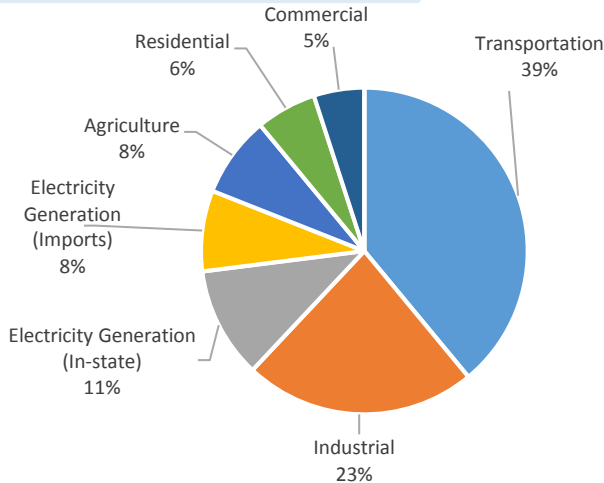


California, Greenhouse Gases, and Climate Change

Major GHG sources in California



The three largest sources of greenhouse gases are transportation (cars, trucks, freight), industrial (manufacturing, mining, refining, and food processing), and electric.

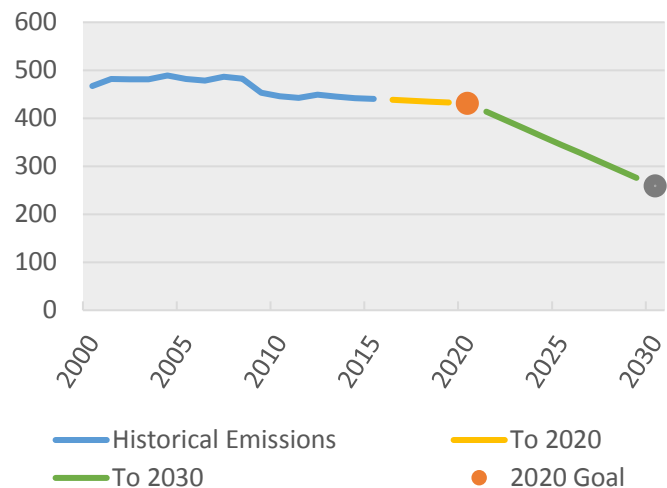
Each of these has its own emissions pattern with respect to which greenhouse gases are emitted. For example – agriculture and waste processing can emit substantial amounts of methane. To make measuring these gases easy, all greenhouse gas emissions are converted into a common unit – metric tons of CO₂ equivalent which expresses the amount of CO₂ that would be required to drive the same amount of atmospheric warming.

To monitor this CA requires emitters to report their emissions to the state annually. Any company that produces more than 25,000 tons of CO₂ equivalent is covered by the cap and trade system. The primary groups which are covered include industrial producers, and large fuel producers and suppliers.

Source (ARB 2015 emissions inventory).

