

**Climate Change Impacts on and Actions from the Construction Industry: Past,
Present and Future**

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Abstract

In the movement towards reduced emissions and sustainability, climate change policies have and will continue to influence actions taken in the construction industry. These policies can be seen on the local, national, and international level. This includes the banning of fossil fuel systems and sustainable building requirements to limit carbon emissions. In response, the construction industry has begun transitioning to electric equipment and vehicles, selecting renewable materials, and practicing value engineering for sustainable alternatives. AGC's role in this will be lobbying, educating the industry on new trends, and proposing new means and methods that promote green construction.

Climate Change Policies Effect on the Construction Industry

In the movement towards reduced emissions and sustainability, climate change policies have and will continue to influence actions taken in the construction industry. These policies can be seen on the local, national, and international level.

On the local level, ordinances have been put in place that require green certifications for public buildings, ban the use of certain building materials, and incentivize tax credits. Since the early 2000's, major cities around the United States have begun requiring public buildings to achieve various levels of LEED certification or face fines. A prime example of this is the city of Washington, DC, which beginning in 2012, required "that public schools shall aspire to meet LEED for Schools at the Gold level or higher" or face "fines on private commercial buildings that do not provide proof that the project is LEED certifiable within 2 years of receipt of occupancy" (*LEED Legislation by City: See Where LEED Certification Is Required*, 2015). In my home state of Massachusetts, many local communities have fought the attorney general over banning the implementation of fossil fuel infrastructure in new buildings and renovations. In 2019, the town of Brookline, MA "by an overwhelming majority," passed "a bylaw prohibiting fossil fuel infrastructure in new construction or gut renovations. It was the first such municipal measure passed outside of California. Inspired by the idea, other towns began preparing similar measures" (Shemkus, 2021). This was all in the effort to meet Massachusetts' goal of becoming carbon-neutral by the year 2050. The bylaw was ultimately reversed by Massachusetts Attorney General, Maura Healey, who deemed that it was unlawful for municipalities to supersede state building codes (Shemkus, 2021).

However, not all policy initiatives have been in an effort to limit or force certain actions upon the construction industry. One of the main climate change policies that incentivize green construction has been tax credits. As a part of the 2022 Inflation Reduction Act, there are “expanded tax credits for energy efficient commercial buildings, new energy efficient homes, and electric vehicle (EV) charging infrastructure” (The White House, 2022).

The 2022 Inflation Reduction Act not only saw the incentivization of tax credits, but also increased funding for many renewable new construction projects around the United States. Specifically, the act provides “\$9 billion in home energy rebate programs to help people electrify their home appliances and for energy-efficient retrofits”, introduces a “\$1 billion grant program to make affordable housing more energy efficient”, and “includes more than \$60 billion to support “on-shore clean energy manufacturing in the U.S.,”” (*What the Inflation Reduction Act Does for Green Energy*, 2022).

On the international level, many countries have pledged to the Paris Agreement in an effort to “limit greenhouse gas emissions to levels that would prevent global temperatures from increasing more than 2 °C (3.6 °F) above the temperature benchmark set before the beginning of the Industrial Revolution” (The Editors of Encyclopaedia Britannica, 2019). As a part of this agreement, countries around the world have pledged to reduce their emissions in various industries, such as construction, to meet the world emission goals.

Actions from the Construction Industry

Within the construction industry, much has been done in recent years by companies large and small in an effort to reduce emissions. These efforts include the transition to electric equipment and vehicles, selection of renewable materials, and value engineering of sustainable alternatives.

Similar to the move of passenger vehicles towards electric and hybrid, the construction industry is also seeing a movement towards adopting electric equipment. One of the companies at the forefront of implementing green initiatives has been the Swedish-based construction company, Skanska. Specifically, Skanska UK “with its new EV First initiative, the company will no longer offer pure petrol or diesel vehicles as a benefit to eligible employees. Instead, fully electric vehicles (EVs) will be the preferred option, with petrol-electric hybrids (PHEVs) as an alternative, if more practical for the individual” (Sketchley, 2020). But the electric vehicle moment is not limited to just cars and trucks, as equipment ranging from site lights to excavators have also begun to go all electric. One of the most common applications of electric equipment has been in the use of portable solar site light stations. Primarily used for night work on heavy civil projects, solar light stations are a renewable source of light which provide many benefits over the traditional gas or diesel-powered light stations. Some of these benefits include off-grid power, no electricity bills or running costs, and little to no maintenance compared to fossil fuel powered engines (SOLAR CONSTRUCTION SITE LIGHTING | CONSTRUCTION WORK, n.d.).

Additionally, heavy equipment companies such as Komatsu and Caterpillar have also invested in electric technology. “In 2017, Komatsu unveiled a massive electric dump truck called the e-Dumper, which featured a gigantic 600-kWh battery pack. Caterpillar has also invested in Fisker, which is developing solid-state batteries designed to outperform the lithium-ion batteries used in all current electric vehicles” (Edelstein, n.d.).

