# A on green certified leed building: the uc davis brewery, winery, and case study ...

Environment, Water

## Abstract

The number of worldwide issues concerning environmental safety and corporate social responsibility has been on an ever-increasing rate. This is why we can also see a significant growth in the demand for environment-friendly and self-sustaining buildings. The number of domestic and international organizations that monitor and facilitate the standardization by means of a tiered certification of such buildings has also been on an ever-increasing rate. The LEED certification program is one of the most prominent ones in the U. S. and the UC Davis Brewery, Winery, and Food buildings have received platinum grade certification under such program. The objective of this paper was to discuss and analyze the various implications and the advantages and disadvantages associated with building a platinum LEED certified building. In the end, it has been found out that being LEED certified, regardless of the level, would lead to significant financial savings in the long run, which could reach several million dollars. However, contractors have to deal with the fact that the construction of such buildings might require a larger amount of capital compared to the construction of a typical building and the fact that LEED certified buildings cost significantly more to maintain. Nonetheless, despite the additional initial and maintenance costs, it has been proven that establishing platinum LEED certified building such as the UC Davis Winery, Brewery, and Food buildings, would be worth it.


## Introduction

There was once a time when the only topic at hand was how much industrialization cared for nothing but profit despite the hard it was doing to

its workers. Times have changed since then, people now have more rights to work but of course, when money is involved, there’s always something wrong that has to be rectified. Once people were done with the troubles that businesses were doing to the human race, the next problem is the damage that industries are causing the earth.

This may seem petty to some, and worthy of hell’s embrace for others, but regardless of the moral stand of the person, these issues call for immediate action as, while the damages towards the human race can easily be resolved, the damages towards nature and its effect on the future of life, is not as easy to find a resolution for. As such, construction in urbanization and industrialization has now turned towards creating buildings that are not only profitable, but also sustainable, efficient, comfortable and environmentally safe for the future.

Of course, there are many paths to get to the same place and some practices are better than others. Those who do better in the same field tend to reap better rewards. In 1998, the Leadership in Energy and Environmental Design was launched, a system for encouraging businesses to develop buildings that were sustainable, cost efficient, with reduced energy consumption and lowered harmful toxics to the local and global environment.

It is in this endeavor that the LEED is used to encourage businesses to go ‘ green’ on their buildings, to recognize environmental leadership in the building industry, stimulate green competition and to raise the awareness of the people about the benefits of making a ‘ green building’ or even a green neighborhood.

## The LEED in a Nutshell

As stated above, the LEED is a system for rating the construction of buildings on whether or not they are good for the environment and the future in general. It is in this way that the US is trying to be responsible for the companies that call the country home and to ensure that these companies are in turn responsible for their surrounding environment .

The system is controlled by the United States Green Building Council whose aim, since its foundation in 1993, is the promotion of designs, constructions and operations of buildings that are environmentally responsible, profitable and healthy to live and work in.

It is also by the structure of the assessment process of the LEED that it can be seen if the building that a company is building is energy efficient and if it releases less carbon dioxide than is usually expected. The system is not the only one of its kind however, and it is not only practiced in the US. If all goes well, the LEED system can be used to standardize the way buildings are made in the first place.

The chart above shows the growth of LEED certified square feet per year. In year 2000, LEED certified 677600 S. F. The growth keeps on increasing steadily from year 2000 to 2004. After 2004, the growth jumped from 12, 320, 035 S. F. to 22, 571, 885 S. F. achieving around 10 million S. F. in one year. As of 2013, LEED has certified 1, 736, 602, 847 S. F.

## Methodology

As a system that is also used for assessment, the LEED system has levels of ratings and its corresponding points needed to attain said level. The latest

version (v3) is currently 100 possible base points for the system and 6 points for innovation in design and an extra 4 points for Regional Priority. The 110 points can be found in the following categories:

sustainable sites (26 points), water efficiency (10 points), energy and atmosphere (35 points), materials and resources (14), indoor environmental quality (15 points), innovation and design process (6 points) and regional priority (awareness and education – 4 points) for a total of 110 points .

There are certain prerequisites in each category for everyone and in these prerequisites, no point is given, furthermore, all categories are mandatory for all building projects. Once the points are tallied, the LEED level is now given. Certification requires at least 40 points with a 49 points ceiling. The next level, silver, has a range of 50 to 59 points. Gold requires 60 points minimum with a maximum score of 79 points and platinum is anything above 80 points .

A LEED level is not automatically given however, one must first submit an application that documents that the building complies with the categories of the LEED rating system. There are also fees that need to be paid such as registration and certification fees. Nowadays, registration is electronically streamlined with applicants filling out PDF’s that process the filing of the documents .

