Corporate Sustainability Advisor

COGNITIVE GARAGE

Team - 23

Contents

Green Future

Understanding sustainability and carbon credits

The future of our planet is inextricably linked to the actions we take today. As global temperatures rise and the impacts of climate change become increasingly apparent, it's crucial that we take decisive action to create a more sustainable future. As the famous environmentalist Al Gore stated, "The world has a moral obligation to take bold and immediate action to address the global climate crisis."

Recent reports from leading environmental organizations, such as the Intergovernmental Panel on Climate Change (IPCC), have emphasized the urgency of the situation, stating that we have only a limited window of opportunity to act before it's too late. The IPCC's 2018 report stated that we must reduce global carbon emissions by 45% from 2010 levels by 2030, and reach net-zero by 2050, in order to avoid the worst effects of climate change.

One important way that businesses can play a role in addressing the climate crisis is through the use of carbon credits. Carbon credits represent a certain amount of greenhouse gas emissions, and provide a mechanism for companies to offset their own emissions by investing in emissions reduction projects in other areas.

45%

percentage reduction of carbon emissions by 2030

2050

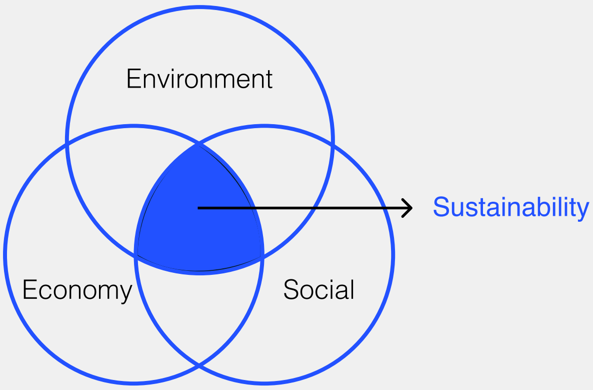
carbon footprint by 2050

In this document, we'll explore the concept of sustainability, and the role of carbon credits in creating a greener, more sustainable future. We'll delve into the details of how carbon credits work, and examine the various benefits and risks involved. And we'll take a closer look at the ways in which governments and corporations can collaborate to create a sustainable future for all.

In this document, we delve into the intricacies of sustainability and carbon credits, exploring the various parameters and decision points that impact their adoption and implementation. With the help of inputs from domain experts and a thorough understanding of data and parameters, we aim to create a model that will assist corporations in their journey towards a greener future.

One of the ways in which businesses and corporations can contribute towards a more sustainable future is through the adoption of sustainable practices and by exploring the concept of carbon credits. The idea behind carbon credits is simple - to reduce the amount of carbon emissions being released into the atmosphere and mitigate the impact of climate change. By trading carbon credits, companies can offset their emissions and reach their goal of a zero carbon footprint

The pillars of sustainablity



- **Environmental sustainability**, which involves the responsible use of natural resources and protection of the environment for future generations.
- **Social sustainability**, which focuses on creating a just and equitable society with a high quality of life for all people.
- **Economic sustainability**, which involves creating a stable and robust economy that provides financial security and prosperity for both individuals and communities. These three pillars are interdependent and must be considered together in order to create a truly sustainable future.

Defining the Challenge

Identifying the Right Use Case

In today's world, the pressing need for a sustainable future has never been greater. With global warming, resource depletion, and other environmental issues becoming increasingly pressing, companies and governments are struggling to keep up. The challenge of finding a balance between economic growth and environmental protection is a complex one, and it requires innovative solutions to help bridge the gap. This is where the concept of a sustainability advisor comes into play.

A sustainability advisor is a tool designed to help organizations navigate the complex and ever-changing landscape of sustainability. It provides an automated approach to decision-making, helping companies to take a more strategic and proactive approach to sustainability. By taking into account a wide range of data and information, a sustainability advisor can help organizations identify opportunities for improvement and make informed decisions that can have a real impact on the environment and the bottom line.

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In order to achieve this, companies must understand the complex web of factors that impact sustainability. From energy consumption and waste management, to water usage and supply chain management, there are many areas in which organizations must focus their efforts if they are to be successful in reducing their environmental footprint. This is where a sustainability advisor can provide valuable assistance.

By automating the decision-making process, a sustainability advisor can help organizations to stay on top of the ever-changing landscape of sustainability. With the ability to process large amounts of data and provide real-time insights, a sustainability advisor can help companies make informed decisions that can have a real impact on their sustainability performance.

