

Earth Day 2022 and Sustainable Existence on our Planet

Update December 27, 2022

Dear Mayor Schaaf,

Your two terms as Mayor of Oakland will officially end on **January 2, 2023 when Councilmember Sheng Thao is sworn in as the next Mayor of Oakland**. Thank you for your active and courageous leadership during these eight years as you have grappled with a diverse array of challenging issues.

You began as Mayor of Oakland on November 14, 2014. I wrote my first Earth Day letter to you in April, 2015 and have written one to you each Earth Day since then. So, this **update** to my Earth Day 2022 letter will be my final Earth Day to you. I hope to continue my annual Earth Day letters with your successor Sheng Thao who is keenly interested in environmental matters.

Sustainable Existence on Our Planet

Earth Day is dedicated to the health of our Planet and to our sustainable existence on it. Sustainability refers to the population size which our Planet can **sustain indefinitely**. It can sustain a larger population at subsistence levels at which per capita resource requirements are low than it can at higher standards of living such as those of the United States and western Europe today at which per capita resource requirements are much higher. Our standard of living includes environmental amenities we choose such as open space for species preservation (biodiversity) and the preservation of wilderness; these environmental amenities add to our quality of life and happiness.

Human population growth and global warming

Unsustainable population levels impair our environment in myriad ways, including global warming. We cannot mitigate nor resolve this grave problem of global warming just by making **per capita*** reductions in CO₂ emissions if population growth negates these reductions. Energy-saving technology has **reduced per capita carbon dioxide emissions** since the first Earth Day (April 22, 1970).

Total carbon dioxide emissions are higher, however, because of population growth.

Even if mileage standards had risen to 47 mpg as proposed by the Obama administration rather than 37 mpg as counter-proposed by the Trump administration or if they rise to 40 mpg by 2026 as proposed by the Biden administration, **total** carbon dioxide emissions will still rise **because of population growth**, negating the benefits of higher mpg standards. **Human population growth is a major, if not the major, contributor to global warming."**

* Per capita is a Latin phrase literally meaning "by heads" or "for each head" and is used idiomatically to mean "per person".

Our Leaders are failing to make the connection

between human population and growth global warming

Our leaders are failing to make the connection between **human population growth** and **global warming**. Governor Gavin Newsom has spoken out strongly against global warming, for example, in his communications with former President Donald Trump. Newsom correctly perceives the reality of global warming, **but he has not indicated in his public statements** that he perceives the **connection between population growth and global warming**. Rather, he appears to believe that we can just keep our

population growing (with the commensurate economic growth that population growth drives).

Newsom has signed a funding package that will lead to the creation of 84,000 new homes. Recall that when he was campaigning for governor, Newsom announced his “audacious” Marshall Plan to build more housing, with a goal of 3.5 million new housing units to be built by 2025—about 500,000 per year. The governor does not appear to see a conflict between building more homes for more people which results in increased **total** carbon dioxide emissions and trying to mitigate global warming. (Governor Newsom and his wife, Jennifer Siebel Newsom, have four children.)

Our business writers are failing to make the connection between human population and growth global warming.

Business writers such as Dan Walters and Ethan Varian who favor population growth with its concomitant housing growth appear regularly in the East Bay Times exhorting us to support population growth and its concomitant housing growth. A recent Varian article (December 12, 2022) touted YIMBY leader Sonya Trauss (YIMBY = Yes In My Backyard). His December 25, 2022 article was entitled “Vision of Oakland housing, Plans call for building as many as 36,000 homes in next decade.”

Neither Walters, nor Varian nor Trauss appear to have given thought to **what population levels are sustainable in California** (over the long-term). In other words, what is the state’s carrying capacity? They blithely assume that the environment will support the levels of population and housing they are calling for. They effectively assume that the environment is subsidiary to the economy. The truth is, however, that the economy depends on the environment (or more generally the Earth's carrying capacity), not the other way around. The environment would do just fine without the

economy, but not the other way around. Or as the then Prince of Wales and now King Charles III put it, “**the economy is a wholly owned subsidiary of Nature and not the other way around**” (*Newsweek*, 12/14/2009).

Proponents of population growth and its concomitant housing growth like Walters, Varian and Trauss suggest that we have a moral obligation to support population growth and its concomitant housing growth. This is completely in reverse. We have a moral obligation to support measures that militate toward sustainable (i.e., long-term) existence in California and the nation and on our planet. Thus, those who favor a smaller population are acting morally and those who favor population growth and its concomitant housing growth are not.