## Under the Microscope

Sustainable Sites – one of the founding categories of the lot, this category deals mainly with the location upon which the building will be placed. Under this category there are subcategories with erosion and sedimentation control

being a prerequisite that is not given any point. In this first subcategory, the applicant is expected to provide an erosion and sedimentation control plan, prevent topsoil loss due to storm and wind erosion, prevent sedimentation due to storm sewage and streams and prevent air pollution due to dust and other particle matters .

Another subcategory is site selection where all that is required is to avoid the following: sites that are prime agricultural land, sites that are less than 5 feet above the 100 year flood plain, sites that are within 100 feet of any wetlands, sites that are inhabited by threated species and sites that are or were public parklands. This subcategory merely intends to avoid development on inappropriate sites and is equivalent to the first possible point for the building.

The subcategory of development density is equivalent to one point and is mostly focused on urban development. In urban redevelopment, to get an LEED approval, you will need to ensure that you have 60, 000sq. ft./acre of land, and you will need to find out the density radius and 2 story downtown development of the area you wish to build in. in brownfield redevelopment, a point is also given where the definition of a brownfield also includes areas with perceived contamination .

There are also four points available in looking for alternative transportation. The four points are awarded if the building has public transportation access, bicycle storage areas and changing rooms and showers, alternative fuel vehicles and parking capacity and carpooling. The whole point of making an entire subcategory for alternative transportation in the first place is to reduce the amount of pollution that may possibly be released from

automobile use of occupants, clients and visitors of the building.

Another point is also given in the subcategory of site disturbance reduction. The whole purpose of this subcategory is to conserve the natural areas and restore the damaged areas surrounding the building to also promote biodiversity. This is when an applicant needs to ensure that his or her building is at least 5 feet beyond sidewalks, curbs, walkways and the likes. They must also be 40 feet beyond building perimeter and 25 feet beyond the constructed areas. If the site is not new, then it is required that at least 50% of the area is restored if it is in a degraded state to get the points for this subcategory. Points are also deducted if the building exceeds the open space requirement by 25%. Furthermore, campuses, bases and other special types of buildings need to meet a different set of requirements depending on the type of building it is .

In the subcategory of storm water management, another point is given if the amount of disruption and pollution of natural water flows is limited or nonexistent. The treatment of the storm water is also looked into and is another considerable for another point if onsite infiltration and elimination of contaminants in the storm water is done.

In the next subcategory of landscape and exterior design to reduce heat islands, LEED standards require that the builder either shade at least 30% of their non-roof impervious surfaces, or use light colored or reflective materials, or place 50% of their parking underground, or use an open grid pavement for 50% of their parking space. Finally, builders are expected to use high performance roofs or 50% of their roof must be vegetated .

In the final subcategory under sustainable sites, buildings that wish to get

LEED certification must use items that reduce light pollution. Specifically, they must meet the IESNA foot candle levels and design. This is to ensure that no direct beam illumination leaves the building site.

Water Efficiency – unlike sustainable sites, this category only has three subcategories mainly efficient landscaping, innovative technologies and water use reduction. The first subcategory inspects if the building uses micro irrigation or does it capture water to reduce irrigation by at least 50%. Furthermore, the subcategory also covers the question does the building use only captured water or does it have no permanent irrigation system .

In the subcategory of innovative wastewater technologies, the only point looked at is if the building uses technologies that reduces water use for sewage conveyance by 50% and finally, in the water use reduction subcategory, the building must have a reduced use of portable water by at least 20% to 30% .

Energy and Atmosphere – in this subcategory, the LEED has three prerequisites that must be met unequivocally, namely, fundamental building commissioning, minimum energy performance, and CFC reduction. Specifically, these three prerequisites must meet the standards set by the ASHRAE Green Guide.

The building also has to follow the same guide when it comes to optimizing energy performance. To be precise, it must comply with the 90. 1-1999 section of the ASHRAE Standards, it is even better if the building goes beyond this. New buildings that exceed this standard by 60% can get up to 10 points .

The subcategory of renewable energy is rather small in compassion to the

other subcategories of holding only three points. These points are given depending on the amount of renewable energy that the building uses. 5% is equivalent to 1 point, 10% to 2 and 20% to three points. In additional building commissioning, the building must meet the specifications of electricity, introductory architecture and mechanics.

The building must also be able to help in the elimination of HCFC. It must pass the global warming potential test and the ozone depletion potential test. Finally, the last two subcategories are measurement and verification and green power. In these two subcategories, the building is expected to be held accountable for optimization of its use in energy and water consumption performance over time. Green power specifically covers the requirement that the building has a two year contract for renewable sources which provide at least 50% of the building’s power usage .