As the world continues to move towards a more sustainable future, the role of a sustainability advisor will become increasingly important. With its ability to help organizations make data-driven decisions and stay ahead of the curve, a sustainability advisor is a crucial tool for companies looking to remain competitive and make a positive impact on the environment.

Expert Insights

Gaining a deeper understanding of sustainability practices and investments

Kent A. Williams

Assistant Professor in Climate Change
Leadership at Rowe School of Business
Dalhousie University, Nova Scotia, Canada

> Sustainability should go beyond policies and laws to reach a behavioral level. It's important to measure and understand the human cost of operations, and technology can help to quantify aspects that were previously difficult to measure.Sustainability efforts should be inclusive and address the needs of diverse populations. Companies must consider the impact of their operations on different communities and work towards creating a positive social impact.

Q. Is there any demand for a AI based (tech) solution for corporate sustainability ?

AI-driven automation solutions can play a crucial role in achieving sustainability by providing data-driven insights, tracking and monitoring progress, and making more informed decisions. With AI, companies can efficiently and accurately measure their carbon footprint, track sustainability goals, and make data-driven decisions to drive sustainable growth. By incorporating AI-driven automation solutions, companies can bring sustainability to the forefront of their operations and take meaningful action to address the pressing challenges of our time.

Q. Can sustainable investments be used as a financial tool?

I strongly believe that sustainable investments can be used as a financial instrument. These investments have proven to be profitable for businesses and are no longer just a moral or social responsibility, but a contributor to the growth of the business. While they may come at the cost of a heavy initial investment, the return on investment can be extremely beneficial. Companies need to realize that the realization of profits from such an investment takes time and can be very helpful in all possible dimensions.

Q. How should we approach to make a decision model for corporate sustainability advisor?

When it comes to making a decision model for corporate sustainability advisor, the first step is to understand the 17 Sustainable Development Goals (SDGs) set by the United Nations. These SDGs provide a framework for companies to measure their sustainability efforts and identify areas for improvement.
Next, we need to use technology, such as AI-driven automation solutions, to quantify the human cost of operations and measure the impact of sustainable development practices and investments. By doing so, we can help companies understand the true cost of their operations and make informed decisions.
It's important to note that these sustainable investments are no longer just a moral or social responsibility, but a contributor to business growth. Companies that do not commit to ESG commitments are missing out on a large opportunity cost.
We can differentiate our application from the products in the market by incorporating the SDGs and providing a process for measuring and educating companies, both small and large, about sustainable development practices and investments. This can help companies make informed decisions and reduce their dependency on stock performance.

Companies not committing to ESG commitments are missing a huge opportunity cost. It's time to educate both small and large businesses on the benefits of sustainable thinking. By using SDG goals to quantify and measure their efforts, businesses can make informed decisions and contribute to their own growth. It's not just a moral or social responsibility anymore, it's a profitable investment. It may come with a high initial cost, but the return on investment is worth it. We need to shift our focus from short term gains to long term sustainability and I believe our application can play a big role in that change. ”

Arpita Pandey

Assistant Professor, Marketing Area, Indian Institute of Management, Bangalore

Q. How to begin development of such a automated model?

To begin the development of an automated model for corporate sustainability, it's important to have a clear understanding of the problem statement and objectives. Then, you need to gather relevant data and information, including ESG metrics and financial performance of companies.

Next, you need to select appropriate machine learning algorithms and build a decision tree or other models to analyze the data and make predictions. You also need to consider ethical and social impact considerations while building the model.

It's important to validate the model through tests and simulations, and to fine-tune it based on the results. Finally, the model needs to be integrated with the company's existing systems and processes for seamless implementation.

In short, the development process requires a systematic and data-driven approach, along with a thorough understanding of ESG metrics and ethical considerations.

Q. What impact can we expect from such a model?

I can say that the impact we can expect from such an automated model is immense. It can be used to help businesses take informed decisions about sustainability and investment, by taking into account the costs, benefits and trade-offs of different options. By using data-driven insights and metrics, the model can help businesses to quantify the impact of their decisions and investments, and to track their progress over time. The model can also help businesses to understand the broader context of sustainability, by aligning their activities with the United Nations Sustainable Development Goals. With its ability to provide transparent, credible and evidence-based information, this model has the potential to be a game changer for the way that businesses approach sustainability.

