

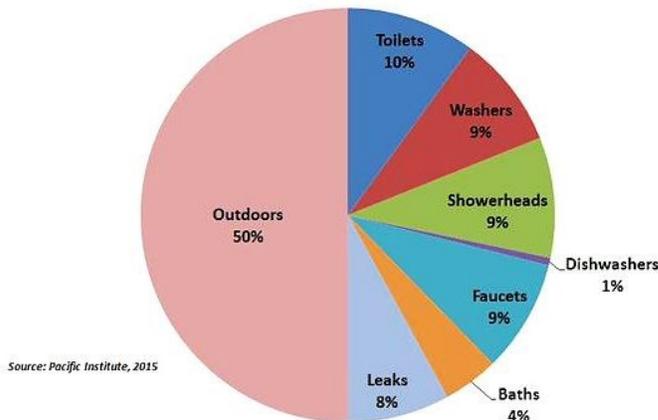
OVERVIEW

Climate change mitigation practices on income properties can have a positive effect on the profitability of the property. We label buildings taking the steps to fight climate change as a Climate Mitigation Building (CMB). The basic concept is to reuse water (greywater) from the building to enable the growth of lush landscapes, including large trees that naturally cool the building, sequester carbon and clean the air of pollutants. The result is a cleaner environment and a building with lower operating costs.

DETAILS

The benefits of a Climate Mitigation Building (CMB) are many. Let's begin by discussing the environmental aspects. The CMB is based on a solid foundation around high-efficiency water utilization.

Average California Household Water Use (Total), percent



In Southern California, where I am writing this, we use about 50% of our drinkable (tap) water on landscapes, with a smaller percentage being used when drought tolerant/native plants are used in the landscape. For inside the building use, the tap water is used only once before passing to the sewer for treatment and eventually winding up in the ocean or a river.

The CMB concept takes greywater, which is water after used at the bathroom sinks, air conditioner condensation (on commercial properties), and any showers or laundry on site and uses this waste water as an irrigation source. Using this abundant water source, landscapes can

be green, lush cooling islands without depleting drinkable water sources.

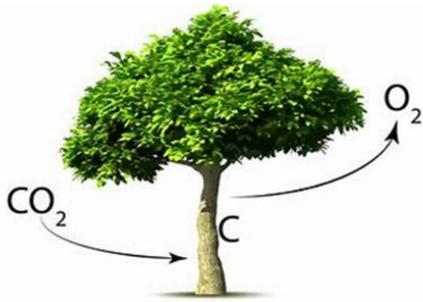


Figure 1: Photosynthesis, exchanging CO₂ for carbon and oxygen

A vital next step in CMB design is the planting of trees, lots and lots of trees, for their carbon capturing capabilities (fig. 1). It is a fact that trees planted within twenty (20) feet of the south side of a building is going to shade that side during the hottest of summer days. To get even more bang from the trees planted, incorporate tall, large-canopy trees that will shade the roof line, assuming no solar panels are installed (Fig 2) . From an



Figure 2: 40 ft tree shading face and roof of the building.

environmental perspective, the CMB is now sequestering carbon, cleaning the air of pollutants, cutting energy costs for cooling, and cleaning the greywater through transpiration (plants evaporating water).

Calculations on the many benefits of trees can be seen on the USDA website tree.com. We highly recommend review of this site. What most individuals do not realize is that any plant material will capture carbon and fix that carbon into the plant material and the soil for up to thirty (30) years. So, as your green landscape takes shape, it will constantly store carbon. Nice term for this is called carbon sequestering.

I personally favor fruit trees, even in a commercial building setting, because they provide the additional benefit of cutting carbon by producing fruit that employees or local nonprofits can enjoy without the cost of transportation. I recommend you seek out the gardeners/landscapers who identify themselves as urban farmers. These individuals take pride in maintaining organically-grown urban orchards and farms.



Back to shade trees: In developing a CMB plan, you will want to consider shading the parking lot with large canopy of trees as well. The logic behind this is that shade trees lower the internal heat of cars parked under them, resulting in the need for less air conditioner time and less gas used to run the air conditioner.



Let's not stop at trees though, because greywater can be used to maintain a lush green lawn under the trees or green parking areas. The combination of tree and undergrowth landscapes creates a cooling

effect from plant transpiration, thereby lowering the surrounding temperatures as the hot summer breeze blows through your urban forest/orchard, lowering the need for air conditioning.

Rain/storm water capture is yet another level of the CMB. For most properties, the tried and true method



for getting rid of rain/storm water was to push as much as of it as possible off the property. CMB preferred method for dealing with rain/storm water is to use large bioswales around the property to capture it and increase the water held in the soil (water banking). Much of the excess water will also percolate down into the natural aquifer, providing future water security in the area.