Life, Liberty and the Pursuit of Happiness

Our Declaration of Independence says, “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are **Life, Liberty and the Pursuit of Happiness.**” Some people are happier with a smaller population with more living space and with more open space for outdoor amenities and species preservation. Others are happier with a larger population with less living space and with less open space for outdoor amenities and species preservation. People pursue their happiness in their own way: different strokes for different folks

Species Preservation.

A report entitled “Animals are disappearing, running out of places to live” appeared in the *New York Times* on December 16, 2022.

“Wildlife is disappearing around the world in the oceans and on land. The main cause on land is perhaps the most straightforward. Humans are taking over too much of the planet, erasing what was there before.”

“With our bottomless appetite for unchecked and unequal economic growth, humanity has become a weapon of mass extinction,” U.N. Secretary-General Antonio Guterres said in his opening remarks last week in Montreal.

We don’t have to look much farther than our own backyard to appreciate what Guterres is saying.

No more opossums

There are loud and frequent calls to build much more housing in California to support a larger population. This essay raises the question of what **human** population levels and development levels are compatible with sustainable existence in our state. But what about the **non-human** occupants of our state?

Until a few years ago, I used to see **opossums** sitting on our back fence at night. They are interesting animals. I could walk right up to them, but they would just stay there on the fence. Opossums are adaptable animals and can co-exist with humans – up to a point. But even opossums need a certain amount of space.

There used to be some open space and bushes in the surrounding lots. But now we are being asked by growth advocates to add an accessory apartment or accessory dwelling unit (ADU), e.g., a granny flat, wherever there is any open space. The result will be that in cities there will be more humans (and more economic growth) and less or no wildlife like opossums. (I have not seen an **opossum** in our backyard for over four years.)

The existence value of non-human species

Our standard of living includes environmental amenities we choose such as open space for species preservation (biodiversity) and the preservation of wilderness; these environmental amenities add to our quality of life and happiness. Surveys have consistently shown that humans place value on the existence of wildlife whether it is a species you are likely to see such as an **opossum** or a species you will almost certainly never see such as a Siberian tiger. But preserving these species in the wild requires setting aside enough open space for them to exist. And this open space won't be available for humans to build houses on to accommodate our growing numbers (which are the main drivers of our cherished economic growth).

The NIMBY (Not In My Back Yard) movement favors keeping back yards as back yards rather than replacing them with accessory apartment or accessory dwelling units (ADUs) and also favors retaining open space rather than losing it to a growing population with more housing developments. California's current population of 39.0 million is at least twice its sustainable level and needs to be gradually reduced to levels compatible with sustainable existence in our state. The NIMBY movement indirectly militates against population growth which helps our planet and future generations while the YIMBY (Yes In My Back Yard) movement has the opposite effect.

To restate: Keeping back yards as back yards and open space as open space helps our planet because these actions militate toward lower population levels and toward sustainable existence on our planet and in our state. Higher population levels have the opposite effect. We are being asked to give up our back yards and our open space for the goal of having a larger population (with concomitant more housing). **But this goal**

does not merit support: it is antithetical to and incompatible with sustainable existence on our planet.

We are speeding forward on a “Ship of Fools*.” We are playing with nature, but nature always bats last.

* The ship of fools is an allegory, originating from Book VI of Plato's Republic, about a ship with a dysfunctional crew. The allegory is intended to represent the problems of governance prevailing in a political system not based on expert knowledge.

William E. Jackman, PhD
Statistician/SAS & SQL Programmer
Oakland, California
December 27, 2022

I am a second-generation Irish-American who grew up with immigrant Irish grandparents and aunts in Oakland. I am a graduate of Oakland High School and of the College of Engineering at UC Berkeley. I am fluent in Spanish.

Earth Day 2022 and Sustainable Existence on our Planet-(April 2022)

Dear Mayor Schaaf,

On November 4, 2022, you will complete your eighth year as Mayor of Oakland. Thank you for your active and courageous leadership during these eight years as you have grappled with a diverse array of challenging issues. Unfortunately, the Mayor of Oakland

is limited to two terms, so you won't be able to run for reelection in November 2022.
Best wishes for the next phase of your career.

You began as Mayor of Oakland on November 14, 2014. I wrote my first Earth Day letter to you in April, 2015 and have written one to you each Earth Day since then. So, this will be my eighth and final Earth Day to you. I hope to continue my annual Earth Day letters with your successor.

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administration rather than 37 mpg as counter-proposed by the Trump administration or if they rise to 40 mpg by 2026 as proposed by the Biden administration, **total** carbon dioxide emissions will still rise because of population growth, negating the benefits of higher mpg standards. **Human population growth is a major, if not the major, contributor to global warming."**

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Our leaders are failing to make the connection between human population growth and global warming. Governor Gavin Newsom has spoken out strongly against global warming, for example, in his communications with former President Donald Trump. Newsom correctly perceives the reality of global warming, **but he has not indicated in his public statements** that he perceives the **connection between population growth and global warming**. Rather, he appears to believe that we can just keep our population growing (with the commensurate economic growth that population growth drives).