Building the Blueprint

Mapping out the input parameters and decision making

In order to effectively address the challenges posed by sustainability and its impact on businesses, it is crucial to understand the various factors that play a role in the decision-making process. This involves mapping out the various input parameters and their relationships to the decisions that need to be made.

This section of the report, titled "Building the Blueprint," will delve into the process of identifying the key parameters that impact sustainability in the corporate world and how they can be used to automate decision-making.

We will explore the types of data and information that will be used to build the decision model and highlight the importance of involving all stakeholders in the sustainable practices. This will include an examination of the role of regulations, technology, and supply chain management in creating a truly sustainable business environment.

60+

parameters included in our Bayesian model

Multi

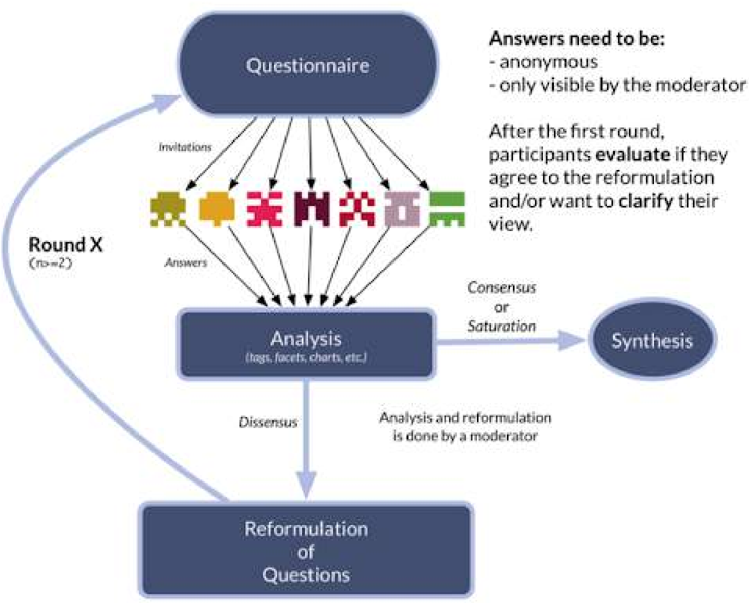
dimensional model to enable accurate decision making

Delphi Method : A Structured approach to Consensus - Building and Forecasting

The Delphi method is a forecasting and consensus-building process used in many fields, such as business, government, and social sciences. It involves gathering a panel of experts, who anonymously provide their predictions or opinions on a specific issue through a series of rounds of questionnaires. The goal of the Delphi method is to reduce the influence of individual biases and reach a group consensus by aggregating and integrating the responses from the experts over multiple rounds. The method is widely used for solving complex problems and making forecasts because it can provide a more accurate and reliable answer than relying solely on the opinion of one expert.

The Delphi method typically involves the following steps:

- **Identifying the problem**: The first step is to clearly define the problem that needs to be addressed.
- **Selecting experts:** A panel of experts is selected based on their knowledge and experience relevant to the problem being addressed.
- **Administering questionnaires:** The experts are given a questionnaire, which they complete anonymously. The questionnaire may contain open-ended questions or a list of possible answers to choose from.
- **Aggregating Responses:** The responses from the experts are collected and aggregated to determine the consensus view.
- **Refining the questions:** Based on the responses received in the first round, the questions may be refined or modified for the next round.
- **Repeat Rounds:** The process of administering questionnaires and aggregating responses is repeated several times until a consensus is reached or until further rounds would not significantly improve the results.
- **Reaching a consensus:** The final outcome of the Delphi method is a consensus estimate or prediction arrived at through a structured process of gathering and integrating expert opinions.



Analyzing Impact : A Multi Dimensional analysis to Sustainability

To accurately measure the impact, a multi-dimensional analysis is required that takes into account the economic, environmental, and social parameters. In terms of carbon credits, the impact on the economy can be analyzed through the financial benefits of reduced greenhouse gas emissions and the creation of new markets for carbon credits. The environmental impact can be evaluated by examining the reduction in greenhouse gas emissions, the increase in renewable energy sources, and the improvement in air and water quality. The social impact can be assessed by evaluating the impact on communities, including the creation of new jobs and the improvement of living standards. The combination of these parameters provides a comprehensive view of the impact of sustainable development and helps in determining the effectiveness of carbon credits as a financial instrument for promoting sustainability.