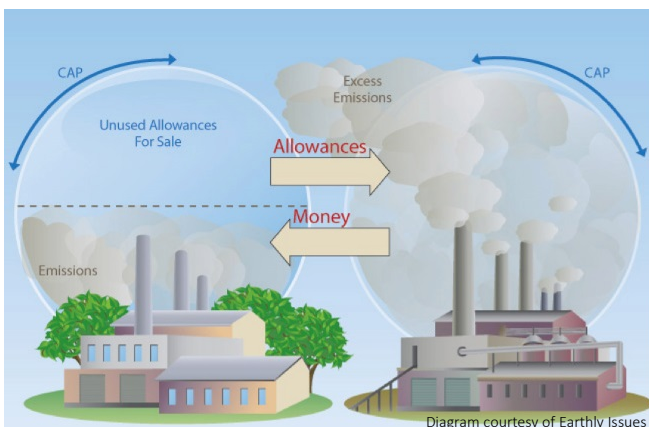
- ❑ **2006 – AB 32**
Required sharp reduction of greenhouse gas emissions
- ❑ **2012 – 1st Auction**
California begin auctioning off permissions to emit greenhouse gases, known as *allowances*. In 2013, the program became binding for industrial and stationary source producers, and was expanded in 2015 to cover fuel producers as well.
- ❑ **2016 – SB 32**
By 2016, the program was ready for expansion. SB 32 was signed in 2016 by Governor Jerry Brown and set a new, more ambitious target of reducing greenhouse gas emissions to 40 percent below 1990 levels by 2030. In order to achieve this, California needs to reduce its emissions by 132 million metric tons over the next decade.
- ❑ **2017 – AB 398 & AB 617**
In 2017 two major pieces of legislation strengthened and expanded these policies further. *AB 398* extended the cap and trade program to 2030, providing much needed assurance of policy continuity while *AB 617* sets up a local governance program for air pollution from both mobile and stationary sources in areas designated by the State as having a high burden of exposure to toxic and criteria air pollutants – although it does not cover greenhouse gases. It also creates incentives for companies to retire old technology by 2023.

California's milestones



Strategies for reducing Greenhouse gases

1. Cap and trade

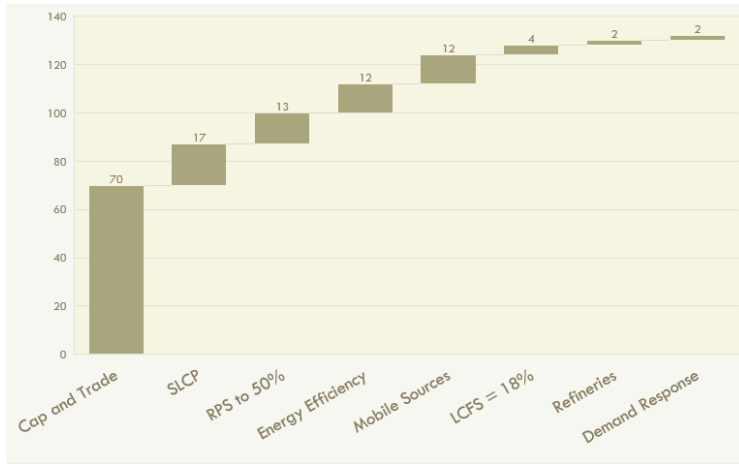


Cap and trade works by creating incentives for companies to reduce their greenhouse gas emissions. The state sets a cap on carbon emissions and then auctions allowances for emitting pollution. Companies must then invest in carbon emissions reducing technologies or purchase allowances that allow them to continue emitting carbon dioxide.

Currently the program covers 85% of the state's GHG emissions. Approximately 50% of the emissions reductions required by 2030 are expected to come from cap and trade. Money from the auction is used by the Air Resources Board to offset potential utility rate increases for consumers, and to invest in GHG reducing programs throughout the state, particularly ones benefitting disadvantaged communities.

Two challenges have to be met for a cap and trade program to work. First, regulators have to make sure that companies aren't incentivized to move their polluting activities outside the state. California does this by allocating the bulk of allowances to emitting industries for free. Second, regulators must protect consumers from rapid rate increases in the cost of electricity or fuel. California does this for electricity by using a portion of auction proceeds to go back to utility rate payers.

2. Complementary Policies



Although cap and trade is a crucial pillar of California's climate strategy – it's not the only strategy the state is using to reduce its climate impact. By 2030, half of the state's intended emissions reductions could come from these complementary policies. These were originally designed to help speed GHG reductions in the early years of the program, with cap and trade becoming the workhorse over time as the cap declines and becomes more binding.

The graph presents the proposed package of policies that ARB has suggested as a path to achieving reduction in GHG emissions required to meet the 2030 goal. Some of these have been enacted by the legislature already. These include reducing short lived climate pollutants (like black carbon, methane, ozone, and Hydrofluorocarbons), increasing the percentage of state energy coming from renewable sources, doubling energy efficiency in buildings, and increasing the responsiveness of energy demand.

