will narrow my scope by focusing on recently constructed Leadership in Energy and Design (LEED) certified, Energy-Star certified, Transit Oriented/walkable (using WalkScore.com), and water-smart buildings. I will complete an exploratory search for properties corresponding with these set criteria using Loop-net, Co-star, the Green Building Information Gateway (GBIG), and the ‘snowball’ method to develop a list of applicable projects according to this set of qualifications. From that list, I will select two of each property type (industrial, hospitality/hotel, multifamily, commercial/retail, and office) which will encapsulate a variety of buildings in terms of size (small vs. large), location and density (urban vs. suburban), and the size of their development team (national vs local, for example). From this list of roughly ten projects, I will analyze each of the Case Studies’ successes and failures in terms of finances, public image, and other challenges that may present themselves throughout the
process using the information available on the applications used to discover the properties, local news, and public record. These projects will then be compared and contrasted to discover trends in terms of what works, what does not, and potentially what things may be controlled in future projects to help ensure higher chances of success.

The next step will be to reach out to some of the key players in the Sustainable Building Industry in Phoenix who are leading the way in this field, particularly those responsible for the development of the listed Case Studies and conduct in-depth, recorded interviews. With these Phenomenological Studies, I will focus on three areas: What was their motivation for innovation and change? What were some of the challenges faced related to the execution of the project? How did/does the project perform compared to the equivalent non-sustainable building? With this information, I will try to ascertain what general factors are holding this field back and what may need to change to create a more sustainable future in our building industry. This more qualitative side of the research will go a long way in helping understand the human side of the Sustainable Building Industry in Phoenix and even potentially work out what we can do moving forward to ensure that more sustainable real estate development will occur.
Literature Review

Sustainability

Creating a more sustainable world is one of the most significant challenges facing our species at this point. Currently, there is no established common definition of what sustainability means, and therefore, there is a lack of consensus regarding how to act on these issues. Many groups over time have attempted to create an overarching and comprehensive definition of “sustainability,” but none have been entirely successful. Generally, the accepted definition of sustainability in most circles is “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” as determined by the Brundtland Commissions’ report, “Our Common Future.” This definition of sustainability helps guide the lens of study for this research project, but still does not solve the issue of exactly what action should be taken to achieve this goal.

The “Three Pillars” of Sustainability - environmental, social, and economic - as defined by in the report “Our Common Future” are generally a decent way of framing the mind in terms of sustainability. However, (Fien, 2002) acknowledges a total of Four Pillars of sustainability; ecological, economic, equity and political. This set of pillars is roughly equivalent in that ecological equals environmental, and equity and political are essentially an exploded view of Brundtland’s social considerations. It is important to consider each of these pillars in the context of all worldly things, but for the sake of this research project, the Pillars will be discussed in the context of real estate development and the building industry in general.

Many researchers have proven that the building industry has a strong impact on our environment. Research shows that the global contribution from buildings towards energy consumption has steadily increased reaching figures between 20% and 40% in developed
countries, and has exceeded the other major sectors: industrial and transportation (Pérez-Lombard, Ortiz, & Pout, 2008).

For this research, a sustainable building will be defined as one considering aspects of sustainability through energy-efficiency (LEED or EnergyStar), water conscious design, transit-oriented or walkable building placement, or any combination of those criteria. Further along in this review, those items will be discussed in more detail.

**Environmental Issues in the Southwest**

The southwestern United States has recently been faced with challenges relating to drought and water scarcity. High temperatures and relatively low amounts of precipitation classify the majority of this area “desert,” or at least arid and semi-arid (Carter & Campbell, 2009). Naturally, these characteristics are a recipe for intense water scarcity in the region. In modern times, massive population growth and vastly higher demand for water overall have placed even more stress on that precious resource, exacerbating the issue.

Macdonald addresses several sectors adversely affected by water scarcity issues, including agriculture, human consumption, environments, energy production, wildfires, landscaping, and importantly, buildings (2010). The way that these challenges have been addressed vary state to state depending on regulatory decisions of state governments including controlling urban water demand through building codes that help reduce water consumption in the built environment, focusing on things like landscaping, appliances, and climate control systems (Simons, Choi, & Simons, 2009).

On a wider scale, regulators must focus on their state’s water consumption as a whole. In Arizona, some recent years such as 2002 and 2009 have yielded up to 40% lower precipitation rates than average (Macdonald, 2010). This lack of precipitation places strains on some of Arizona’s largest water needs, such as agriculture, tourism, mining, etc. If these industries take a
hit and are not controlled for, it is likely that Arizona’s economy will experience some significant instability. With climate change occurring at an increasing rate, Arizona is becoming even warmer in many areas, leading to a higher demand for water (Balling & Gober, 2007). On the other hand, many water sources in the Southwest are depleting; which also a factor likely related to our changing climate.

The Southwestern United States largely depend upon the Colorado River as a primary water source. California, Nevada, Utah, Arizona, and New Mexico have an agreement which decides the water rights each state receive to the flows from the Colorado River. This agreement was first made in 1922 which determines each state’s apportioned water flow; with a separate agreement in 1944 to leave a small amount of water flow to Mexico (Christensen, Wood, Voisin, Lettenmaier, & Palmer, 2004). The Southwest, particularly Arizona, is put at risk with this agreement due to the uncertain future of the Colorado River as a dependable and stable water source. Buildings are a massive source of water consumption; therefore, Arizona could massively benefit from having a better performing built environment concerning water (Simons et al., 2009).

Impacts of Building Industry

According to Stern, building operations are responsible for roughly 20% of global greenhouse gas emissions (2008). This 20% value does not even consider the emissions put out during construction and demolition, solely through the operations of the buildings themselves. Pérez-Lombard et al., (2008) argue that this value jumps to nearly 40% of emissions in some countries when factoring in all construction activity. Greenhouse gas output is known to have many adverse effects on the environment, including contributing to global warming; not to mention the vast amounts of resource consumption. Thus, there is a growing need for environmental awareness in the real estate and building businesses.
A significant portion of these emissions are a result of the production of the massive amounts of energy needed to fuel our buildings. This energy is primarily used for heating and cooling of spaces; which accounts for upwards of 50% of energy use within buildings and 20% of consumption in the United States of America as a whole (Pérez-Lombard et al., 2008). This same study predicts that energy consumption overall will climb at a rate of roughly 1.5% per year, with no signs of slowing down. Other damages done on our environment as a result of our building industry are immense amounts of waste, heavy consumption of water, and placement of these buildings in a way that require modes of transportation, such as the automobile, which place a heavy strain on our environment (Kenworthy, 2006).

Benefits of Green Building

One common misconception regarding sustainability is that it is expensive and “not worth the effort.” Fuerst & McAllister found there to be no significant statistical difference in average construction costs between Green Buildings and traditional buildings, while others state as much as a 5-7% increase in overall costs associated with the development of Green Buildings (2011). These numbers largely fluctuate based on the location of construction, the type of construction, and the level/certification standards of the Green Building type being built.

Sustainability within the building industry can be brought about through countless methods. However, this study will focus on Water and Energy Consumption, Transit Oriented Design, and Walkability, all of which provide unique benefits for our economic systems, social structures, and the environment overall.

