

Framework and Analytics for Emissions Forecasting and Planning



AMGEN®

BUSINESS PROBLEM

Amgen has committed to 100% carbon neutrality, 40% water reduction, and 75% waste reduction by 2027, while anticipating production increases, new products, and new projects. To achieve this goal, Amgen is taking a science and data-based approach to analyze current and past performance to forecast future emissions. The business need is to develop solutions that predict how changes to supply growth, new projects, and other business changes impact sustainability progress. The business solution should inform changes and optimization of Amgen's capital deployment and resources to maximize carbon efficiency.

DATA SOURCES

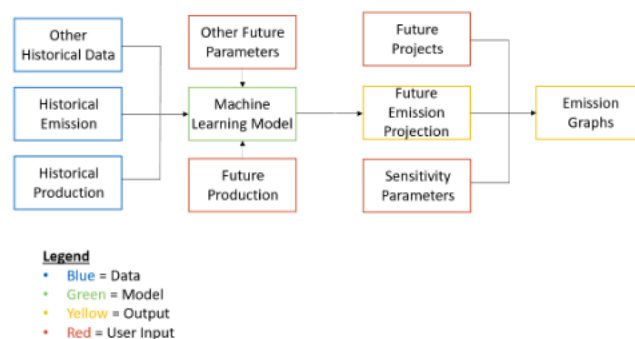
Current data sources that are available are historical emissions per site, historical production volumes, future long-range production plans, and future projects. Other data sources that may be needed include number of employees onsite, building types, or other data that may influence a site's emission profiles. This is represented as "Other Historical Data" in the process image.

Data Types and Format

All data is represented as time series data. The data types are all numerical values.

APPROACH

A framework is used to breakdown Amgen's emission into four verticals: manufacturing, drug development, administration, and fleet. Analysis and forecasting were focused to the manufacturing vertical. Data from a variety of sources, including past production volume, weather, and historical emissions, were used to develop linear regressions to understand emission driver and build emission forecasts.



IMPACT

The final outcome is an excel-based tool that takes a few inputs from users and will display an updated emissions forecast with sensitivity bounds and display a breakdown of the source of future emissions growth. The inputs a user will need to put in are high, low, and expected percent variable energy for manufacturing, area footprint increases for drug development and administration buildings, and percentage increase in internal combustion car equivalents for fleet. Underlying this tool are reliable and accurate data and analysis that will enable Amgen executives to quickly and confidently determine what investments or business changes need to occur to reach the 2027 Sustainability Goals without compromising Amgen's business strategy and mission to serve patients.

DRIVERS

The catalyst for this project is Amgen's 2027 Sustainability Goals and a potential gap in understanding how changes in the business that do not go through capital investment funding and sustainability analysis will affect Amgen's emission profile.

BARRIERS

Some barriers to this project were data granularity and data validation. The validated data for emissions is currently at a monthly level; therefore, there were only 12 data points per year for the analysis which limited the types of analysis performed and posed other challenges. In addition, validating production data was a challenge and was critical for the regression analysis.

ENABLERS

The company culture and people really enabled this project. Every employee I spoke to was willing to engage and offer any nuggets of wisdom for this project. This ranged from manufacturing knowledge to data science knowledge. The support was overwhelming and enabled me to obtain the necessary resources to complete this project.

ACTIONS



Actions taken were first to chat with the various stakeholders from manufacturing, the environmental team, the sustainability analytics team, and leadership to understand their goals and hypothesis for this project. I then spent time to formulate a hypothesis, collect and validate data, and conduct analysis to understand the key emission drivers. These emission drivers were then included in an excel-based tool which was shared for feedback.

INNOVATION

An innovative aspect of my solution was developing energy usage models for different sites to understand key emission drivers. Amgen had hypothesis as to what drove energy usage at each site, but had not used data to validate this prior to this project.

IMPROVEMENT

The final improvement my solution provided was an understanding of how incremental changes in manufacturing affected Amgen's emission profile. In addition, how product supply changes for certain manufacturing technologies could lead to larger jumps in emissions due to plant build outs. This informs Amgen on best strategies for investment and utilization of existing resources to minimize emission growth.

BEST PRACTICES

Best practices would include engaging with stakeholders to understand the context of the business, problem, and desired solution. In addition, data should always be validated prior to use in any analysis.

OTHER APPLICATIONS

The approach and type of analysis could be applied to other parts of Amgen's business or to other companies in different industries. All that is needed is a clear understanding of the business problem to be solved, the desired solution, and the data available to help build an accurate forecast.