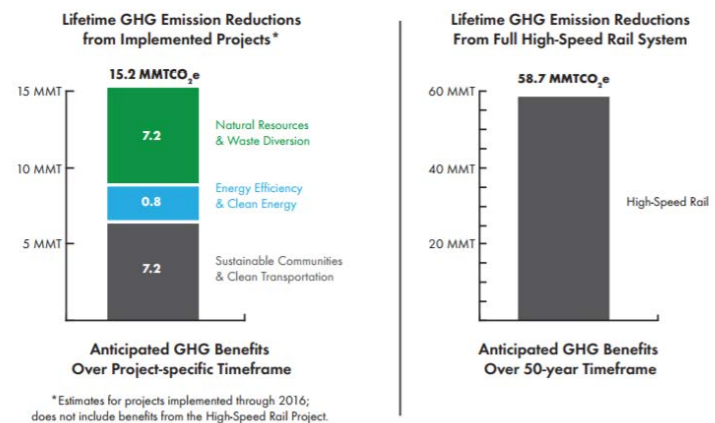
Others, like the low carbon fuel standards, mobile source strategies, and refinery reductions, are still under debate at the legislature. Debates over what the most effective means to achieving the target are ongoing as it's possible that directly regulating some of these emissions will raise the overall cost of reducing GHG emissions.

The cap and trade auctions generate revenue for climate investments, which must be used to reduce greenhouse gas emissions and benefit disadvantaged communities.

Investments are broken into three bins: sustainable communities and clean transportation; energy efficiency and clean energy; and natural resources and waste. The graph indicates the lifetime GHG emissions reductions that are estimated from the projects which have been implemented (or are in the process of being implemented) as of 2016.

60% of the funds raised through the auction are designated for specific projects; high speed rail (25%), affordable housing and sustainable communities grants (20%), intercity rail (10%), 5% for low carbon transit. The other 40% is available for annual appropriation and use subject to the disadvantaged community and GHG emissions reduction program requirements.

3. Fund Reinvestments



Glossary of terms

Greenhouse gases – A gas known to have a warming effect on the earth's atmosphere.

CO₂ – carbon dioxide - emitted from burning fossil fuels, solid waste, trees and wood products, chemical reactions. Removed from the atmosphere by plants. Makes up the majority of US GHG emissions.

CH₄ – Methane - emitted during coal, oil, and natural gas production and transport. Also through livestock and other agriculture, and organic waste decomposition.

N₂O – nitrous oxide - emitted through agricultural and industrial activities, fossil fuel burning, and solid waste.

Fluorinated gases - synthetic greenhouse gases emitted from industrial processes. The most famous of these are refrigerants used in cars and refrigerators.

Criteria air pollutants – Any one of six additional atmospheric pollutants that have a detrimental effect on public health and safety.

CO – carbon monoxide; emitted from mobile sources and gasoline burning vehicles; reduced oxygen in the blood and threatens health of high risk groups, particularly child development

Ozone – primarily emitted through industrial processes; known to have respiratory impacts both from short term exposures, and by aggravating pre-existing respiratory conditions.

Particulate matter – microscopic particles which are released into the air through both mechanical and combustion processes. They are categorized according to size, and both sizes are known to have health effects. Evidence for health impacts of fine dust (PM_{2.5}) on respiratory and cardiovascular conditions is particularly strong.

Lead – primarily produced through industrial processes; accumulates in the body and has extremely negative impacts on child development.

Sulfur dioxide - emitted from fossil fuel combustion, known to worsen asthma and respiratory problems in children and older adults; a precursor to acid rain.

Nitrogen dioxide – emitted by both mobile (cars and trucks) and stationary (power plants) sources; known to worsen asthma and other respiratory symptoms, particularly among children and older adults; a precursor to acid rain.