Walkability

Walkability, a byproduct of compact urban development within our built environment presents many benefits; including reduction of automobile use which decreases emission outputs and energy-consumption, increased health within communities, stronger community bonds, and
the bolstering of local businesses. “These efforts to achieve more compact, people-scale, walkable development patterns are also associated with a need to build more effective community in cities and to create a much higher quality urban public realm that has a real sense of place and meaning for people” (Kenworthy, 2006). All three of the Pillars of Sustainability are addressed within walkable environments.

This result is achieved by the strategic placement of development in a way that ties buildings together into an urban fabric. Walkability is defined as “the degree to which an area within walking distance of a property encourages walking for recreational or functional purposes” (Pivo & Fisher, 2011). For this study, walkability will be determined according to the ranking system on WalkScore.com, a website which measures the walkability of any address based on the distance to nearby places and pedestrian friendliness. A higher score means a more walkable environment in the area surrounding a given building. In theory, a higher Walk Score means a more sustainable building in most cases, all else being equal.

**Transit Oriented Development**

Transit Oriented Development, similar to Walkability, has the goal of reducing car dependency within cities. Kenworthy illustrates that our built environments are becoming increasingly “sprawled” out, which leads to things such as longer commuting times (2006). Longer commutes result in more time in our cars, away from family and friends, all while polluting our environment through the emission of greenhouse gasses. Typically, public transit is a cheaper, more cost-effective alternative mode of transportation than owning a vehicle (An & Pivo, 2018). Thus, not only do Transit Oriented Developments have benefits in the eyes of sustainability, but also help the wallets of the building occupants and the building owners, who may now be able to charge a premium for their more desirable building.
Transit Oriented Buildings will also be defined based on the rating system on WalkScore.com, which also includes a “Transit Score” system. “The Transit Score algorithm calculates a score for a specific point by summing the relative "usefulness" of nearby routes. We define usefulness as the distance to the nearest stop on the route, the frequency of the route, and type of route” (WalkScore.com). Both Transit and Walk Scores do contribute to the overall sustainability of a building as it relates to its place within a built environment concerning all three Pillars of Sustainability, but what about within its walls?

**Energy Efficiency**

According to Pérez-Lombard, et al., the energy consumption of buildings is quite a serious consideration, with somewhere around 20% of overall greenhouse gas emissions being a result of building operations, primarily used for climate control within these buildings (2008). Heating, ventilation, and cooling (HVAC) is responsible for up to 20% of the United States total energy consumption and is largely result of the countless areas of inefficiency in our buildings, particularly the HVAC systems being used. There are currently several major sustainable/green building classification systems in operation in the United States, all of which have similar end goals. By far the two most widespread and commonly accepted classification systems used today are the United States Department of Energy and Environmental Protection Agency’s EnergyStar system, founded in 1992, and the United States Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) system, founded in 1998 (Jackson, 2009). As of 2018, more than 94,000 projects are classified as ‘LEED’ (USGBC, 2018), and 12,600 commercial buildings alone have earned EnergyStar certification (Energy Star, 2016).

LEED buildings are ranked on a points system which ranks certified buildings from the ‘basic certification’ to their distinguished ‘platinum’ rating. This rating system accounts for things ranging from the building’s placement within the built environment down to the particular
fixtures and appliances used within the structure. However, the LEED ranking system is notorious for being relatively challenging with regards to the complexity of the application process, as well as being a particularly costly and time-intensive process. It should also be mentioned that there are questions around the performance and overall effectiveness of LEED-rated buildings (Guy R. Newsham, Sandra Mancini, 2009), but generally, they are seen as a good basis for sustainable buildings in modern markets.

EnergyStar buildings are ranked on a scale of 1-100 based on a set of ever-evolving criteria. Both of these rankings concentrate their analysis on a building’s ‘sustainability’ with regards to material choices and energy efficiency performance, with LEED placing more of a focus on things such as water consumption and waste management. EnergyStar certification is redone every year and essentially ranks a building’s performance relative to other similar buildings (US EPA, 2018).

**Water Consumption**

A significant portion of our resource consumption as a civilization occurs within our buildings. In the Southwest, water is of primary concern and its supply is becoming increasingly limited; however, the large majority of our buildings are designed without proper consideration for issues surrounding water consumption. The United States Bureau of Reclamation’s WaterSMART program has taken the initiative to attempt to reduce water use in the Western United States through various measures including sponsoring and subsidizing projects that address water conservation, but their work largely includes infrastructure and agriculture projects (USBR, 2018). In the building industry, there is not the same level of high-level promotion from our government. Thus, water issues are often left alone.

Within the built environment, there are countless ways to reduce water use, several of which can be retrofitted, or done post construction, in existing structures (Seyranian, Sinatra, &
Typically, these strategies involve things such as low flow appliances like shower heads, toilets, and dishwashers, as well as low-water landscaping, known as xeriscaping. Xeriscaping involves using native, natural vegetation to eliminate the need for supplemental landscape watering. Institutions and markets have seen some results in terms of lowering water usage through increased rates. However, this is not necessarily beneficial to the building owner/operator or the tenants within. Also, with water becoming an increasingly more valuable resource, particularly in the Southwest, finding cost-effective ways to reduce water consumption is vital for the sustainability of our built environments. Based on the simple concept of supply and demand, increased scarcity of clean, fresh water soon will lead to a jump in water prices, financially harming the users of the resource if our building stock is not supplied with water-conserving features.

Financial Feasibility

The current lack of sustainable buildings in our building stock leads us to believe that traditional thinking in the industry is that green building methods are not a cost-effective alternative to standard building practices. The United States Department of Energy currently has a plan to “create a technology and knowledge base for cost-effective net-zero commercial buildings by 2025” (Torcellini, Pless, & Deru, 2006). This plan focuses on the fact that sustainable buildings will drastically reduce operating costs within buildings, making them more desirable for potential tenants, leading to higher rental rates and lower vacancy rates while also being more appealing to potential property buyers.

Rental properties make money by taking income through rental charges, then subtracting out the operating costs of that building; it is clear to see how sustainable buildings may help increase property values. The Net Operating Income (Rental Income – Operating Expenses) will be affected positively on both sides of the equation by a successful sustainable building. Also,
because property value, at least for rental income properties, is a function of the Net Operating Income (NOI) divided by the Capitalization Rate (Cap Rate), an increase in the NOI will directly increase property value. An & Pivo have shown that green buildings also receive a lower Cap Rate than the current market rate for standard buildings due to the lower perceived risk of investing in that type of asset (2018).

However, Jackson says, “risks associated with sustainable real estate are determined by the uncertainty surrounding market-determined rent and occupancy premiums and cost premiums associated with sustainable buildings” (2009). Moreover, Menassa states that “a study of 750 corporate real estate executives cites high construction costs (61%), long payback periods (57%), and difficulty in quantifying the benefits of green building (43%) as the main obstacles” (2011).