Materials and Resources – materials and resources are expected to be recyclable to begin with. That is one of the requirements when it comes to this category. It is not expected that everything within the building and its construction is recyclable, but it is expected that most of it is.

Such as in the instance of the first subcategory, the major prerequisite is that there is an adequate method for the disposal, segregation and reuse of recyclable materials such as paper, glass, cardboard, metals, and plastics. This subcategory is required and is equivalent to not points but the intent of reducing waste generated by the building’s occupants that will be dumped into landfills is to be expected.

The new building is expected to maintain at least 75% of the existing walls, floors and roofs. Anything that can be reused should be. It is even

encouraged to use 100% of the mentioned materials to further extend their life cycle but under no circumstance should the new building block existing railroad tracks . Also, if 100% of the building’s structure and shell is reused, it is also greatly encouraged that at least 50% of the non-shell areas such as doors, interior walls and the likes are also reused.

Construction waste management is also another subcategory under materials and resources. In this subcategory, the main objective is to divert at least 50% of the materials used in construction, demolition and land clearing debris from landfill disposal sites. Again another point is given if the building managers can increase said diversion from 50% to 75%. The same requirements are to be filled such as the implementation of a waste management plan and the calculations are also the same such as debris being calculated by weight or volume.

The next subcategory is resource reuse. As the name plainly suggest, this category requires that the company owning the building to use salvaged, refurbished, or reused materials, furnishing or products for at least 5% of the building’s materials. This is to reduce the demand for new or virgin products and thereby reduce waste and impacts connected with the extraction and processing of virgin products . Like many of the subcategories under materials and resources, an extra point is given if resource reuse can reach 10% or more.

Another point is also given for the subcategory of recycled content. With the same intent as resource reuse, this subcategory requires the use of materials that are 5% post-consumer recycled or 10% post-consumer and ½ post-industrial recycled materials. Again, like the subcategories that came

before it, another point is given if the building can go up to 10% post-consumer recycled or 20% post-consumer recycled and ½ post-industrial materials.

The next subcategory covers materials used within the region itself. This is for the purpose of supporting the region’s economy and reducing the environmental impact that comes from transportation. In this subcategory, building managers get a point for using at least 20% of their materials from within a 500 mile radius within the region whereby the region is considered the final assembly location of the product. Another point is also awarded for reaching a minimum of 50% of regional materials used .

The use of rapidly renewable materials is also awarded a point. With a purpose of reducing the use of limited raw materials by using rapidly renewable materials such as plants that are harvested within a ten year cycle or less, buildings are required to use a total of 5% of their materials from rapidly renewable sources to avail to this point.

Finally, the use of certified wood is also equivalent to 1 point. For this subcategory, the building is required to use 50% of wood-based materials and products that are certified by the Forest Stewardship Council’s Principals and Criteria. These wood-based materials must be used for, but are not limited to, the following: finishes, furnishing, bracings and the likes. In the end, at least 2% of the total materials used must be made of wood for companies to get the point in this subcategory.

Indoor Environmental Quality – the main purpose of this category is to ensure that the indoor environment of the building is actually inhabitable and that the façade of the building isn’t just that; a pretty face for the world

to see. The first subcategory that garners no points as it is required is minimum IAQ performance.

As stated by its very name, the purpose of the subcategory is to insure that the indoor air quality is comfortable enough for the well-being of its occupants. In this sense, the building has to meet the requirement of the ASHRAE 62-1999 standards, ventilation for acceptable indoor air quality and approved addenda .

The next required field is environmental tobacco smoke control. As there will always be people who smoke, it is required that the building ensure that no non-smoking occupant come in contact with ETS by either banning smoking within the building or provide a room that effectively contains, captures and removes ETS from the building. Furthermore, these smoking rooms must also first be verified that they meet the ASHRAE 129-1997 standard.

The subcategory of carbon dioxide monitoring is the first subcategory in this field that provides a point. Here, it is required that the building has a permanent monitoring system for carbon dioxide emissions.

Next is ventilation effectiveness. Here it is checked if the building has a ventilation system that provides the effective delivery of fresh air to 90% of the rooms or must have areas that are in the path of air flow for 95% of the occupied hours .

The subcategory of construction IAQ Management Plan is divided into two parts which have almost the same intentions and requirements: during construction and before occupancy. In the during construction phrase, a point is given if there is a developed and implemented IAQ management plan that met or exceeded the recommended design approaches of the

SMACNA IAQ guide for occupied buildings under construction, protect stored on-site or installed absorptive materials from moisture damage and the replacement of all filtration media before occupancy .