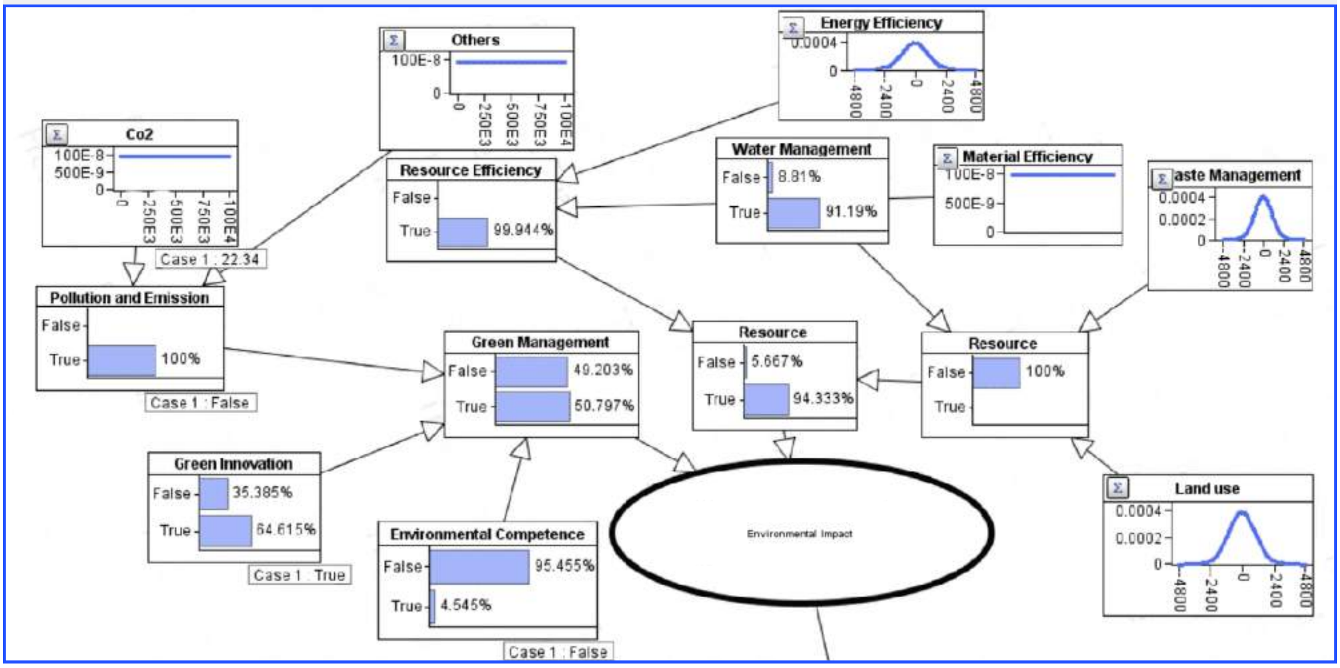
#ProcessNotJustProduct

Environmental Susutainability

By enhancing and appreciating the environment and natural resources over the long term and preserving the ecological balance, environmental sustainability seeks to protect natural resources for future generations. The ability of the stakeholders in the supply chain network to adjust their daily operations to the limitations of the environment is the foundation of environmental sustainability.

Environmental sustainability is "the reuse of materials, recycling of materials, raw material quality and wastage," according to Grover et al. As a result, the goal of environmental sustainability is to improve the world through ethical supply chain management. Green management and resource management aspects are discovered to be crucial in terms of environmental sustainability after an assessment of the relevant literature.

Sample Bayesian Model*



*This Bayesian model was made to develop a better understanding on how our parameters are related to Environmental Impact. Data are not accurate.

Now lets gain a deeper understanding of how each of these parameters impact on the final decisive node :

Material Efficiency :

The definition of material efficiency as a metric to assess the degree of material consumption, incorporation, and waste is that it is a component of sustainable development. In the context of the supply chain, material efficiency refers to the use of recycled materials and wastes as well as the reduction of the amount of raw materials used in manufacturing.