Uncertainty in the industry can be greatly quelled by solid statistical evidence proving the success of green buildings from a cost standpoint. Jackson however, also argues that sustainable buildings produce great returns with limited risk (2009). According to Jackson, LEED buildings bring an average internal rate of return (IRR) of 126%, and EnergyStar buildings bring an average IRR of 140%, both having less than 10% probability of failure financially (2009).

Maintenance on sustainable properties, which typically include things such as state-of-the-art heating and cooling (HVAC) systems and other technologies, may seem daunting to some property owners. However, Heinemeier et al., found no significant difference in the maintenance costs or requirements for these more efficient systems compared to standard building technologies (2012). In the current building industry climate, with commodity and labor prices rising along with interest rates, retrofitting our current building stock might be the best option in terms of a means towards making our built environments more sustainable.
Overall, green buildings, especially walkable, transit-oriented and/or energy-efficient ones, have shown to have a lower risk of mortgage default when compared to traditional properties (An & Pivo, 2018). Andonov, Eichholtz, & Kok have shown evidence of green buildings receiving more favorable interest rates on financing because they are often a more secure investment (2015). In this current market of rising interest rates and growing uncertainty about the future of real estate markets, it is important to find ways to limit risk. Pivo & Fisher found that a 10-point increase in WalkScore alone corresponds to a 1-9% increase in property value (2011).

**Real Estate Market Trends**

The construction and real estate markets are in constant flux. Numerous outside factors such as geopolitical relations, macro- and micro-economic conditions, resource and labor markets, and various other things impact the real estate markets. CB Richard Ellis (CBRE), the Urban Land Institute (ULI), and several others put out reports periodically which summarize the trends in the real estate and construction industry. These reports come in various levels of detail and geographical focus, ranging from Global Markets to particular cities. For this study, we will begin by analyzing nationwide trends, then focus on the Southwest region, and finally, the market trends within Phoenix, Arizona.

**Nationwide**

Gross Domestic Product and Job Supply are steadily increasing in the United States, which means that more Americans will have the funding to buy and invest in real estate soon, which is good for business. There is an influx of people moving towards urban centers, with a growing preference for increased density and a multi-family style of residence, especially amongst Millennials, with 22.6% of new multi-family construction occurring in urban cores (CBRE, 2018). In Global Markets, uncertainty regarding trade deals and tariffs between the
United States and other major economic centers such as Asia and Europe may play a role in the mind of those in the industry as well.

In the Financial Markets, the Federal Reserve has been steadily increasing interest rates, along with increasing labor costs, making new construction more expensive for builders and purchases more costly for potential owners (ULI, 2018). This should lead to a rise in value-add retrofit opportunities and a growth in the rental property industry (reduced vacancy rates and increased rental rates), should this trend continue. In the Office space sector, the United States is nearing saturation due to excess building and a transition to more mobile workers, which suggests that new office construction will slow shortly. Concerning leases, tenants are resigning in higher numbers and are trying to lock in lower rates by signing longer-term leases, while the market rates steadily increase. In some places, such as Miami, Florida, regulators are requiring all new government and public buildings, as well as commercial buildings over 25,000 square feet, be LEED Certified (An & Pivo, 2018). In the foreseeable futures, capitalization (cap) rates in the industry, which affect property values, are expected to remain relatively flat, thus bringing about no significant increases or decreases in property values (CBRE, 2018).

**Southwest**

The Southwestern United States has experienced tremendous growth over the last few decades. In today’s world, the relatively low costs of living and doing business in many areas of the Southwest are seen as very appealing to young professionals and those potentially looking to start families (ULI, 2018). As is the case in the overall United States markets, this age group (20s-40s) has shown a preference for denser, more urban environments with features such as walkable and transit-oriented design and tends to prefer multifamily living as opposed to the suburban, single-family homes preferred by previous generations.
The Southwest’s labor market is heavily agriculture-based, but is growing as an appealing place for employers such as technology companies to move due to the lower costs of doing business (CBRE, 2018). With the population on the upswing, resources such as food and water are becoming increasingly more important to consider. Phoenix, Arizona is perhaps the best example in terms of distilling down the characteristics of the Southwest’s real estate markets.

**Phoenix, Arizona**

The area that is now Phoenix, Arizona has been home to civilization for many thousands of years. Moreover, since that very early beginning, water has been the most significant challenge with relation to Phoenix’s resources. Phoenix, Arizona was officially incorporated as a city in 1881 and became the Territory of Arizona’s capital in 1889 (City of Phoenix, n.d.). Ever since the beginning of Phoenix as a city, it has been necessary to import water to fund its heavily agricultural and industrial economy. To this day, Phoenix relies heavily on water irrigation systems such as the Central Arizona Project (CAP) which draws upon the Colorado River as a source.

As Phoenix’s population continues to grow dramatically, the primary water usage has shifted from those agricultural and industrial uses to now “approximately two-thirds of the water used in Phoenix is for residential purposes” (Balling & Gober, 2007). With population growth continuing for the foreseeable future, it is vital we design our building stock in a more water conscious way to help ease the growing strains on our resource allocations. In 1980, Phoenix implemented the Groundwater Management Act, which was successful in reducing the city’s water consumption by as much as 15%, through the implementation of water-saving appliances and landscaping (Balling & Gober, 2007). However, this Act was subsidized by local
government, which I would argue is not a viable long-term solution to the issue, as these sustainable features can largely already be made feasible and beneficial through costs alone.

Since the early days of Phoenix, Arizona, public transit has been present through the form of a streetcar, implemented in 1887 (City of Phoenix, n.d.). In 2008, the City of Phoenix implemented a new form of transit – the Light Rail System, which came with overlay zoning in the area along the line which essentially mandates Transit Oriented Development (Atkinson-palombo & Kuby, 2011). According to this study, the Light Rail has been successful in bringing in tremendous value in terms of the development along the Light Rail corridor. This form of transportation is a more sustainable alternative to the heavily automobile-dependent system Phoenix has, and continues to, rely on over the past century.

The reports used for the United States and Southwest market summaries above (CBRE, 2018; ULI, 2018) are also extremely insightful for the Phoenix market. Some of the major findings of these reports support the fact that Phoenix is growing at a tremendous rate; with above-average population growth and construction rates. Phoenix accounts for roughly 5% of nationwide development in what are classified as “Suburban Markets” by CBRE. Overall, rental growth in Phoenix is below average, which will make the Phoenix market more desirable for in migrants, both companies and residents, from other, more expensive cities. Construction costs are only 73% of the national average, making overall development costs lower than other similar markets.

However, with the employment growth of almost double the United States average, finding construction labor is becoming increasingly challenging, as would-be construction workers are finding other, more desirable jobs. 5.4% of Phoenix’s labor market is in the Technology industry, up from the 4.8% national average, which is a market seeing considerable growth in
modern economies. ULI argues that office space is currently over-saturated, much as is seen in the nation as a whole and that development will soon pause to allow the markets to catch up. However, CBRE reports that industrial and multi-family residential sectors in Phoenix are positive prospects due to increasing rents and reduced vacancy rates. With tourism and overall population growth showing signs of strength, Phoenix is ranked 29th in Overall Construction Markets to Watch in the nation in ULI’s 2019 Outlook Report (ULI, 2018), making it ripe for development and investment.