The before occupancy stage in turn is to ensure that there are no air problems caused by the removal of construction materials from the building. Here, it is required that the building undergo a two weeks flush-out with a new MERV 13 filtration media and that 100% of outside air is used. Furthermore, after the flushing-out process, the MERV 13 filtration media must be replaced with new ones before occupancy can begin. Another option is to conduct a baseline indoor air quality test before occupancy that is consistent with the US Environmental protection Agency’s current protocol for environmental requirements, baseline IAQ and materials, for the research park campus, section 01445 .

The low-emitting materials subcategory is further divided into four different parts: adhesive and sealants, paints and coatings, carpet and composite wood. All four parts are equal to 1 point and have their own requirements to be met if the point is to be awarded.

In adhesive and sealants, all adhesive and sealants that is used must have a VOC level that is lower than the current limit placed by the SCAQMD rule #1168 and all sealants used as fillers must meet the requirements of the 51st rule of the Bay Area Air Quality Management District Regulation 8. The same is looked for paints and coatings where their VOC level must not exceed the VOC limit placed by the Green Seal’s Standard GS-11 requirements .

Carpets in turn must meet or exceed the regulations placed by the Carpet

and Rug Institute’s Green Labor Indoor Air Quality Test Program. While the composite wood part of this subcategory in turn solely requires that no composite wood or agri-fiber products contains added urea-formula dehyde resins. All of these four parts for the subcategory of low-emitting materials is to reduce the quality of indoor air contaminant that may be harmful for the well-being of the building’s residents .

The subcategory of indoor chemical and pollutant source control aims to avoid the exposure of the building’s occupants to hazardous chemicals that have an effect on the quality of the air. To meet this intention, it is expected that the building has a designed system that minimalizes pollutants in regularly occupied areas. Also, it is required that the building has plumbing that is adequate for the disposal of liquid waste in places where chemical concentrates and water mixing occur.

The subcategory entitled controllability of systems in turn has two parts, perimeter spaces and non-perimeter spaces. Both however have the same intention of providing high levels of ventilation, thermal and lighting system control to individuals or groups in public occupant areas such as conference rooms to ensure the comfort and productivity of its occupants.

Perimeter spaces require that there be at least one operable window and one lighting control zone for every 200 sq. ft. for all areas that are occupied regularly within 15 feet of the perimeter wall. While non-perimeter spaces require that at least 50% of their non-perimeter occupants in regularly occupied areas have control over their airflow, temperature and lighting .

Thermal comfort is also divided into two parts, compliance with ASHRAE 55-1992 and permanent monitoring system. Both have the same intention

however, with providing a thermally comfortable environment that supports the well-being and productivity of the occupants. Complying with ASHRAE 55-1992 merely requires that the building follows the standard thermal comfort level range depending on the climate zone. While permanent monitoring system only requires that there is a permanent temperature and humidity monitoring system that allows operators to control the thermal comfort performance and effectiveness.

Finally, the last subcategory is daylight and views that require the building to have a minimum daylight factor of 2% in 75% of all spaces that are occupied with critical visual tasks. These spaces do not include copy rooms, storage areas and other low occupancy supported areas. Places where sunlight will also hinder progress are also excluded from this requirement. An extra point is awarded if the building can reach a total of 90% of its spaces filled with at least 2% of sunlight .

Last but not the least, Innovation and design process – only has two subcategories as the main intention of this category is to advance the designs of green buildings for the future and does not specifically address an issue. Credit is still given where it is due however, and the building managers can get extra points for their different innovations such as the design approach, the identification of the intent and the likes.

## Platinum LEED certified Building

As platinum is the highest level of certification that any building can get, it is also one of the hardest to get. Not only is it because getting there means having to practically ace the certification examination, but also because of

the amount you will have to spend on making the building worthy of platinum in the first place. With that, the next question that will come to mind is ‘ is it worth it to get platinum LEED certification in the first place?’ The most basic answer to this question is of course yes. Why? While the maximum benefits of a certification depends on the size and type of building, platinum certification is greatly beneficial due to the fact that it forces the building to be, not only environmentally friendly, but also economically profitable as well.

In a report made by Greg Kats for the California’s Sustainable Buildings Task Force back in 2003 summarized that the benefits garnered by the building with a platinum certification is far better than a building without certification. On an average, the cost of certifying a building for LEED is around $4 per square feet. .