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parameters related to Environmental Impact to generate accurate Impact

Green Innovation :

Green innovation is the term for inventions that include new or modified procedures, frameworks, and goods that support environmental sustainability. Participating in green innovation has advantages like decreased waste and increased production. Green innovation, in accordance with Chen et al., is employed to enhance environmental management performance, hence safeguarding natural resources. Green innovation was proposed

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Pollution and Emission Control :

The damage of a natural environment caused by external elements introduced by people, either directly or indirectly, is referred to as pollution. Environmental sustainability is harmed by various harmful gas emissions from the production and transportation stages of the supply chain network, such as CO_2, CO, SO_x, and NO_x. In order to achieve sustainability, the United Nations Environment Assembly (UNEA) places a high priority on improving air quality. As a result, a supply chain that is environmentally sustainable must increase product/service quality while reducing pollution

Resource Management :

The process through which organisations effectively govern and assess their tangible and intangible resources is known as resource management. Utilizing resources effectively is part of resource management. Sustainable supply chain management is based on the wise management of resources to prevent their depletion, per definition. The following is a description of the supporting factors important to effective resource consumption management.

Energy Efficiency :

The ability to do a task while using less energy is referred to as energy efficiency, one of the key components in resource management. According to Marchi and Zanoni, energy efficiency benefits a variety of entities and is a crucial part of sustainable development. Utilizing energy saving techniques can increase productivity, profitability, and quality. According to Marchi and Zinoni), supply chain management's consideration of consumption is crucial for improving energy performance. While energy efficiency assessments rely their conclusions on the overall amount of energy used by a company for its operations, sustainable supply chain management takes both the energy used and the environmental impact of the resources utilised into account.

Waste Management :

Waste management encompasses collecting, transporting, disposing, and recycling waste. There are several types of wastes that should be eliminated from the supply chain including defects, excess inventory, non-value-added processing, waiting, etc. Saeed and Kersten claimed that waste management is one of the attributes of environmental sustainability. To achieve a sustainable supply chain, it is important to manage and control all types of supply chain wastes. Since biomass feedstock includes solid wastes, agricultural residues, and organic leftover, proper management, recycling, and reuse of these materials is required to develop a sustainable supply chain.

Land Use :

Land use is the modification of natural land to cover human needs. Because the use of land plays a major role in protecting the environment, it is essential to follow sustainable land management practices. Land management covers the use of land to meet economic and social opportunities while guaranteeing and improving the quality of the land for future generations . Lambin et al highlighted the positive impact of a sustainable supply chain on land use. To ensure a sustainable supply chain network and maintain balance in the ecosystem, bio-productive lands that are depleted by supply chain activities and interactions should be properly monitored.

Water Management :

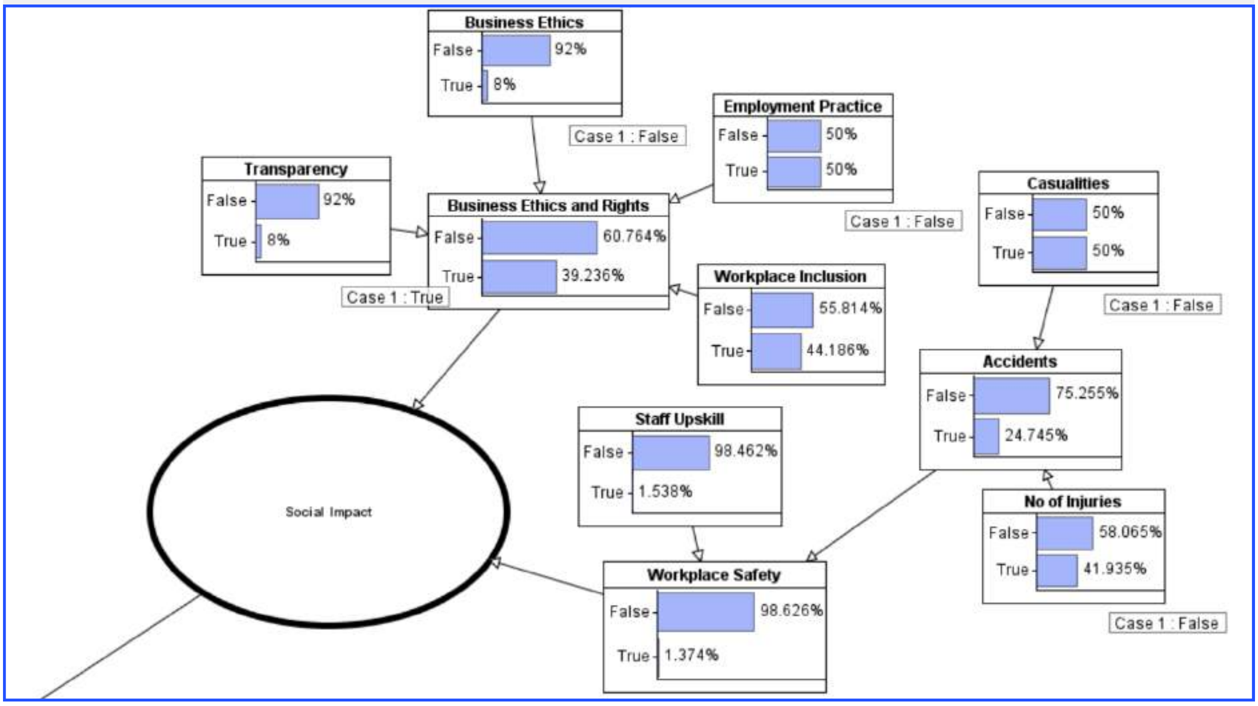
The sustainability of the ecosystem is severely hampered by the lack of adequate supplies of high-quality water. Since water is viewed as a living ecosystem that need to be protected for future generations, it must be handled carefully. Water management is a crucial component of sustainability since it helps prevent waste and deterioration. Obviously, judicious use of natural resources, such as water, is a must for sustainable supply chain management.Vlachos and Aivazidou did a study to look at water use in supply chain networks after realising there were few studies looking at the water footprint in supply chain management. Improved water management in supplier facilities and the surrounding river basins where they operate is essential for reducing the associated companies' water risk. In other words, even though it is frequently disregarded, supply chain water management is crucial for a network of supply chains that is sustainable.