Case Studies

This research project involves case studies of several successful sustainably built real estate development projects in Phoenix, Arizona in order to gain an understanding of the sustainable building industry. The sections below will summarize each of the case studies completed during this research. Additionally, there are a generalized overview of the findings which will describe and comment on any trends or patterns discovered. These case studies were selectively chosen with a diverse scope to study projects of various types and sizes. Two interviews were completed during this process, the results of which are embedded in their respective project descriptions below.
Phoenix Regional Office - DPR Construction

Founded in 1990, DPR Construction has a mindset for innovation and change. One of DPR’s core values, “Ever Forward,” does a good job of describing the company’s motivations and mentality behind their dedicated push towards improvement and change. The mentality is illustrated in their Regional Office in Phoenix, Arizona, a LEED-NC Platinum net-zero energy office space designed as a “workplace of the future.” According to Derek Kirkland, DPR’s Arizona Business Unit Leader, DPR Arizona received full autonomy from their corporate leadership and pushed the envelope with this development project, showing the company’s high-level commitment to sustainability.

DPR Arizona illustrates a commitment to sustainability and urban revitalization through its renovation of an old, tired, underutilized retail building into a modern, innovative 16,533-ft² open-office space. This project was the first net-zero certified commercial building in Arizona, and at the time of construction, the largest of its kind in the entire world. Site selection was key, as a truly sustainable building involves much more than sustainability within solely within its four walls. The site was chosen based on its proximity to public transportation, its location in the heart of Phoenix’s Discovery Triangle redevelopment district, and the opportunity to convert an underutilized structure into something which produces value for the Phoenix community.
DPR’s new environment includes 58 workstations, nine multi-use technology rooms, as well as several amenity rooms such as a fitness center, kitchen/café, and Zen room. Green features include both passive and active cooling solutions including 87 operable windows, four shower towers, Big Ass Fans, a 79 kilowatt-DC photovoltaic covered parking system, 82 Solatube units to improve lighting, an 87-foot zinc-clad solar chimney, and extensive use of rapidly renewable, recyclable, and recycled/reused materials throughout the building. These systems are monitored through a modern Lucid Building Dashboard system to fully understand and analyze building metrics such as water, gas, and energy consumption as well as photovoltaic energy production in real time. This project was designed and constructed during a relatively short 10-month window. DPR worked in close coordination with its engineering and design team, including SmithGroup JJR, DNV GL, and Bel-Aire Mechanical, Inc. to be as innovative as possible, of course with efficiency, schedule, and budget in mind. From a financial perspective, this project was completed for roughly $200/ft². According to Derek Kirkland, the amount is substantially higher than would be required to complete this type of project as a traditional building in the same location (roughly $125-150/ft²). However, DPR Construction has seen a full return on investment (ROI) in just seven years since completing the project, due to the savings stemming from reduced utility and operating expenses. The useful life of this project for DPR is foreseen to be significantly longer than that seven-year payback period, meaning that DPR is
already simply saving money every year. Derek Kirkland did not comment on the market value of this building, as it is not worth the consideration of DPR at this moment since they will be using the space themselves well into the future.

Issues with this project, according to Derek Kirkland, were relatively few and far between. There were no notable challenges in terms of permitting or other city approvals, limited internal conflict amongst decision-makers when determining the goals of the project, and no special issues related to raising funds and placing debt for this project. The most significant sticking points occurred with particular decisions related to design and which innovative features to include in the project and which would be most beneficial in terms of LEED certification. From a maintenance perspective, this building requires marginally more care than a traditional building would. Derek Kirkland points out that the photovoltaic system requires a quarterly cleaning to ensure optimal power generation and the building controls and management systems need ongoing calibration and other adjustments to keep them operating smoothly.

Overall, DPR’s Phoenix Regional Office has been quite successful. Now in its seventh year of operation, this space has already provided DPR with a full return on investment with regards to the sustainable features. Additionally, this office has been a valuable showpiece for DPR to advertise their services, their commitment to sustainability, and their ability to push the envelope to potential clients. Additionally, the space is seen as favorable in many ways, including comfort, healthiness, and enjoyment for workers and users of the building.
Camelback I - Hines

24th at Camelback I is a 302,209 ft² Class A office building including 10,738 ft² of ground-floor retail/restaurant space which sits on 8.5 acres at the Southwest corner of 24th Street and Camelback Road. This property was completed in June 2000 by Hines, who also served as the property manager for the majority of the building’s life thus far. Hines, as a company, has shown its commitment and dedication to sustainable development and management since its beginnings. Hines has been involved with over 63.8 million ft² of LEED space, 81 million ft² of EnergyStar space, and 28 million ft² under their own GREEN OFFICE for Tenants program. In 2018, this property sold for $100-million and its eight floors are currently leased at an occupancy rate of 94% to several notable, high-credit tenants such as AAA Arizona and Cisco Systems.

From a sustainability perspective, this property was certified as LEED EBOM (Existing Buildings - Operations and Maintenance) in 2014. The building was certified under EnergyStar requirements from 2002 – 2005 and 2007 – present. In 2006, this property was awarded the Clean Air Award from the National Air Filtration Association in 2006. The property is within proximity to over 100 walkable restaurants, shops, and other amenities. The Camelback Corridor, the area surrounding this project, is some of the most coveted office real estate in the Phoenix market at this time.
As of February 2019, there is space at the property which is marketed for lease at $28 per ft² per year. This rate is advertised as “Full Service,” meaning the property owner is responsible for all utilities, property taxes, insurance, common area maintenance, janitorial, and telephone/internet subscriptions, up to a certain point. This building takes advantage of passive solar building techniques such as aluminum sunshades at each window to help shade and reduce radiant energy from the sun, and thus, reduce the building’s cooling load.

Camelback II - Hines

24th at Camelback II is located directly adjacent to Camelback I, discussed above. This 11-story, 306,877 ft² Class A office building was developed in 2010, also by Hines. Both Camelback I and II have the same access to hundreds of walkable amenities, and both share an outdoor pedestrian plaza which includes ample seating and low water-use native landscaping. Camelback II was designed by architect Pickard Chilton and is currently certified as both EnergyStar (2012 - 2018) and LEED EBOM Platinum (2013, 2018). At the time of the building’s development and certification, it was the most efficient multi-tenant property in Arizona, with an Energy Star rating of 92. This project was awarded “Transaction of the Year Award and Speculative Office Development Award” by NAIOP (National Association for Industrial and Office Parks) and “The Outstanding Building of the Year Earth Award.” During construction, over 50% of the material waste was diverted from landfills or recycled.

Camelback II has been reported to be over 46% more energy efficient when compared to an average comparable office building in the United States, bringing about an estimated $1.43/ft² savings in annual energy costs. These savings go straight to the bottom-line profit (Net Operating
Income) of the property, which directly corresponds to a higher property valuation. At a 6% capitalization rate, this would lead to a hypothetical value increase of the asset of over $7,300,000!