Newsom has signed a funding package that will lead to the creation of 84,000 new homes. Recall that when he was campaigning for governor, Newsom announced his "audacious" Marshall Plan to build more housing, with a goal of 3.5 million new housing units to be built by 2025—about 500,000 per year. The governor does not appear to see a conflict between building more homes for more people which results in increased **total** carbon dioxide emissions and trying to mitigate global warming. (Governor Newsom and his wife, Jennifer Siebel Newsom, have four children.)

Not even a passing thought about sustainable population levels

Governor Newsom is genuinely concerned about providing housing for our growing population. However, it appears that he and other population growth advocates such as California State Senator Scott Wiener and newspaper columnists Dan Walters and Jonathan Lansner have **not given even a passing thought** to what population levels are compatible with sustainable existence in California and in our nation at our minimum acceptable standard of living. There is a **strong taboo** against discussing sustainable population levels (the “p” word).

The Taboo at the Climate Change Conference held at Glasgow, Scotland

Human population growth is a major, if not the major, contributor to global warming.

In light of this, it is dismaying that **sustainable population levels were not on the agenda** of the 2021 United Nations Climate Change Conference held at Glasgow, Scotland, United Kingdom, 31 October – 13 November, 2021. The final pact of the conference explicitly committed to reducing the use of coal, encouraged more urgent greenhouse gas emissions cuts, and promised more climate finance for developing countries to adapt to climate impacts. **The taboo subject of sustainable population levels was not included in the pact (the “p” word).**

Contradictory and incompatible positions

Despite the clear link between population size and carbon dioxide emissions and despite solid research which shows that the world population of about 7.9 billion is more than three times **its sustainable level of about 1.5 billion to 2.5 billion** and that the U.S. and California populations (about 332.5 million and 38.9 million, respectively) are at least twice their sustainable levels, our leaders such as Governor Newsom enact policies which foster population growth. **However, being against global warming and for**

population growth are contradictory and incompatible positions. More broadly, being for sustainable existence on our planet and for population growth (and the economic growth it drives) are contradictory and incompatible positions.”

Checking with Our Planet First

The *East Bay Times* ran an article last year entitled “Why California’s youth population is shrinking” in which business leaders and academics worried about California’s slowing population growth (not enough babies) and California’s future labor force. For example, Dowell Myers, a demographer and public policy professor at the University of Southern California, commented, “It’s that we need them [babies] to be future workers, future taxpayers, and future consumers...”

Dowell and others are **asking the wrong question**. The most important question business and all of us should ask is: What is the sustainable population of our state, not how large a population we need to provide the workers that business says it needs. **We must check with our planet first.**

We are **not** checking with our planet first. In California, we are plowing ahead at full speed to build more housing for a growing population without considering whether our state and our nation has the carrying capacity to support these population levels.

Business Is Averse to Discussing Sustainable Population Levels

The aversion of business to even consider slower population growth or a smaller total population is **the dominant reason why discussing sustainable population levels is taboo**. Businesses have a deep-seated and unquestioning faith in **p**opulation growth. More people mean more available workers, more customers, more sales, and more profits, especially quarterly profits -- regardless of the long-term consequences of

unsustainable population levels. (Faster economic growth in the U.S. in recent decades compared to that in European countries and Japan has been driven largely by faster population growth, not by a substantial rise in the standard of living of average middle-class and lower middle-class Americans.)

Our economic system is committed to growth.

The Federal Reserve Board of the United States is committed to **continued growth** in the economy and strives to stimulate growth. If a company does not grow, it is shunned by investors. Growth is the idol that nearly all economists, especially business economists, worship – there must be continued growth in sales and profits. Consumers must consume more. (Youngquist, December 2016, p.4)

For example, Wall Street was thrilled recently by the rise in Target’s operating profit, given that it had expected that Target’s operating profit would decline.

From Bloomberg, 3/2/2022:

“Target gets biggest post-earnings pop since 2020.

“Target soared after unveiling a forecast for new profit gains on top of the pandemic-related boom that has already sparked robust growth...

“We see a growth horizon for years to come,” Chief Executive Officer Brian Cornell said with analysts in New York...”

Business economists

The clients of business economists include CEO’s whose compensation depends on quarterly growth in sales and profits. Business economists are delighted to report good news, i.e., growth, to their CEO clients. For example, from the New York Times,

2/17/2022:

“Retail sales rise 3.8% in January.

“Consumers kept economy running despite virus, inflation.