The reason for this can be seen in an article written for the Journal of Sustainable Real Estate. As indoor quality is increased, specifically indoor air quality, employees spend less time on sick leaves and thus in turn increase productivity and output of the company . It is even concluded in the same article that the improvement in indoor air quality has led to a total of $153 in work productivity per square foot. Also, the total amount of value from improved work productivity and higher indoor air quality is estimated to be at around $5, 200 and $1, 200 each. This in turn explains why green buildings have higher rental rates than others .

That is the financial benefit of being LEED certified, the benefit for the environment speaks for itself and the company’s image is also enhanced by the social benefits of ‘ going green’. While some people still do not believe in

global warming, this does not mean that it is not happening. In the same sense that LEED buildings may seem costly now, but there is a great possibility that soon enough, green buildings will be the norm of the future . While the cost of making and certifying a green building is expensive in the present, the fact of the matter is that the benefits gain in the long run far compensates for the developmental cost of making a green building in the first place. The upfront cost is great; indeed it is so large that it tends to scare off many possible developers and investors alike, but like anything worth investing in, the payoffs is worth all the headache that the owner has to suffer through in the beginning.

## The Case Overview

The University of California Davis has recently opened a new facility that has made platinum in the LEED certification. The facility, amply known as the UC Davis Brewery, Winery and Food is a 34, 000 square foot complex that is situated near the southern entry of the campus is the first winery, brewery and food-processing facility to earn a platinum LEED certification from the USGBC .

In the time of its opening, the complex was coincidentally designed to be the second building to attain platinum certification in the campus and the third in the university of California system; the other building on campus being the UC Davis' Tahoe Center for the Environmental Studies in Incline Village, Nevada and the other is situated in UC Santa Barbara known as the Bren's Hall.

This $20 million facility was made solely with private donations made to the

university and is created under high expectations such as it being the embodiment of the university’s “ commitment to environmental excellence” and the “ vision to serve as a catalyst for sustainable economic development and social progress in California and beyond” as their Chancellor Linda Katehi puts it .

The complex was to be a facility that accommodated both teaching and research activities into food processing, brewing and winemaking with the world’s first platinum LEED certification in winery, brewery and food processing pilot plant and milk-processing lab also making it the most complex facility on the campus to date.

The complex is divided into different wings for the three fields that it was made for. The south wing houses the complex’s August A. Busch III building where the Brewing and Food Science Laboratory is contained. This building has a brewery, milk processing laboratory and general foods processing plant. The north wing in turn has the winemaking facilities including rooms for teaching and research into the field and other winemaking facilities and equipment .

## The Score

The claims and the news of getting Platinum are bold in its right and thus needs to be verified with actual evidences which can be attained through a review of scorecards. As per LEED standard for schools, the facility was able to get a score of 60/69 in its scorecard where it is only required that the facility attains a minimum score of 52 points to get platinum certification .

These scores were attained by getting at least one point in all the categories; the breakdown of this can be seen in the following:

## Sustainable Sites:

1 point in site selection, development density and community connectivity. 1 point in each of the alternative transportation subcategories: public transportation access, bicycle storage and changing rooms, low-emitting and fuel efficient vehicles, parking capacity. 1 point in both subcategories of site development: protect or restore habitat and maximize open space. 1 point in both storm water management subcategories: quantity and quality control. 1 point in each heat island effect subcategories; roof and non-roof and 1 point in light pollution reduction bringing it to a total of 13/14 where the only subcategory that the school did not score in was brownfield development .

## Water Efficiency:

The facility was able to get all 5 points in the category with 2 points in water efficient landscaping, 1 point in innovative wastewater technologies and 2 points in Water use reduction.

## Energy and Atmosphere:

In this category, the complex was able to garner a total of 14 out of 17 points given by getting 9 points in optimize energy performance, 3 points in on-site renewable energy, 1 point in enhanced commissioning and 1 point in enhanced refrigerant management. The complex got no points in the fields of measurement and verification and green power.

## Materials and Resources:

This was the category that the complex got its lowest score of 8/13. It got a 2 in construction waste management, recycled content and regional materials and 1 point in rapidly renewable materials and certified wood. The fields that the complex got no points in were building reuse, building reuse – non-structural and resource reuse .

## Indoor Environmental Quality:

One of the two categories that the complex had perfect scores in, the indoor environmental quality of the complex got a score of 15/15 where it got 1 point in all 15 categories namely: outdoor air delivery monitoring, increased ventilation, construction management plan: during construction and before occupancy, low-emitting materials: adhesive and sealants, paints and coatings, carpet systems and composite and agri-fiber. Indoor chemical and pollutant source control, controllability of systems: lightings and thermal comfort, thermal comfort: design and verification, and day lighting and views: daylight 75% of spaces and views for 90% of spaces .