All leaves, pine cones and needles should be collected and kept on the property within the bioswale or within the planters. This landscape plant green trash is beneficial for keeping the soil healthy and locking in more carbon.

The Economics Portion of this Paper::

Reusing water (greywater), eliminates the charges for tap/potable water that would have been spent on the landscapes; it also decreases the sewer charges that are typically based on the amount of water coming onto the property. In some cities, you can get an additional sewer rebate for the greywater diverted to landscapes since the greywater never went to the sewer treatment plant.

On the building side: There is a reduction of your energy costs because the building is being naturally cooled by trees and landscaping, which means the air conditioning units do not have to work or work as hard.



For the landscape maintenance area:

There are several cost reductions and long-term returns. Let's discuss the irrigation equipment first. In most cases,

it is a constant battle to keep sprinkler heads repaired and working properly. The occasional geyser is a big water debacle, since most irrigation systems automatically go on at night when no one can notice the huge waste of water taking place. This literally leads to dollars being thrown down the drain; and/or worse, property damage caused by erosion. With a greywater irrigation system, the equipment is all underground approximately twelve (12) inches or more. This eliminates any damage to the equipment; and, no damage equals no repair costs. Some greywater systems are non-pressurized, so there is no chance of geysers.

Building maintenance reduction: Most irrigation systems have a significant amount of overspray. This overspray damages the exterior walls of structures, causes mold or calcium discoloring on windows, destroys walls, and shortens the life span of parking lots, especially black tops. Ask any black top resurfacing company what the biggest cause of black top wear and damage is; and, they will tell you the

constant overspray from the irrigation, which wears down the black top surface and increases the water under the surface that ultimately leads to cracks and pot holes.

The final economic benefit is more local. In Los Angeles County, we voted for a new property assessment tax in 2018 for storm water cleaning. It is based on the amount of nonpermeable hard surfaces on each parcel. There is an exemption if you clean the water on site using methods like the bioswales we described above. Another example is in the City of Santa Monica which has instituted a water neutrality ordinance. This ties the historical volume of water to the property; no water increase can be added on that property without offsetting the demand from another property somewhere else in Santa Monica. Therefore, any changes made to a CMB for water consumption can be transferred to developers in need of the water offset credits.

As of this writing we have 7 such project with 4 different property owners. Here is an example of a CMB conversion economics: This is a real example of a project in Los Angeles County using all the items laid out above:

The property is a 40-apartment complex, with four two story builds arrange around a sad-looking courtyard and outdated front lawn. The project calls for a large 40' to 50' tree canopy of stony pine trees (when fully grown) on the west side of each building, with the goal of providing complete shading on the west side and roof top from twelve noon until sundown.

The remaining courtyard area is to be planted with 30 full-production orange trees. The goal is to limit the cross-courtyard sounds and visuals, plus give the tenants a feeling of living in an orchard. (The owner grew up in an orange orchard north of Los Angeles in Ventura County.) When the trees are fully grown to 15 feet, the tenants will look out to a sea of dark green, highlighted every six (6) months with bright oranges. We are using multiple varieties so something sweet is available each month starting in October and lasting to March. How cool is it to go out your front door, pick five oranges and sip a glass of freshly squeezed orange juice?

On the west side of the building, between the pine trees, we are planting avocados trees. This creates a solid green wall that cuts the noise from the adjacent property, which just happens to be a preschool attached to an elementary school. The fresh avocados provide another treat for the tenants and additional income to the property owner when commercially harvested once a year (about \$1,000.00).

In both areas described above, the soil is removed to a depth of six (6) inches and is back filled with four (4) inches of mulch. This is the stormwater bioswale that will cut the annual storm water property assessment bill from \$879 a year to zero annually.

The water bill reduction based off the current lawn irrigation is \$3,300 annually, with the expected sewer reduction and rebate amounting to \$2,500 a year.

In Summary:

The total building operating expenses are expected to decrease by \$5,800
Plus reduce taxes by \$879.

An apartment rental premium of \$20 a month is expected to realize from:

- 1) The sense of privacy due to no cross-courtyard views
- 2) The natural cooling experienced when walking on the property
- 3) The reduction of noise from plant density
- 4) The environmental sensory experience
- 5) The option of free oranges and avocados

This adds (20 x 40 = 800) per month or \$9,600 in annual income

There is expected to be a reduction in vacancies due to the unique experience offered that will be hard for competition to duplicate once fully grown and the value added to tenants for lower energy costs, which is

estimated to be around \$45 annually. (Lower vacancy from 5% to 2% = about \$3,000 a month = \$36,000 annually.)

