# Surprising Sources of CO2 Worldwide

Over the past several years we have all become painfully aware that CO2 emissions from fossil fuels likely play a significant role in worldwide climate change. CO2 is the most prevalent greenhouse gas. It is a product of burning fossil fuels including coal, oil, and natural gas. But what most people aren't aware of is the breakdown of sources of CO2.

## Greenhouse Gases

CO2 plays in important role in retaining energy in the earth's atmosphere by forming a blanket around the earth. This is important because without it, we would be very cold. But with too much, we could be too hot. As the sun beats down on us daily, energy is absorbed in the atmosphere. At night, that energy is dissipated back out to space. This happens across day/night cycles and also across the year as we get closer and farther from the sun. Over the course of a year, we would like the energy retained to be equal to the energy dissipated. Any difference will begin to accumulate such that the temperature on earth will increase if we retain more energy or decrease if we dissipate more annually.

## Equilibrium

During the course of modern human history CO2 levels have been holding steady around 270 parts per million. Prior to recent history, CO2 fluctuated as low as 200PPM during severe ice ages and as high as 300PPM during very warm times. But again, these occurred long before people settled into cities as we know them. But we can cull this data from ice core samples as a peak into long forgotten climate history.
Equilibrium set off balance

Our historical human-time temperatures have been relatively stable because until about 100 years ago, there was little change in CO2 levels for a few thousand years. But then, as we started burning coal, then oil and then natural gas, we began to add more CO2 to the atmosphere. While there is a complex set of give and takes between carbon sinks (ocean, trees) and carbon sources (people, animals, fires, fossil fuels), we began to release more than we had in human history and set an increase in motion. For the past 100 years that increase has been evident and accelerating at an ever faster rate as we burn more fossil fuels.

## Higher than ever

Today atmospheric CO2 stands at 385PPM, over 100PPM higher than human history norms. Remember, the range over the last million years ranged from 200PPM (ice age) to 300PPM (ocean 75 feet higher than today). And today we are at 385PPM. So why haven't temperatures risen dramatically? Because there is a delay in temperature systems. We see this annually as the longest day (with the most sun) in the northern hemisphere is June 21st. But the hottest days occur about 45 days later. This lag in response is due partly to the earth's mass absorption response. And we are seeing the same effect in global warming. That is, a lag in earth response, but that lag is now coming of age. So expect more temperature increases in much of the world (and some decreases as winds, rains, and currents shift).

## Energy Related CO2

While modern society considers the passenger car as the big emitter of CO2, it turns out that is actually not the full story. In fact, it isn't the story at all, as we will see. Also, we think of electric plants as a problem. True, but they generate electricity for use by industry and buildings. So lets look at the uses of the energy to get a real picture of how humans generate this clear gas.

## Our Buildings Are the Source

If we break down worldwide CO2 uses into common categories we get:
Industry
Buildings
Transportation
But we can further breakdown transportation into passenger cars and others (planes, boats, trains etc.). And we can also break out building materials from industry, as it is one of the largest industry CO2 categories including cements, drywall, glass, metals and others, and we can tie that to the built environment. And now here is what we get for worldwide emissions as a percent of total (ready to be surprised?):

Built Environment = 52% (40% for operations and 12% for materials)
Industry = 24%
Other Transport = 15%
Passenger cars = 9%

Yes. The biggie? Our buildings. The smallest? Cars.
Now, this is worldwide. In the US, the numbers move around a bit, but buildings are always the largest emitter, in virtually every country and

worldwide. By over 5X worldwide. Surprised?

We Can Fix It

In order to address the built environment, we need to address the materials (such as new cement, drywall, metal processes) as well as building operations (primarily heating and cooling). Currently, almost every building material process was designed 100 to 150 years ago, when energy was nearly free and CO2 had no significance. Today, both are issues. And while homeowners cannot develop new processes to replace the old ones, new industry is doing just that. Companies like CalStar and Serious Materials among many are re-inventing the old processes, reducing embodied energy by 75% or more.

But we all can address operations, at least at home. Easiest targets are sealing ductwork, installing programmable thermostats, insulating homes that aren't, and choosing high R value windows (at least R6 and preferable higher). Up to 50% of heat loss occurs through windows which are closed. Upgrading to dual pane low E windows is a start, but only gets to an R3, hardly much improvement. But new technology is becoming available (such as ThermaProof Windows) which can provide R values above R 10. A 300% improvement, and a significant savings in heating and cooling bills.

Just The Beginning

Education and awareness are key. Yes, we must address everything, including our cars. But cars are not the answer, just a start. We all need to improve our homes and offices. Look around, seal those ducts, and upgrade those windows. Today.

## About the Author

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