## Innovation and Design Process:

The other field that the complex got a perfect score in. the complex got a point in all four innovation and design subcategories and 1 point in LEED accredited professional.

## The Goal

The UC Davis Brewery, Winery and Foods complex was created, not to be the world’s first platinum complex in its field, but rather as a testing ground for

techniques in the processes of production that conserves energy, water and other vital sources for the future. Among the numerous platinum LEED certified buildings in the world, the complex is one of the few that focuses on efficient water and energy use .

In this endeavor, a solar power generator can be found onsite and a large capacity system for conserving processed water and rainwater capturing has been used. As with LEED specifications, the captured rainwater will be used for toilets and landscaping. Furthermore, the facility's energy needs for temperature control and air quality is also reduced thanks to the innovative design of the winery which captures and removes carbon dioxide .

In a given example, the winery building will teach and research into how a winery can operate using rainwater that has been captured, filtered and reused many times in making consumable wine. More importantly, with the system that removes carbon dioxide, the facility is expected to have a net-zero footprints, as such, the facility will help in preventing damage to the ozone layer .

As per the words of the dean of the College of Agriculture and Environmental Sciences, Neal Van Alfen, another goal of the complex is to " conduct cutting-edge research and train the next generation of food industry leaders." While another goal of the facility is to be " proof of [the institution's] enduring commitment to food, wine, beer and agriculture, over all – here in our region and globally." As the UC Davis' Chancellor, Linda P. B. Katehi puts .

Finally, Katehi also stated that another goal of the facility is "[the institution] wants to be a driver of innovation – a partner in economic development – to

improve our economy and quality of life. We want to be stewards of our natural resources and a model of sustainability.”

## Goal to Score Analysis

While the goals of the complex and its score can be analyzed in their own separate sections, the two sections, goal analysis and scorecard analysis, are greatly intertwined that separating them would merely make it redundant. To understand whether the goal was achieved, one must look at the scorecard results and to understand why a high score was given for a particular section or category one must in turn look at the objectives that the university had set.

Because the main goal of the facility is for teaching and research into clean food production in the first place, it is not unexpected the facility will achieve high scores in its LEED certification. Indeed, the mere fact that it is using a new system for integrating rainwater into wine making and also in removing and reusing carbon dioxide is enough for it to get a perfect score in the category of innovation and design. As many studies will prove, carbon dioxide is a natural by-product of fermentation, thus, reusing carbon dioxide for the brewing of wine is a process that can be disastrous if not done properly. The new system manages this risk to the point where it is safe enough to do, again, giving credit to where it is due.

This new system is also enough of a reason for getting all five points in water efficiency, storm water treatment and any other category that had to deal with water. Had the grounds they used to build the facility on was once contaminated land, the complex would have achieved a perfect score in

sustainable sites as well.

For a facility created for consumable products that is required to sustain life, namely food, it also comes to no surprise that the complex would get a perfect score in indoor environmental quality. Looking at it from any angle, food processing is a very delicate procedure that must be handled with care as the food produced will no doubt affect the lives of its consumers to a certain degree. Additionally, the complex will be doing many test on food for research purposes, as such, the need to ensure that waste is disposed properly, water has to be filtered to a great degree and so forth is essential to keeping the complex top notched. This also achieves the goal set that the complex be the pinnacle of an example in making the quality of life better. Moreover, this also has the effect of increasing student retention as in other studies; it has been proven that a good working environment decreases the possibility of a student dropping outand increases the number of students with good grades which in turn achieves the goal of training the new leaders of the food industry. It also ensures that the work done within the complex will be better as a green environment constitutes to a better performance as the study done in 2003 proves. This also answers the question of whether or not the unintended goal of increasing student participation is achieved.

The perfect indoor environmental quality also has the added effect of increasing the number of students that will wish to enroll into the college even if only because they find the college aesthetically pleasing to the eyes. Correspondingly, this will also raise the image of the entire campus in the eyes of the public as sooner or later, another building or another college will be raised in the same manner that the complex was built: “ green”. Should

this happen and, hypothetically, another building within the campus also gets a platinum LEED certification, then the effect is doubled and will keep on doubling until such time when the campus stops making “ green buildings” or when green buildings are no longer an exemption but a norm.

While the goals of making the building friendly to the environment is achieved overall, the aspect that made the complex lose its chance at getting a perfect score is the fact that there were no buildings that were reused to make the facility in the first place. While it did get perfect scores in the other subcategories of Materials and Resources, thereby still focusing on making the complex as environmentally friendly as possible, the complex was built on a patch of land that had no prior buildings made on the same spot before it. The reuse of a building may not have been one of the goals set by the institution, but this lack still had a great effect on the scorecard of the complex when it came to materials and resources.