“Prices were rising fast, products were in short supply, and the omicron virus put a chill on the country at the start of the year. Through it all, consumers kept spending.

“We are seeing a strong bounce to start the year, suggesting positive momentum for now, in spite of elevated prices,” said Rubeel Farouqi, chief U.S. economist at High Frequency Economics.

The U.S. government

The **U.S. government** also fosters economic growth and is pleased to report good news, i.e., positive growth. From the Associated Press, 2/25/2022:

“U.S. slightly revises up its GDP Q4 estimate

“**Washington** The U.S. ended 2021 by expanding at a brisk 7% annual pace from October through December, the government reported Thursday in a slight upgrade from its earlier estimate as businesses stepped up their restocking of supplies.”

The IMF

International economic associations such as the International Monetary Fund (IMF) also foster economic growth and report on it. From its April 19, 2022 update:

“... economic damage from the conflict [war in Ukraine] will contribute to a significant slowdown in global growth in 2022 and add to inflation. Fuel and food prices have increased rapidly, hitting vulnerable populations in low-income countries hardest.

Global growth is projected to slow from an estimated 6.1 percent in 2021 to 3.6 percent in 2022 and 2023. This is 0.8 and 0.2 percentage points lower for 2022 and 2023 than projected in January. Beyond 2023, global growth is forecast to decline to about 3.3 percent over the medium term.”

The four forecasts of economic growth cited above – by CEOs, by business economists, by the U.S. government, and by the IMF – do not take into account what levels of economic activity or growth are compatible with sustainable existence on our planet.

No more opossums

This section is a bit of a digression but is a topic I have wanted to include for several years but have not.

There are loud and frequent calls to build much more housing in California. This essay raises the question of what **human** population levels and development levels are compatible with sustainable existence in our state. But what about the **non-human** occupants of our state?

Until a few years ago, I used to see **opossums** sitting on our back fence at night. They are interesting animals. I could walk right up to them, but they would just stay there on the fence. Opossums are adaptable animals and can co-exist with humans – up to a point. But even opossums need a certain amount of space.

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The existence value of non-human species

Our standard of living includes environmental amenities we choose such as open space for species preservation (biodiversity) and the preservation of wilderness; these

environmental amenities add to our quality of life and happiness. Surveys have consistently shown that humans place value on the existence of wildlife whether it is a species you are likely to see such as an **opossum** or a species you will almost certainly never see such as a Siberian tiger. But preserving these species in the wild requires setting aside enough open space for them to exist. And this open space won't be available for humans to build houses on to accommodate our growing numbers (which are the main drivers of our touted economic growth).

The NIMBY (Not In My Back Yard) movement favors keeping back yards as back yards rather than replacing them with accessory apartment or accessory dwelling units (ADUs) and also favors retaining open space rather than losing it to more housing developments. California's current population of 38.9 million is at least twice its sustainable level and needs to be gradually reduced to levels compatible with sustainable existence in our state. The NIMBY movement indirectly militates against population growth which helps our planet and future generations while the YIMBY (Yes In My Back Yard) movement has the opposite effect.

To restate: Keeping back yards as back yards and open space as open space helps our planet because these actions militate toward lower population levels and toward sustainable existence on our planet and in our state. Higher population levels have the opposite effect. We are being asked to give up back yards and our open space for the goal of having a larger population (and more housing). **But this goal does not merit support:** it is antithetical to and incompatible with sustainable existence on our planet.

Business Impedes the Transition to Sustainable Population Levels

The world population of about 7.9 billion is more than three times **its sustainable level of about 1.5 billion to 2.5 billion** and that the U.S. and California populations (about

332.5 million and 38.9 million, respectively) are at least twice their sustainable levels. For ourselves and for those who follow us, **it is imperative** that we begin the transition to first stabilizing our population and then gradually transitioning to lower population levels.

The aversion of business

However, I have already discussed **the aversion of business** to even consider slower population growth or a smaller population. Businesses have a deep-seated and unquestioning faith in population growth. More people mean more available workers, more customers, more sales, and more profits, especially quarterly profits -- regardless of the long-term consequences of unsustainable population levels.

Moving to sustainable population levels

Can we move to sustainable population levels to help future generations? This will be difficult for U.S. residents to accomplish because projections show that more than 85% of our country's population growth in the coming decades will be immigration-related.

Business, population growth and immigration

U.S. residents are not going to get help from business in the transition to sustainable population levels. Business is overwhelmingly pro-immigration because immigration brings more low-wage workers, more customers, more sales, and more profits. For example:

- from a February 21, 2022 Bloomberg Opinion in *Bloomberg Businessweek*, p 6: "U.S. immigration policies should be guided by two basic principles. The first is that immigrants are indispensable to American innovation and long-term economic growth..."
- from *Time* magazine, March 14/March 21, 2022, p.18: "If immigration does not improve...I'm not sure how we can get back to growth.", Ron Hetrick, Economist.