Not only that, but the savings lead to annual greenhouse gas reductions equivalent to removing 557 passenger vehicles from the road each year. There is an effective reduction of 970 metric tons of CO₂ each year, which is the equivalent to the emissions produced by generating electricity for 144 average homes. The heat island effect, a phenomenon where cityscapes lead to higher surface temperatures, is combated by covered parking areas and reflective roofing materials. The building sources 50% of its energy from renewable energy sources based on a clean energy certificate system.

Within the building itself, there is extensive use of low-VOC materials and finishes, enhanced indoor air quality systems, and all of the cleaning products used are Green Seal certified. Due to Hines’ water-saving techniques, they were able to reduce the amount of indoor potable water usage by 813,000 gallons per year (34.92%) and were able to reduce outdoor landscaping-related water usage by 60% through the implementation of native vegetation and innovative irrigation systems.

Hines has implemented their GREEN OFFICE for Tenants program at this property, which is designed to assist tenants in greening their office space through electronic waste recycling programs and other initiatives. This property is currently home to several notable, high-credit tenants such as Aspect Software, Insight Global, and VEREIT. Presently, there is space within the property being marketed at $40-43/ft²/year (full service), which is towards the higher-end of the Phoenix office market. In conjunction with high rents due to the desirable
location, amenities, features, and comfort of the building, the property owners can realize the benefits of the sustainability features and the savings associated with those features.

Arizona Department of Environmental Quality - Phoenix Office

The Arizona Department of Environmental Quality (ADEQ) building, located at 1110 West Washington Street, Phoenix, Arizona, 85007, is a six-story, 300,000 ft² building focused on high performance and environmental consideration. The structure is designed to blend in with two historical structures: the Evans House (1893) and the Carnegie Library (1908) which are located directly adjacent to this relatively new building. The ADEQ building has earned LEED Silver Certification from the United States Green Building Council.

This project is especially unique because it was developed as a public-private partnership. The ADEQ is committed to a 25-year Privatized Lease-To-Own financing agreement which helped the governmental agency reduce the burden of the up-front costs of this investment. Typically, a public-private partnership involves the private partner assisting with the project financing and, in return, acquires the title to the asset, amortizes the cost of the investment over the lease term, then transfers the title to the public partner at the end of the term. This strategy made it possible for ADEQ to implement energy-saving features and pursue LEED Certification, which otherwise would likely have not been the case due to the additional up-front costs.

ADEQ’s builder, Opus West, estimates the energy-saving features to cost an additional one percent (1%) over a traditional building of this type. These additional up-front costs are justified by the building’s reduced energy consumption and the cost savings associated with that. Energy
consumption expenses are around $1.17 per ft$^2$ for this building, as opposed to $1.51$ per ft$^2$, which is currently the low-end industry average. This reduction of over 22% means that the project should see a payback period on the additional up-front costs of only four years. Being that ADEQ will use this building at least for the entire 25-year lease term, they will see savings each year for well over 20 years of operations.

Special care was taken during the design of this building to implement the best-balanced features in terms of effectiveness and affordability. The building’s landscaping and exterior site-design were designed with low water-consumption in mind, using recycled water from the building’s cooling tower system, drastically reducing water-usage. The building limits its impact on the urban heat island effect through the use of landscaping, shading, and a reflective white roof. Mechanical systems were considered based on their efficiency and energy-consumption, as well as maintenance and cost considerations. Each mechanical motor uses a variable frequency drive system, which greatly reduces its operational power requirements. Low-E glass windows were chosen to reflect out solar radiation, reducing heat-gains and cooling loads overall. There is extensive use of efficient LED lighting and sensor-based fluorescent lighting ballasts which turn on when rooms are in use and adjust the amount of light they put out based on the natural light coming into the space.

ADEQ’s parking structure includes a 900 panel, 100-kilowatt solar power generation system which doubles as shading for automobile parking. The property includes 15 electric car charging stations as well as a bike storage facility with showers and lockers for riders to use. Cooling for the space is managed by a cooling tower system with no CFC refrigerants, which helps reduce water use and greenhouse gas output related to refrigerant leakage. Interior air quality is
monitored through several sensors which adjust exhaust air fan speeds based on interior carbon dioxide levels and modulate these levels within the desired range.

Material choice was something strongly considered by the designers and builders of this project. 87% of construction debris was recycled or reused during the construction of this project. Recycled products were used extensively throughout the project, including items such as some structural steel, glass, carpets, and ceiling tiles. All wood used throughout the building has been sourced from sustainable foresting techniques and has been certified based on the Forest Stewardship Council Guidelines. Material sourcing was a key consideration for the builder, with about half of the materials coming from within 500 miles of the site. This reduced the total amount of energy, resources, pollution, and time associated with the transportation of these items. Lastly, all materials, especially adhesives, sealants, and paints are low in terms of volatile organic compounds (VOC) and other emissions, drastically improving the interior air quality of the building.

Goodyear Distribution Center – REI Co-Op

REI Co-Op, a well-known outdoor equipment company, has shown a commitment to the environment and sustainability since its beginnings in 1938. In 2018, REI invested over 70% of
their profits back into the outdoor community and other environmental benefit groups, with over $8.4-million of those profits going directly to non-profit partners. Their latest mission along their path towards “green” is the goal of improving the energy efficiency and overall sustainability of their distribution facilities and other buildings. Perhaps the best example of REI’s growing efforts towards sustainability is their distribution center in Goodyear, Arizona. This 400,000ft\(^2\) facility located on a 34-acre site just west of Phoenix has added 40% more capacity to REI’s supply chain and has helped lower delivery costs by more than 25% at the unit level. This facility has been designed with the utmost consideration for efficiency in all aspects and also with the comfort of its occupants in mind.

The origins of the REI Goodyear Distribution Center were primarily centered around Return on Investment (ROI). Every design decision was made based on a balance between ROI, efficiency, and sustainability overall. This process began with a design charrette which included every major partner/shareholder of the project. Project planners, architects, developers, operations and supply chain experts, sustainability consultants, contractors, builders, and many others were all brought into a room together with the target of establishing the goals of the project and the ways to go about achieving those goals. REI’s Divisional Vice President of Supply Chain Operations, Bill Best, described this process with the term “vested outsourcing,” where everyone involved in the process becomes deeply invested in the outcome of the project. REI owns and operates this facility themselves, but partnered with two Arizona developers, Merit Partners Inc., and Sunbelt Holdings to complete the project. The architecture was led by Butler Design Group, and Renaissance Builders led the construction process. Rick Bingle, REI’s Senior Vice President of Supply Chain Management, notes that the project was a “truly collaborative process that did not have the usual handoff from architect to building contractors.”
This builds on the idea of vested outsourcing, where the project is developed with a team-like mindset as opposed to the “one after another” mindset of some other projects.

REI’s LEED Platinum facility is net zero energy, meaning that it produces at least as much energy as it uses. This volume of power generation is achieved through a 2.2-megawatt solar system consisting of nearly 6,700 Canadian Solar CS5X-315P panels which cover roughly 280,000 ft$^2$ of roof space. This system alone produces 3,650 MWh of power, which is enough energy to power the entire distribution facility or the equivalent of powering 390 average homes.