Parking lot/black top surface life span is expected to increase by ten (10) years, a per-square-foot benefit of \$2.00 per year. This sample property value is \$2,400 in capex.

Total Economic Building Analysis:

Drop vacancies to 2% or lower: \$36,000
Reduce water/sewer bill by \$1.00 per square foot of landscape: \$5,800
In Los Angeles county, reduce tax bill based on website calculation \$879.00
Add \$20 increase per apartment to your rent roll: \$9,600
Income from Oranges: \$1,000
Income from Avocados \$1,000
Decrease in landscape maintenance cost: \$2,400

Total changes on a typical CMB buildings Net Operating Income annually: \$56,679.00
How does this annual increase in Net Operation Income (NOI) change the properties valuation?
These annual savings will increase as water and energy become more expensive and laws requiring landlord to show what the energy & water cost are per apartment.

The Social Benefit

At the end of the day we believe environmental changes need to be economical profitable for wide spread adoption. Even if we all know the climate is changing and will affect our livelihood and effect our kids – the bottom line is profitability, that is what our bankers and lenders want to see. This plan allows climate aware building operators a path to do both, to be financially responsible fiduciary investors and to be environmentally responsible for future generations.

Experience the satisfaction of knowing you are participating in climate change mitigation

[More About ENVIROMENTAL PAYBACK](#) Next Page

THE ENVIROMENTAL PAYBACK

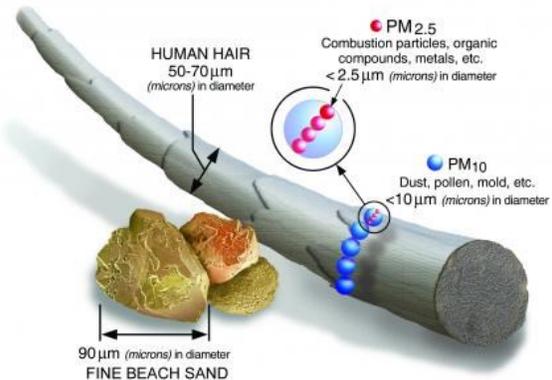
Trees are the lungs of the earth. The same way humans breath oxygen and exhale CO₂, trees breath in CO₂ and exhale oxygen. This carbon dioxide becomes sugars that can then be eaten, burnt for fuel, or simply enjoyed in its leafy form. According to coloradotree.org, an adult tree can change 48 pounds of carbon every year into enough oxygen to keep two people alive. taking in the CO₂ and giving back oxygen

Air pollution

Air pollution is made up of many things besides carbon dioxide (CO₂). The more commons items are Ozone -O₃, Nitrogen dioxide – NO₂, Sulfur dioxide – SO₂, Volatile Organic Compounds, Fine Particulate Matter 2.5 and 10. For a CMB each one of these are both removed and additional volumes are avoid by keeping the buildings and cars cool, thus requiring less energy for air conditioners.

Environment Mitigation Effect, In the example above the total volumes are as follow:

pounds of Carbon Sequestered	394,708
pounds of Carbon Avoid	403,224
Electricity Saved KWh	694,796
Fuel Saved MMBtu	1,340
Tree Bio Mass (Short Ton)	298
Gallons of rain fall intercepted	3,983,070
Gallons of avoid runoff	1,252,816
	-
Pounds of O ₃ removed (Ozone)	12,038
pounds of NO ₂ Avoided	40
Pounds of NO ₂ removed	3,060
Pounds of SO ₂ Avoided	148
Pounds of SO ₂ removed	850
Pounds of VOC avoided	382
Pounds of PM _{2.5} Avoided	250
Pounds of PM ₂ removed	310



Info graphic shows the size of Fine Particulate Matter – the leading cause of haze in smog.

Heat Island Reduction

Shade to Full sun differential 15 degrees

Feels like 22 difference due to increase atmospheric moisture given off by plants.

There are additional environmental benefits from having locally grown fruit such as:

Avoidance of Carbon from not having to transport the fruit and water foot print from growing local.

The Climate Mitigation Building (CMB) – Income properties

Client Base: Apartment complexes and Commercial Buildings

Takeaway:

Building retrofits for climate mitigation can increase the bottom line

Keywords: Green Building, Climate Change Mitigation, Climate Change, Carbon Sequester, Carbon Draw Down, Urban Heat Island, Energy Savings, Energy Reduction, Energy Avoidance, Energy Apartment Audit, Water Conservation, Greywater, Edible Landscape, Tree Canopy