Already refuted in my Earth Day 2018 letter to you.

I have already refuted these mistaken beliefs in the need for immigration to save us economically in previous essays. I **have copied below** the relevant section from my 2018 Earth Day essay. I also refuted these mistaken beliefs in my essay “We’ve Got Plenty of Smart People Here Too.”, June 28, 2020 (Smart people_01.docx) which I have **attached**.

From my essay “Earth Day 2018 and Sustainable Existence on our Planet”

Can We Move to Sustainable Population Levels to Help Future Generations?

The current U.S population of 332.5 million is roughly twice the sustainable level of approximately 150-200 million people. So, the first step toward a more sustainable U.S. population would be to stabilize our population at its current level and then gradually reduce it. This will be difficult for U.S. residents to accomplish: The U.S. Census Bureau estimates that immigration will become the “primary driver of U.S. population growth” between 2027 and 2038. Immigration is expected to account for 82% of U.S. population growth by 2050.

There are humanitarian reasons for allowing high levels of immigration to the U.S., but the dominant reasons advanced are economic. Businesses say that they have to import workers ranging from computer programmers to dishwashers and everything in between to remain competitive.

Computer Programmers

Silicon Valley regularly reports that more than two-thirds of its computer programmers are foreign-born. This is indeed remarkable given that California has a population of 39 million, has a widely-admired system of higher education (its three-tier system), and is

much more racially and ethnically diverse than the countries which are providing us with programmers.

Construction Workers

Jared Bernstein (who was the Chief Economist and Economic Adviser to Vice President Joseph Biden in the Obama Administration and is currently a Member of the Council of Economic Advisers in the Biden administration) wrote, "Compared to less-educated Hispanic immigrants, white and black high-school dropouts have not been nearly as heavily employed in construction." (Eberstadt, pp. 173-174) What Bernstein observed from a national perspective can be readily observed in California and Oakland. Employers claim there is a shortage of construction workers because not enough native-born whites, blacks, Asians, or Latinos will do this work. So, they have no alternative but to hire Hispanic immigrants.

So according to business, California's current population of 39 million (which is among the most diverse in the world) is not large enough to provide the workforce the state needs. (To put this in perspective, California's population in 1950 was 10,586,223.) **So, the state's population has to keep growing so our economy can keep growing.** This line of thinking is bad for our Planet and bad for future generations. The most important question business and all of us should ask is: What is the sustainable population of our state, not how large a population we need to provide the workers business says it needs.

(Comparisons to California's population of 38 million: Canada, 36.3 million; Australia, 24.1 million; Sweden, 9.9 million; Israel, 8.5 million; Denmark, 5.7 million; Ireland, 4.8 million; Estonia, a Baltic high-tech center (Skype and much more), 1.3 million.)

Less Diverse Nations with Smaller Populations

Are Beating Us Economically.

This paper is about sustainable population levels, not economic competitiveness. This section will be a short digression. As written in the previous section, business claims that we have to import “smart” workers and lots of other workers to be competitive in world markets. Importing workers adds to our diversity, giving us an advantage, they say. But is this strategy working?

The following five countries have smaller populations and much less diverse populations than the U.S. but do not import lots of workers. Yet they are beating us economically, invalidating our claims that with a population of 332.5 million we have to import lots of workers to be competitive. (Data cited is for 2016.)

- Japan has a population about 39% of that of the U.S., but they had a trade surplus with us of \$68.9 billion.
- Taiwan has a population about 7% of that of the U.S., but they had a trade surplus with us of \$12 billion.
- South Korea has a population about 15% of that of the U.S., but they had a trade surplus with us of \$27.7 billion.
- Vietnam has a population about 28% of that of the U.S., but they had a trade surplus with us of \$32 billion.
- Germany has a population about 25% of that of the U.S., but they had a trade surplus with us of \$65 billion.

Native-born residents of these nations are the source of the computer programmers and engineers and other technical workers these nations need to successfully compete economically. Their native-born residents are **also** the source of the workers who do roofing and construction, wash dishes in restaurants, work in retirement homes, work in

agriculture, etc. This occurs because the price mechanism in these countries adjusts and allocates sufficient wages to these jobs so that workers will do them. Such market adjustment of wages tends not to occur in the United States because of the readily available supply of low-cost imported labor. This situation has also contributed to the phenomenon of “Men Without Work” in the United States (book by Nicholas Eberstadt, 2016; the aforementioned Jared Bernstein was a commentator to this book). “Men Without Work” are among the occupants of homeless camps.