Additionally, the distribution center is adjacent to Goodyear’s power generation facility, which helps reduce the transitory power losses on any grid energy used. This system is expected to pay itself back in just five years; and with a lifespan of 25 years, the building should provide 20 years of free electricity for REI, while also mitigating the company’s exposure to volatile energy prices over the next two decades.

Originally, it was discovered that the building would use between 4 – 4.4MW of power per year, which they could not keep up with in terms of solar production given the roof space they had available. This spurred the designers to attempt to cut power consumption anywhere possible, which would reduce the requirements for power generation. These efforts resulted in a lowered energy load of a total of 2.2 MW, which they were indeed able to generate with 280,000
ft² of solar panels. A typical building of this type would require over 100 rooftop HVAC units; while REI’s building only needs four (closed water-loop) HVAC units. This leaves the necessary room for the massive solar system and an extensive sky-light system to improve interior lighting. In addition to the highly efficient HVAC systems, energy savings were made in several other areas of the facility. Conveyor belts and lighting throughout the facility are on sensor-systems that are designed to cut power to the items which are not in use. Water is conserved throughout the property through the use of various methods; including no-water urinals and low-flush toilets in restrooms, native landscaping with efficient drip irrigation systems, and a non-evaporative cooling system which result in millions of gallons of water savings per year. REI has also joined a river restoration project in the Verde Valley, high in the Phoenix watershed, as a partnership with the Bonneville Environment Foundation and The Nature Conservancy which will help restore river habitats and modernize irrigation infrastructure. Facility-wide recycling programs have been implemented on this project and have resulted in 97% of materials being recycled. These initiatives and features have provided immense benefits for REI in terms of operational cost savings as well as moving towards their sustainability goals. However, these features have had compounding benefits for the employees and users of the facility. Bill Best stated that one of their goals was to “build the building with the people who will be working in the facility in mind.” This includes a trail system surrounding the building which flows through the desert botanical gardens designed in conjunction with the Phoenix Botanical Garden and other environmental groups, a fitness center, physical therapist, café, bike storage, and comfortable, consistent air conditioning systems. Employees have reported feeling more comfortable and have increased productivity levels in this space compared to similar facilities.
REI Co-Op as a company is part of the U.S. EPA’s Green Power Partnership and has been named a Green Power Leader in the industry. All REI buildings and facilities are being operated with green standards in mind. In 2004, REI’s Portland, Oregon location became the first retail store in the U.S. to earn LEED Commercial Interior (CI) Gold Certification. The Goodyear Distribution Center has achieved LEED Platinum Certification, won the NAIOP Award for Top Industrial Development, and has been recognized by the Department of Energy’s Better Building Challenge as an outstanding example for others to follow.

Since REI owns and operates all of its buildings and also does not carry any real debt, it can amortize the up-front costs in terms of ROI over a longer period, which helps increase the feasibility of some of these improvements. In some cases, this makes certain investments possible that would not necessarily be possible under a leasing scenario, for example. This particular project had a total development budget of $73-million and is expected to pay itself back in just nine years.

This project is seen as much more valuable than just the ROI in terms of dollars. All of REI’s facilities are open source and encourage competitors and other interested people to tour the facilities, ask questions, and try to understand and replicate as much as the technology as possible. REI believes in sustainability with regards to its greater good and its service to the environment and the world. Their facility in Goodyear shows that it is possible not just effectively to benefit the planet, but also employees, the community, the environment, and importantly, their wallets as well.

**The Vista at Granite Crossing – Maracay Homes**

Maracay Homes has been involved in green building in Arizona since 1998. Since then, Maracay has developed almost 300 Phoenix-area homes that either are or will be registered with LEED and EnergyStar Certifications. Maracay Homes’ LivingSmart Program, which is a
multifaceted initiative, has been implemented to improve the sustainability of each of their homes. The LivingSmart Program includes HealthSmart, EnergySmart, EarthSmart, WaterSmart, and HomeSmart, each of which set and achieve different goals related to green building at each of the projects.

HealthSmart has been designed to improve interior air quality and health conditions for occupants. This includes features such as low VOC, water-based paints, caulking, and adhesives. Ventilation fans and MERV-8 HVAC filters handle air filtration throughout per the US EPA’s Indoor airPLUS program specifications. All furnaces are sealed and accompanied by central vacuum systems. EnergySmart is designed to tackle challenges related to energy efficiency and the reduction of energy consumption. Smart thermostats are utilized to control the energy-efficient heating and cooling systems in a simpler, more user-friendly manner. Tankless water heaters and EnergyStar appliances are available throughout each home, which also reduces energy use. Low E windows and radiant roof barriers help to reduce solar heat gains and reduce temperature fluctuations. Solar system packages are available for additional costs to help move homes towards Net Zero Energy. EarthSmart ensures that sustainable, recycled, and recyclable materials are selected throughout. Construction waste is reused and/or recycled where possible. Homes can be modified with built-in recycling and compost bins and CRI Green Label carpeting. WaterSmart includes the use of WaterSense and EnergyStar appliances and fixtures, tankless water heaters, water recirculating pumps, drought-tolerant native plants, and water-sensing drip irrigation systems.
Lastly, HomeSmart integrates all of these features with smart home features which connect through your smartphone or tablet to help monitor things such as lighting, heating and cooling, security systems, and Wi-Fi controls. Maracay prides itself on the real-world performance of these features, something which they measure and analyze according to the Residential Energy Services Network (RESNET) Home Energy Rating System (HERS). The lower the HERS score, the better. A traditional existing home in America is around HERS 130, a typical new home is HERS 100, and Maracay’s homes are consistently below HERS score of 60.

Maracay Homes implements the majority of these features at each of their residential developments, which they believe sets them apart from their competition. The Vista at Granite Crossing is a recent residential development completed by Maracay Homes, with 37 homes located in east Mesa. These homes range from 2,685 – 4,363 ft², with four to six bedrooms, 2.5-4.5 bathrooms, and three- to four-car garages. Each home embodies the features mentioned above as part of Maracay’s extensive LivingSmart program, as well as implementing natural, low-water-use desert landscaping throughout the development. Each home is LEED Certified by the USGBC and have been shown to use 30-50% less energy than traditional homes, which saves homeowners a tremendous amount on monthly energy bills. This project opened in early 2018.
and the demand has been such that the project is already fully occupied. This is no surprise since, according to a 2015 National Association of Homebuilders survey, energy-efficiency is what prospective home buyers want most, as discussed by Maracay Homes.

The fact that a high-volume homebuilder is spending the additional up-front costs required to add green features to their homes is a tremendous compliment to the market for sustainable residential properties in Phoenix, Arizona. Being that Maracay Homes, the developer, will not ever occupy the building, they will not see the benefits of these features in terms of utility cost savings. Rather, these homes must command higher resale prices versus traditional homes. That premium must be high enough to pay back at least the additional up-front investment of implementing these features or green building would not be a feasible strategy for Maracay to explore from a financial perspective.