On the topic of materials in the construction industry, a lot of efforts have been implemented to encourage renewable materials, and materials manufactured locally. Not only does the sourcing of local materials reduce emissions because of shipping, but also greatly benefits local businesses. Currently, transportation of material accounts for 2-3% of carbon emissions generated by the construction industry (Sizirici et al., 2021). One of the main construction materials trying to take the place of structural steel in the construction of commercial buildings has been cross laminated timber or also known as CLT. “Developed in Germany and Austria in the early 1990s... It is a subtype of engineered wood paneling, made of layers of solid-sawn lumber glued together, that has been widely used for the construction of both public and private buildings. Due to its versatility and reliability, as well as its eco-friendly nature, CLT is steadily growing as one of the preferred construction materials for load-bearing structures, as well as interior and exterior visual structures of modern, sustainable buildings” (CLT Construction: A Modern Building Material | WIGO Group, n.d.). Unlike steel, which is a limited resource, CLT is a renewable building material as it is primarily made of wood, which can be sustainably sourced from trees. For every tree cut down to produce CLT, another can be planted, thus ensuring the longevity of the resource.

One of the other major actions of the construction industry has been the increase in value engineering services from the contractor to promote more sustainable alternatives. The construction industry is starting to move away from the traditional design-bid-build delivery method and is shifting towards alternative delivery methods such as design-build, CM as agency, CM at risk, and P3. According to the Design-Build Institute of America, “design-build is anticipated to account for as much as 47% of construction spending in the assessed segments (nonresidential, highway/street, transportation and water/wastewater) by 2025” (kwright@dbia.org, 2021). All of these methods encourage the construction management firm or contractors to get involved in the project early during the design phase to provide constructability reviews and value engineering alternatives to the design team and owner. During the design phase, the contractor can help to identify alternatives that not only provide more utility to the owner but can also be more sustainable and efficient in terms of operation. Examples include the implementation of energy efficient lighting systems, energy efficient HVAC systems, and improvements to the exterior shell that can lead to improved thermal capabilities and lower heating and cooling costs.

Addressing Climate Change in the Construction Industry

In my opinion, there are many feasible actions that can take place in the construction industry to reduce emissions and combat climate change. Some of these actions include changing materials and types of equipment used and altering methods of construction.

One of the main causes of emissions in the construction industry comes from the production of materials. According to the United Nations Environment Programme, in 2019, “When adding emissions from the building construction industry on top of operational emissions, the sector accounted for 38% of total global energy-related CO2 emissions” (Neill, 2020). Of that, a majority of the emissions are the result of iron and steel production, which account for roughly 7.2% of overall global emissions (Ritchie & Roser, 2020). In order to lower these statistics, the construction industry must move away from the use of limited resources and move towards the use of more sustainable building materials. As mentioned before, the adoption of CLT in large commercial buildings must become more commonplace. On the infrastructure side, alternatives must be found to replace the use of concrete and asphalt on our bridges and roadways. While asphalt is one of the most recycled materials in construction, it is only used to make more asphalt, which the process itself releases vast amounts of emissions.

In terms of construction equipment, the United States must catch up to its European counterparts with the adoption of renewable equipment such as electric trucks, electric excavators, and electric light sources. At the very least, if this is not attainable, the construction industry must place regulations on the practice of machine idling and on the use of high emissions emitting equipment to lower the overall carbon emissions.

The most important of all the actions that can be taken by the construction industry, means and methods of construction must be changed to promote a more sustainable jobsite.

This can include actions that take place in the preconstruction phase to procure local materials, minimize the movement of equipment, and reuse or recycle materials on-site. Not only will this lead to a more sustainable project but could also lead to increased productivity and decreased project costs.

AGC's Role on Climate Change

The Associated General Contractors of America has the opportunity to be a major player when it comes to advocating for reduced emissions and sustainability in the construction industry. Primarily, AGC's role in the battle against climate change will be to advocate for green policies that benefit contractors, lobby for federal bills that increase spending for sustainable projects, and to educate AGC members and their companies on new methods and technologies.

The first key role that AGC will have on climate change is to advocate and lobby for green policies that benefit contractors. In particular, AGC Chapters at the state level should lobby for particular questions during election time that involve increasing funding for green construction projects. On the federal level, the national AGC could help to lobby for larger bills that see an increase in funding for green construction projects, or that provide incentives for contractors to reduce emissions. Some of these incentives could include tax reductions for companies that stay under a certain emissions threshold, tax write-offs/subsidies for purchasing electric equipment, and grants for construction projects.

The main area that AGC could have the most impact on combating climate change in the construction industry comes from their outreach and ability to educate. With the outreach that AGC has, their main tool could be to educate their members and member companies on new techniques and technologies. This could be in the form of promoting the use of electric equipment, incorporating more sustainable means and methods, recycling and adoption of more sustainable materials, etc.

Overall, AGC has the opportunity to make a significant contribution in the movement towards reduced emissions and creating a more sustainable construction industry. The construction industry has come a long way from past years with the adoption of more sustainable construction materials, equipment, and methods, but there is still a long way to go. If the United States and the world is able to meet many goals of reaching net-zero by 2050 and staying below the benchmark of 2 °C of warming, the construction industry has to be a leader in that effort. AGC, with its long history and widespan of influence in the construction industry is in the right position to be able to make change happen.

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