Nevertheless, the complex was still able to get a good score in the subcategory of protecting or restoring the habitat despite being built on new land. Also, the onsite solar generator is a good enough example as to why the complex received three points in on site renewable energy source, but the fact that the complex got no points in green energy only means that the solar generator did not meet the standard requirement that 50% of its electricity must power the complex. This setback still does not reduce the overall environmentally friendly image of the complex as the mere fact that a solar generator was placed is a rare thing for campuses when compared to the rest of the world.

The LEED scorecard of the complex is proof enough that the complex did

meet many, if not all, of its desired goals. In a sense, the only goals that were not achieved were the social goals that only time will tell if it will remain achievable. But for the moment however, the UC Davis' Brewery, Winery and Food Processing Complex did achieve its social goals of being a model for sustainability, it can train a new generation of leaders in agriculture, it has the equipment needed to produce great research in its desired fields. Whether or not this will always be the case is something that will be decided should a day come when another facility will try to be the leader in the said fields.

## The LEED lead

The profit made from an LEED build is more than enough to answer this analysis. However, what was covered in the previous section entitle " Platinum LEED Building" was merely a look at the gains of an LEED certified building as a whole, the question of how the UC Davis's Brewery, Winery and Food Processing complex benefits from an LEED certification however, has not been covered.

In a sense, the LEED certification of the complex has the same benefits of any other platinum LEED certification; the fact that this is a school building raises the bar of this to a whole new level. With an LEED certification, the campus benefits in many ways. One is the same application of getting more money in the long run for the campus. As the main purpose of the complex is research and teaching, these are the two main assets that are greatly enhanced. In more simple terms, the application of increased productivity for research and teaching can easily be felt in the output of complex.

Because the complex has a platinum certificate, it can easily be seen that the complex has the necessary facilities to carry out its researchers. To add to this point, a LEED certification for a complex that focuses on agriculture further emphasizes the fact that is complex is the best in the world when it comes to its specialization, specifically in food processing, brewing of beer and making of wine.

Another benefit of the LEED certification has towards the complex is the fact that the world knows that this complex is in fact committed to food, wine and beer as one of their goals state. In fact, all of the goals that the UC Davis placed can be credited as achieved with the LEED certification. In a way, the LEED certification also certifies that the College of Agriculture and Environmental Science of the UC Davis campus is also one of the best as it its truly committed to creating innovations and “ uplifting the quality of life” the world over.

The LEED certification also adds prestige to the school as whole as one of the few educational institution that “ walks their talk”, an institution that doesn’t stop with just talking about a better world for future generations, but one that actually tries its best to achieving a goal that can be considered impossible to attain.

Lastly, the platinum LEED certification that the complex received is a great motivator for its current students to achieve more, not just because of the studied effects of a clean environment has on the productivity of its residents, but also because they know that the great amount of money they are investing in their education is actually getting them somewhere. This is also a great way to attract prospective students towards the campus as they

now have solid evidence that their college actually does its best to practically apply what the students learn in real life and not just in theoretical discussions.

## An example

The complex prides itself in the fact that every penny donated towards its construction was used to the best amount that could be milked out of it. As the studies have shown, the returns in the investment of the complex will be more than worth the troubles of its construction and maintenance. The UC Davis' Brewery, Winery and Food Processing complex stands as a good example of what can be achieved when a green building reaches platinum LEED certification.

The facilities of the complex are laid out in a way that both the north and the south wing are close enough to be considered as one complex, but not close enough that they will intersect and cause a mix up in the delivery of research materials and what not. More importantly, the one story complex is planned out in a very simple and orderly manner. The north wing is where all the facilities, rooms, equipment, etc. for wine making is placed. This also segregates the water treatment plant where the system for integrating rain water into wine making is located.

Directly beside it in the south wing is the brewery. Again, the layout is simple in a sense that all facilities related to drinks with alcohol in its content is close to one another. Also close to it is the milk processing laboratory. While not an alcoholic beverage producing section, it still does keep the plan simple as the farther you go south, the more solid the food being processed

becomes. Lastly in the south wing is the tomato industry pilot plant. As mentioned above, the further south you go the more solid the food becomes. More importantly, this also ensures that the food processing plant is farthest from the winery to ensure that no contamination of researches can happen between solid and liquid food.