Often, Maracay will consult with future homeowners before construction and will sell them the property before constructing it. Customers are allowed to ‘design’ their home from a set of design models and can choose which features they would like to implement. This process reduces the risk for the developer and helps ensure that they produce products that the market is directly there for.
Phoenix Biomedical Sciences Partnership Building – The University of Arizona

The Biomedical Sciences Partnership Building (BSPB) serves as a hub for health care science and research of various types for The University of Arizona. This facility provides a space for learning and research to take place in many areas including flow cytometry, physics, material sciences, engineering, chemistry, biology, and nanotechnology. The project includes two 80-seat seminar rooms and eight floors of laboratory space. This 10-story, 245,000 ft² facility was designed by CO Architects and Ayers Saint Gross, while Atelier Ten provided the energy/environmental design services which are vital to the success of this project. The project was constructed through a joint-partnership between two notable builders; Sundt and DPR Construction and was completed in 2016.

The project took place over a relatively short period; only taking 27-months total including planning, design, and construction of the development. The $100-million-dollar project received LEED Silver Certification from the USGBC in 2016. Passive solar techniques are highlighted in this project, including a favorable building orientation with windows strategically placed on the North and Sides of the building in order to control daylighting and conserve energy. The higher floors cantilever increasingly outwards towards the top of the building to shade the levels below, which also reduces the building’s cooling load in Arizona’s harsh
weather. The building layout creates a shady courtyard which harkens back the feeling of a “canyon” space between two building masses. These courtyards include native, low water consumption vegetation, which also brings a cooling effect to the space through evapotranspiration. The project was constructed with consideration for recyclable and recycled project. The copper paneling on the building facades consists of up to 95% recycled material.

In terms of cooling, the building includes a “cascading” air supply system, which allows conditioned air to flow through the space more efficiently. Within labs and larger open spaces, chilled beams are implemented to cool these spaces more efficiently. The LED lighting is included throughout the property to meet lighting needs when daylighting is not an option. Users of the space have also been reported to feel the additional comfort brought along by these green building features. Being that this project is a University-sponsored development project, the financial considerations and decision of the project are much different when compared to a commercial property. For example, the University of Arizona may be using this building for up to 50 or more years, which could allow for some more long-term investments, in terms of return on investment, much more feasible options.
Discussion

Project Diversity

The data collected for this project was carefully chosen in order to gather a diverse set of asset classes and property types. This study analyzed case studies of each of the following: single-tenant office, multi-tenant mixed-use (office and retail), government office, industrial, residential (sub-division), and University research/education. This diversity allowed for the research to reveal some similarities and differences in approaches between each of the property types. This background allows for generalizations about the sustainable building industry in Phoenix as a whole to be made with a higher level of confidence than would be the case otherwise.

The data was analyzed through both the lens of traditional quantitative techniques where numbers and figures are key, as well as a qualitative component which revolved around talking to individuals in the industry and attempting to pick out trends and themes through a process called sensemaking. This process “involves the ongoing retrospective development of plausible images that rationalize what people are doing” (Weick, Sutcliffe, & Obstfeld, 2005). This process involves simply collecting and internalizing as much data and commentary as possible and picking out trends and patterns which make themselves apparent. I have read hundreds of articles and news stories, had informal discussions with professors, peers, and industry professionals, and physically visited several of the case studies in person. Sensemaking helped in understanding the complex motivations behind each of these projects in a way that traditional data is not capable of capturing.

Motivations

Several interesting themes and trends emerged from this data set. The most noteworthy pattern that emerged was the similarities in motivations for each of the project. While studying
the background of each of the companies/organizations responsible for these projects, it became apparent that each of the groups specifically noted sustainability and innovation in their mission statements. These groups used green buildings as a physical representation of their goals and their commitment to sustainability as a company. The companies used the development projects to show others, both potential clients and competitors, what they are capable of and what their company truly stands for. Therefore, the implementation of green building features was not a unidirectional decision for these companies. These buildings produce far more value to the organizations involved than solely from a financial perspective.

Financial Information

Financial information is often safeguarded information for real estate projects. However, with the information available on these projects, it was possible to make some generalizations about the financial performance of these projects. First, most of the data suggested that sustainable features do carry an additional up-front cost. However, it is near impossible to place a percentage on this increase, as these costs are entirely dependent on outside factors such as which features are implemented, the size and scope of the development, etc.

Up-Front Costs

Derek Kirkland from DPR Construction estimated that their office project cost roughly $200/ft², while a similar traditional building would cost somewhere between $125-150/ft², an additional cost of about 40-60%. ADEQ’s building was projected only to cost 1% more than it would have had it been built without green features. REI’s 400,000ft² distribution center had a total development budget of $73-million, which comes out to $182.50/ft². The industry average for industrial construction in Phoenix are around $100/ft². Maracay Homes offers homes similar to those at Vista at Granite Crossing for sale in the $350,000-$450,000 range, or an average of around $150/ft², depending on the size, location, and features of the home. Homebuilders, such
as KB Homes, Meritage Homes, and others state that construction costs for standard homes are around $120/ft². The math on this suggests that Maracay Homes must not be paying too much more than that traditional average; else their profit margin would be too slim. The University of Arizona’s 245,000 ft² Phoenix Biomedical Sciences Partnership Building cost roughly $136-million in total, or about $555/ft², which is roughly comparable to other recent university research laboratory construction projects. 24th at Camelback I and II both did not have development costs available.

Savings

Up-front costs must be justified by some form of return on investment (ROI). ADEQ’s building notes a payback in just four years due to the 22% reduction in operating expenses. DPR reported an expected payback period of seven years. REI’s distribution center should pay back its solar system in just five years and will see a full ROI in a total of nine years, as well as reducing their company-wide delivering costs by as much as 25%. Camelback II saves $1.42/ft² per year due to energy savings. Camelback I likely has similar returns. Maracay’s homes use 30-50% less energy than traditional buildings, meaning home buyers could be willing to pay a premium in order to save hundreds of dollars each year on their utilities. The University of Arizona did not report on their building’s performance in terms of operating expense savings.

Valuation

As discussed in the Literature Review, sustainable commercial buildings have been reported to show higher property values due to their increased rental rates, higher occupancy rates, and thus, higher Net Operating Incomes. Generally, commercial real estate assets are valued primarily by the amount of cash flow they produce using a financial lever known as a capitalization (cap) rate. The formula for this calculation is Net Operating Income / Cap Rate. For example, if the property has an NOI of 200,000 and a fair cap rate is 7%, the property would
be valued at $2,857,000. For this example, let us say that the implementation of sustainable features would cost $175,000. If these upgrades were to provide a reduction of operating expenses by even $20,000 per year; at the same cap rate, this property would now be valued at $3,142,000, a net increase of almost $285,000. In this example, the up-front costs are justified financially due to the increased property valuation alone. However, the owner would also see the savings of $20,000 per year for every year they owned the property, making this upgrade even more appealing.