“If immigration does not improve...”, Ron Hetrick, Economist.

Previously cited from Time magazine, March 14/March 21, 2022, p.18: “If immigration does not improve...I’m not sure how we can get back to growth.”, Ron Hetrick, Economist.

Ron Hetrick does not need to worry about insufficient immigration to the U.S.

Thousands of people are **already in motion** to come here, and millions more **would come if they could**. Regardless of issues with the quality of life in the United States, it still holds allure for millions of people around the world.

Already in motion

The Washington Post reports that U.S. Customs and Border Protection (CBP) authorities are on pace to make more than 200,000 detentions along the Mexican border in March [2022], the highest monthly total since August [2021]. Of greater concern to CBP officials, the agency has been holding more than 15,000 migrants per day at border stations and tent facilities, exceeding capacity limits. Last month [February 2021], CBP averaged fewer than 7,500 in custody per day.

Would come if they could

Gallop polls have consistently shown that hundreds of millions of people worldwide would migrate to the United States if they could. The U.S. has consistently been the top destination for migrants in the surveys.

- Gallop survey released December 10, 2018 (based on 2015-2017 data):
“More Than 750 Million Worldwide Would Migrate If They Could.”
158 million (21%) named the U.S. as their desired future residence.
- Gallop survey released April 20, 2012 (based on 2010-2012 data):
“150 Million Adults Worldwide Would Migrate to the U.S.” This was 23% of the 640 million people worldwide who would migrate if they could.

Growth enthusiasts will take their growth any way they can get it.

Even the most enthusiastic growth advocates acknowledge that human economic activity has been damaging our planet. So, they propose “green growth” as a replacement for traditional economic growth. The concepts of no growth or negative growth are incomprehensible and anathema to them. Yet, these growth enthusiasts probably view themselves as being opposed to global warming.

However, no growth or negative growth is what we need now to preserve our planets as a livable place for those who will come after us. The world population of about 7.9 billion is more than three times **its sustainable level of about 1.5 billion to 2.5 billion**, and the U.S. and California populations (about 332.5 million and 38.9 million, respectively) are at least twice their sustainable levels.

Zero Emission Vehicles (ZEVs), the key to perpetual economic growth?

The most salient current hindrance to business and economic growth is global warming. Can ZEVs diminish this obstacle and facilitate perpetual economic growth?

A zero-emission vehicle, or ZEV, is a vehicle that does not emit exhaust gas or other pollutants from the onboard source of power. The California definition also adds that this includes under any and all possible operational modes and conditions. California has an objective to achieve five million zero-emission vehicles (ZEVs) on the road by 2030 and 250,000 electric vehicle charging stations by 2025. Further, by 2035, all new cars and passenger trucks sold in California must be ZEVs.

U.S. Government has set goals of:

- 100 percent zero-emission vehicle (ZEV) acquisitions by 2035, including 100 percent zero-emission light-duty vehicle acquisitions by 2027;
- Net-zero emissions from federal procurement no later than 2050

Growth enthusiasts are delighted to hear that ZEVs do not emit exhaust gas or other pollutants from the onboard source of power. Wow! So, our population and our economy can keep growing without the hindrance of global warming.

If this sounds too good to be true, it is.

There is substantial, but not unanimous, consensus among expert that ZEVs are better for our planet than vehicles with internal combustions engines. However, this is **not a free ride**; ZEVs also have environmental costs.

A ZEV does not emit exhaust gas or other pollutants from the onboard source of power. But it does not move on its own. The power to move it must come from somewhere. Newton's first law of motion states that an object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force. So, the unbalanced force which moves the ZEV from rest to motion has to come from somewhere. In fact, it comes from electrical energy which is transmitted via power lines from where it is generated and is converted to chemical energy in the ZEV's lithium-ion battery during charging.

Energy sources for ZEVs

From the U.S. Energy Information Administration:

In 2021, about 61% of electricity generation was from fossil fuels—coal, natural gas, petroleum, and other gases; about 19% was from nuclear energy; and about 20% was from renewable energy sources.

Because of their lithium-ion batteries, electric cars can release their chemically stored energy without any kind of combustion on site. So, they emit zero greenhouse gases on site. However, the energy to charge the ZEVs' batteries is transmitted via electrical lines from the sources of generation. If the sources of the energy at, for example, a power plant are fossil fuels (61% for the US in 2021), CO² is emitted at the power plant rather directly on site by the ZEV.

Renewable energy

In 2021, about 20% of energy used in the US was from renewable energy sources. This figure for California, using 2020 data, was 33%, with 13.6% from hydropower. The share of hydropower in California is likely to decrease significantly because several years of drought has greatly reduced the amount of water in dams available for generating hydropower. This will increase the role of wind as the primary renewable energy source.