Between the numerous ways of designing a facility, it would appear in the layout that the designers used the integrated approach where they placed the needs of the product to be developed over the needs of the people who will make it. This is not to say that doing this is wrong, it simply means that the complex is planned out in a way that reduces the time it takes for a product to be finished.

While it is known that it took at least $20 million to create the facility, where and how the money was used is something that has not been disclosed by the institution. Some hypothesis can be made for an argument however such as using the average cost of a solar panel, water free urinals, food processing machines and the likes.

It is the return that can be easier to see. If we use the data from the 2003 study and the 2009 article about the financial returns of a platinum LEED certified building, then the possible return of would amount to a total of approximately $23 million, at least $3 million more than what it took to build the complex to begin with.

Likewise, the complex may have been made using donations, but it is highly unlikely that it will also operate on donations. This is when the student’s tuitions will affect the maintenance of the complex. Of course a student’s tuition pays for more than just facility, and to do a breakdown and an

analysis of this would require another study, but part of that payment is the upkeep of the campus that they study in. The effect this has towards the total number of students that UC Davis has will be looked at later.

## Finance: Calculation of the Economic and Environmental Savings (Energy, Water, and Others) of the Building

There is no other objective and accurate way to calculate how much the University of California as a whole could save from their approximately two year old compound of platinum LEED certified buildings than by reviewing and analyzing a copy of their past financial reports. This section will focus on hypothesizing the amount of possible savings that the University of California could have as a result of the modernization and at the same time, environment-friendly transition of its infrastructure system. By doing so, we can have an objective means of verifying whether what the literatures suggest about the advantages of LEED certified buildings is really valid or not. Apparently, the literatures suggest that even though constructing a building based on LEED or any other organization capable of bestowing environment-friend certification would predispose the investing organization into a scenario characterized by larger upfront expenses and even larger initial operating ones, it would still lead to huge savings, at least in the future. And when we say future, we mean years, or even decades, depending on a wide range of factors that include, but are not limited to, the level of certification from the certifying body, the state where the owner of the infrastructure operates in—this is important because acts and laws regarding tax breaks and exemptions vary from one state to another, the type of business operations the firm is involved in, etc. To establish a non-biased

assessment of the possible impact of the construction of the UC Davis Brewery, Winery, and Food Buildings on the University of California's financial figures in the future, we will compare financial data from the financial report published by the University of California in 2009, which was the year before the construction of the UC Davis Brewery, Winery, and Food Buildings was finished with the ones in 2011, which was approximately a year after the construction of the said buildings was finished. The comparison timespan will be for the next 20 years, a time when the theoretical savings as a result of the environment-friendly building operations would have kicked in and already been realized, or otherwise. Unfortunately, due to issues of disclosure and confidentiality, we had limited access to the actual financial figures about the construction of the UC Davis Brewery, Winery, and Food Buildings, which hinders us from analyzing its impact on future financial figures micro-economically. Instead, what has been conducted was a macro-economic analysis of the construction's impact on the organization's financial figures which will be done by reviewing the University of California's financial statements as a whole.

Another reason why a micro-economic or a per building analysis was unlikely is the fact that the UC Davis assets are not audited individual, but are rather " audited as part of the Consolidated Annual Financial Report of the University of California by the firm of Price Water House Coopers LLP, who has issued an unqualified opinion thereon dated October 14, 2009 that has been transmitted to the UC Board of Regents" . Below is a table explaining the UC Davis' financial position in the year 2009. Basically, the financial position can be best characterized by computing for the net assets—which

would most likely include the infrastructures and other profit generating entities. The net assets can be measured by simply computing for the difference between total assets and total liabilities. Narratively, UC Davis' total assets and total liabilities as of June 30, 2009 were 4. 2 billion USD and 1. 9 billion USD respectively. After doing the math, the net assets that year would be approximately 2. 3 billion USD, which can be seen as a slight increase from the 2. 25 billion USD worth of net assets the organization recorded in 2008. Below is the tabulated form of the UC Davis' financial position for the year 2009, with financial data from the year 2008, for reference and comparative purposes. All data presented in the table below are in millions of dollars. All ongoing land, infrastructure, building, equipment, libraries and collection improvement projects are recorded and audited under the capital assets section of the financial report which means that the construction of the UC Davis Brewery, Winery, and Food Buildings belong to that section. It would also be important to know at this point that the main and only source of the approximately 20 million USD budget used to construct the LEED platinum certified building was private donations. Meaning, the University of California did not have to issue new bonds or resort to other options for financing, all of which have something in common: they carry a certain degree of risk which would put the educational institution in an unwanted situation because procuring that 20 million USD from a bank for example, would mean risking losing that same amount for pilot brewery, winery, and food facilities.