Building Features

Each of the case study projects covered in this research had vastly different sustainable features, once again emphasizing the importance of diversity in this project. Some common features include passive solar orientation with large windows on the North and South facades and minimal windows placed on the East and West facades; a selection of EnergyStar or similar appliances and fixtures; efficient HVAC systems; low water-use native landscaping; lighting from natural sources and LED bulbs; an emphasis on interior air quality through touches such as low VOC products, quality filtration systems, and sensors; a concentration on reducing material consumption through the use of recycled materials when possible; and a focus on reusing or recycling waste. Some projects opted for further strategies such as improved air tightness, solar system installations, and building monitoring systems. This shows that there is no “copy and paste” when it comes to green buildings; each project is unique. However, there are some common themes here for future projects to analyze and potentially replicate.

Ownership Structures

Ownership structures also varied for each project, further diversifying this data set. DPR’s office building is a self-built, self-owned project. REI’s facility is a self-owned and operated project, but was built in partnership with two development companies, Sunbelt
Holdings and Merit Partners. ADEQ’s building is structured as a public-private partnership where ADEQ is on a 25-year lease-to-own contract. Maracay Homes operates as a bulk home builder who sells homes to customers before, during, or after construction, but does not operate these homes as rentals in any case. 24th at Camelback I was developed by Hines in 2000 and was owned and managed by them from 2012 to 2018. In 2018, Hines sold this property to New York Life, but continues to serve as the property manager. Camelback II has been developed, owned, and managed by Hines for its entire life. Both of those properties are currently being leased to multiple office and retail tenants on full-service contracts. The Biomedical Sciences Partnership Building was developed by the University of Arizona and is currently occupied and operated by the school as well.

In theory, return on investment is more substantial when a property is self-owned and occupied, in which case one would fully receive the benefits of the cost savings created by the green building features. ROI seems to be more elusive for shorter-term projects where the developer plans to dispose of the property within a relatively short (5-7 year) window. In this case, the ROI window for sustainable buildings is likely outside of their holding period, making the necessary returns potentially unachievable. For example, Bill Best from REI stated that their distribution center project would not have made sense under a leasing structure – it only really makes sense to amortize the costs of their project over their long-term ownership situation. However, it is important to note, that a situation such as the one covered in the ‘Valuation’ section of this conclusion could produce an ROI as soon as the property is stabilized, which would likely occur within that 5-7-year window.

*Occupant Benefits*

While this project is intended to focus primarily on the financial feasibility of sustainable development in Phoenix, it is important to consider ancillary benefits as well. Each of the case
studies made a note of their buildings being superior in terms of interior comfort, occupant
health, and overall desirability for users. Different methods were used to achieve this, ranging
from low VOC paints and adhesives, air filtration to limit dust, particulates, and pollutants,
increased air tightness to reduce noise pollution, and several other things. Attractive landscaping,
public spaces, fitness centers, building control dashboards and technology, and other amenities
were included in many of these projects.

These additions follow the Three Pillars of Sustainability; environmental, economic, and
social and show each project’s commitment to a complete view of sustainability. Users of these
spaces, according to industry professionals, have reported higher levels of health, comfort, and
overall satisfaction.

**Maintenance**

There have been suggestions that maintenance related to sustainable features is often a
major issue in green building projects. According to the industry professionals I have spoken
with throughout this project, notably Bill Best and Derek Kirkland, maintenance is not any more
challenging or expensive for these projects than would be the case for any traditional building.
Solar photovoltaic systems do require periodic cleaning to ensure maximum performance and the
building’s technological features require maintenance, which traditional projects would not have,
but these are rather insignificant in the grand scheme of the project. Neither of these
professionals indicated that there are any specific challenges related to the maintenance of their
efficient HVAC systems or other cutting-edge technologies; however, this may, of course,
change further along in the life of these projects.
Conclusion: The Future of the Industry in Phoenix, Arizona

From several informal conversations with various industry professionals and professors, green building is often perceived as a way to set oneself apart from the competition. For example, given two identical office buildings listed at the same rental price, tenants will almost always select the sustainable option. The factors mentioned above such as interior comfort, health, etc. are seen as significantly valuable to potential tenants and could be enough to sway their decision. Similar to special design and architecture on a project, there are justifiable costs associated with producing a “better” building, but those costs will often be recouped through increased interest and occupancy, and thus an increased property value.

Considering the reductions in energy and water consumption and the cost savings brought along by sustainable buildings, this additional investment appears to be feasible in many cases. In the future, as resources such as water and power in Phoenix become more and more insecure due to potential climate change impacts, price volatility, etc. sustainable buildings will likely become even more attractive. In a rapidly growing market such as Phoenix, it is important for developers to have the means to set their products apart from the competition.

However, several industry professionals have mentioned their unwillingness to subject themselves to the lofty costs and time commitments of LEED or EnergyStar Certification processes. One professional I spoke with says that the majority of his company’s office and industrial buildings are currently operating to roughly LEED Gold standards, but they have not been certified due to the “unjust” costs, paperwork, and time commitments required to be certified.

As other local governments push towards a more progressive building code in terms of energy performance, it can be expected that Phoenix will follow suit eventually. As it sits
Currently, Phoenix’s government does not show any noticeable resistance or disdain for green buildings, but does also not actively support them through instruments such as tax credits and other benefits to the extent that other governments do. In order for a higher rate of sustainable development to occur in Phoenix looking forward, this will likely have to change.

**Future Research**

Research should be continued into all aspects of this project. More and more case studies documenting successful building projects in Phoenix, Arizona should be completed in order to understand the latest activity in the market. Failed and/or underperforming green building projects should also be analyzed to attempt to understand the underpinnings of those failures. More and more industry professionals should be consulted with and interviewed for more information and evolution stories for both successful and unsuccessful projects. Local government officials should be questioned on where they predict the future of building code and resource regulation to be heading in order to gauge the feasibility of these types of projects moving forward.

New regulatory developments such as Qualified Opportunity Zones (QOZs) could play a role in altering the sustainable building market. QOZ have been added in the Tax Cuts and Jobs Act of 2017, in order to help stimulate investment, in economically depressed areas of each state through multiple tax benefits for investors (Eldridge, Hawkins, & Mitra-majumdar, 2019). One of the requirements of these QOZs is that the investor doubles his/her initial investment into a piece of property or business to qualify for the tax benefits. This requirement helps to build a strong case for retrofitting existing properties with sustainable features as part of that up-front improvement budget. Another component of the QOZs are that a 10 year holding period is mandatory in order to receive the full benefit of the program, which would also strengthen the
case for sustainable building in that the investor has the ability to amortize any green building features over the relatively longer-term investment window of 10 years (Wiig, 2019).

The case studies in this research should be followed-up on periodically to determine their levels of success over the long term, especially concerning maintenance and durability, financial performance, resale activity, etc. This research could be repeated for any real estate market in the United States, perhaps in the world. A comparison between Phoenix’s sustainable building market and a similar market, but with more green building activity, for example, would be interesting.

The information covered in this report will be vital for all members of the building market in Phoenix to read and understand. This should help generate the necessary shift in mindset towards sustainability amongst development professionals, which will potentially lead to an increase in sustainable development in Phoenix as a means of physically representing this newfound mindset and commitment. I believe that this research provides substantial evidence that sustainable development can be incredibly successful in many different ways. Much more research into this topic is needed – and hopefully, this research will inspire future investigation into this ever-changing, massively complex industry and help promote change in the coming years. Our future depends on it.
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