Sources of wind power

The five states with the most electricity generation from wind in 2021 were Texas, Iowa, Oklahoma, Kansas, and Illinois. These states combined produced about 56% of total U.S. wind electricity generation in 2021.

Wind power is more developed in the US than in other countries except China. The top five countries in wind electricity generation and their percentage shares of total world wind electricity generation in 2020 were:

- China–30%
- United States–21%
- Germany–8%
- United Kingdom–5%
- India–4%

Environmental costs of ZEVs

Excerpted from: <https://youmatter.world/en/are-electric-cars-eco-friendly-and-zero-emission-vehicles-26440/>

More carbon emissions at the end of the manufacturing process.

The cycle of making a car starts with raw materials being extracted, refined, transported and manufactured into several components that will be assembled to produce the car

itself. This process is very much the same in both conventional and electric cars. Nevertheless, at the end of the manufacturing process, electric cars are the ones generating more carbon emissions, according to the Union of Concerned Scientists.

Mining activities with very polluting processes

Electric cars store energy in large batteries (the larger they are, the bigger their range is) that have high environmental costs. This happens because these batteries are made of rare earth elements (REE) like lithium, nickel, cobalt or graphite that only exist beneath the surface of the Earth and therefore depend on mining activities with very polluting processes.

Difficulties with recycling lithium-ion batteries

In the conventional car industry, according to a study from the international council of clean transportation (ICCT), 99% of lead-acid batteries (the ones running in fossil fuel powered cars) are recycled in the US. This is not the case for the lithium-ion batteries that have a very specific mix of chemical components and little quantities of lithium, which doesn't make them an appealing market opportunity. For instance, in the EU market, in 2011, only 5% of lithium was being collected and the rest was either incinerated or dumped in landfills.

Recommendation of the youmatter study see (URL above).

We have rare earth elements (REE) for some time but do we truly have enough for the long run? UN forecasts are that 68% of the world population will live in urban areas in 2050, so issues like traffic, parking, and high consumption rates will need to be managed as well.

The truth is that public transportation is a better option than using individual vehicles if we want to lower our carbon footprint, so shouldn't we be more worried about

reinventing it? At the same time, some scientists say that the sharing economy of cars, or even motorbikes or bicycles, will be the next stage in the evolution of mobility, with new business models already being developed. Let's embrace the change?

Other environmental limitations of ZEVs

Energy losses recharging ZEVs

As discussed previously, the energy to recharge the lithium-ion batteries of ZEV's must be transmitted from where it is generated, e.g., a power plant, hydropower facility, or a wind farm. However, there are considerable power losses in the transmission process.

- **Energy losses in high-voltage transmission lines.**

High-voltage transmission lines carry electrical energy long distances – dozens or hundreds of miles – from where it is generated to the low-voltage distribution system of an entity like a city. For example, high-voltage transmission lines transmit energy from a power plant like Moss Landing (near Monterey, CA) to a city like Oakland where the energy will be further transmitted on the city's low-voltage distribution system.

Electrical distribution on high-voltage transmission lines is comparatively efficient, with energy losses around **two percent** (a national average). However, these losses are a function of distance and assume average transmission distances. Due to high electricity demand, California imports more electricity than any other state, (32% of its consumption in 2018), so the transmission distances are longer than average. For example, California imports considerable electrical energy from the Pacific Northwest and from the desert Southwest. It is reasonable to assume that energy losses in this long-distance transmission for California are **more than** the average of **two percent** for the nation; let's assume

it is **three percent**.

- **Energy losses in low-voltage distribution lines**

These are the lines that, for example, transmit electrical energy throughout a city like Oakland. Energy losses in distribution lines average about **four percent**.

- **Energy losses at the charging site.**

When the electrical energy finally arrives at the charging station – be it in your garage or a public charging station – there are more energy losses:

Up to 25 % energy is lost when charging electric vehicles, tests show – Smart2.

Staffers charging at home using a typical 120-volt wall outlet saw efficiency of, at best, 85 percent, and it dropped to as little as 60 percent in very cold weather, when charging the battery requires expending significant energy to keep it warm.

A rough expectation is that your EV may use as much as 12 to 15 percent more energy than what you add back to the battery. Some energy is written off to what's known as "transmission loss," some is converted to heat, and some is used to keep the battery at the right temperature during charging. (Car and Driver, April 10, 2021)

<https://www.caranddriver.com/features/a36062942/evs-explained-charging-losses/#:~:text=Staffers%20charging%20at%20home%20using,energy%20to%20keep%20it%20warm.>

So, if Moss Landing power plant transmits 100 kWh to your home charging station in Oakland, there will be energy losses of at least 20 kWh (3% for transmission, 4% for distribution, and 15% for the charging process): only 80 kWh of the 100 kWh generated in Moss Landing will enter your lithium-ion batteries.

Do high-end ZEVs like Tesla's have lower energy losses in the recharging process?

It is tempting to think that energy losses while recharging ZEVs can be reduced by better technology. However, these energy losses for Tesla's are also in the 12 to 15 percent more reported above. From the APR 10, 2021 Car and Driver report by John Voelcker, "Using the 2021 Tesla Model Y as an example, Tesla's own data—buried deep in 49 pages of certification documents filed with the EPA—shows it took 87.868 kWh to add 77.702 kWh to the battery of the Long Range version. That's a **13 percent average**. For the Model Y Performance version, adding 81.052 kWh to the battery required 92.213 kWh, or **14 percent** more."

ZEVs and power lines

The electrical energy to recharge the ZEVs lithium-ion batteries is transmitted over power lines, often for long distances such as to California from Washington state or the Southwest. Power lines are not popular with Californians. In urban areas, overhead distribution lines don't look good, and in rural areas, including forests, overhead transmission lines are notorious for igniting wildfires.

To make power lines more acceptable to Californians, green growth and ZEV enthusiasts propose putting power lines underground. This is a proposal that most Californians like but they expect someone else to pay for it, e.g., PG&E shareholders. **And it really is expensive.**

PG&E, the state's largest utility, maintains approximately 81,000 miles of overhead distribution lines and approximately 26,000 miles of underground distribution lines. It also has about 18,000 miles of larger transmission lines, the majority of which are overhead lines. At a cost of \$3 million per mile, undergrounding 81,000 miles of distribution lines would cost \$243 billion. PG&E has 16 million customers; distributing that expense equally would amount to a bill of **more than \$15,000 per account**.

Undergrounding power lines is a popular idea. It would look nicer, and at first glance it seems like a sensible way to prevent fires that start when tree branches fall on power lines. But it's not as simple as it seems. "You have kind of a tradeoff to look at," says UC Berkeley electrical engineering professor Sascha von Meier. "When power lines are underground, if and when something does go wrong, it's a lot harder to find where the problem is and go fix it. So that then takes longer, and costs more to do."

Underground lines can be affected by earthquakes or malfunction for other reasons. PG&E would have to dig up the street to find and fix the problem. Getting them underground in the first place is also expensive. PG&E estimates it costs \$3 million dollars per circuit mile, and the company has over 100,000 miles of distribution and transmission lines.

"It quickly becomes prohibitively expensive," says Nathaniel Skinner, safety program expert at the CPUC Public Advocates Office. "People are paying a lot for their electricity service right now. There's a lot of people who can't afford the utility bills. At what point does electricity service become unaffordable? And that starts to introduce all sorts of health and safety impacts."

Skinner estimates that if PG&E were to bury only its overhead lines in high fire threat areas it would cost ratepayers anywhere between \$55 billion to \$144 billion dollars. To put that in perspective, Skinner says, all of PG&E's current assets are worth about \$50 billion. So, putting just the most fire prone lines underground would cost as much or more than PG&E is worth. And, even if we assume the low end of the range, the average ratepayer could pay eight-times as much per year.

Environmental concerns would also be high if thousands of miles of trenches were dug through forests or brushland habitat, Borenstein* noted. Opposition could also arise from residents in existing neighborhoods confronted with the prospect of heavy-duty earth-moving projects

*Severin Borenstein is E.T. Grether Professor of Business Administration and Public Policy at the Haas School of Business and faculty director of the Energy Institute at Haas.

Returning to Taking from Our Planet What It Can Restore

Let us rededicate ourselves in 2022 to bringing our demands on our planet back into balance with what it can restore. Some political and academic factions will oppose such measures because they might impede population growth and the economic growth it drives. Don't they realize that the economy depends on the environment (or more generally the Earth's carrying capacity), not the other way around? The environment would do just fine without the economy, but not the other way around. Or as the Prince of Wales put it, **"the economy is a wholly owned subsidiary of Nature and not the other way around"** (*Newsweek*, 12/14/2009).

Sincerely,

William E. Jackman, PhD

Statistician/SAS & SQL Programmer

Oakland, California

April 22, 2022

I am a second-generation Irish-American who grew up with immigrant Irish grandparents and aunts in Oakland. I am a graduate of Oakland High School and of the College of Engineering at UC Berkeley. I am fluent in Spanish.

Source of Quotes

Eberstadt, Nicholas, "Men Without Work", 2016.

Youngquist, Walter, "Framework of the Future", December 2016, www.npg.org/forum-papers2.html