Social Sustainability

Although Social sustainability is the somewhat disregarded criterion of sustainability, it has become a dominant theme over the last several decades. Social sustainability is usually defined as limited inequity and confrontation of social exclusion . Social sustainability is the adoption of values that fight against poverty and social exclusion to maintain harmonious and satisfying levels of business ethics, awareness, and standards of health and safety while respecting the environment.

According to Marshall et al., 2015a, Marshall et al., 2015b, social sustainability has a pivotal role in the manufacturing supply chain. The authors stated that it is important to perceive the conditions in which the products are produced. According the literature, social sustainability in the context of supply chains is defined as the incorporation of social responsibility Based on the existing literature, this study presents and quantifies different factors that have a direct effect on social sustainability.

Sample Bayesian Model*



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Rights and Ethics :

Human rights and ethics represent a cornerstone of social sustainability for a supply chain network. It is necessary to be diligent to avoid violating human rights and to confront any issue related to distributors, buyers, and suppliers that might negatively impact human rights and ethics. The literature identified the following important sub-factors that are considered for rights and ethics within a supply chain network.

10 parameters related to Social Impact to generate accurate Impact

Business Ethics and Consumer Issues :

Business ethics and consumer issues is an area of moral concern. Understanding consumer behavior through business ethics and highlighting certain mechanisms that would clarify the role of ethics in handling consumer-related issues becomes essential to maintaining social and economic development for a supply chain network (Warde, 2014). According to Lashley (2016), who held that business ethics and sustainability are related, saw business ethics as a useful tool to assess management practices and sustainability. Keishna et al. (2011) highlighted the importance of implementing business ethics and sustainability to achieve consumer satisfaction. Based on these statements, we believe that embracing sustainability and business ethics can renew/energize the supply chain and overcome consumer issues.

Pollution and Emission Control :

Employment rights and practices refers to the practices and procedures that pertain to workers. This criterion guarantees employee needs like contracts, job opportunities, equity labor, and compensation. Because the supply chain represents such a massive workforce, employment rights and practices should be carefully monitored and maintained. Employment rights and practices aims to decrease workers' turnover and raise productivity within a supply chain network (Bai and Sarkis 2010; Govindan et al., 2013). Adopting the concept of sustainability improves employment rights and practices. Munny et al. (2019) provided evidence of this and concluded that sustainable employment practices depict a mutually beneficial, lasting, and persistent commitment between employer and workers.

Diversity and Non-Discrimination in Workplace :

The ability to do a task while using less energy is referred to as energy efficiency, one of the key components in resource management. According to Marchi and Zanoni, energy efficiency benefits a variety of entities and is a crucial part of sustainable development. Utilizing energy saving techniques can increase productivity, profitability, and quality. According to Marchi and Zinoni), supply chain management's consideration of consumption is crucial for improving energy performance. While energy efficiency assessments rely their conclusions on the overall amount of energy used by a company for its operations, sustainable supply chain management takes both the energy used and the environmental impact of the resources utilised into account.

Information Disclosure :

Information disclosure concerns dispatching information among the supply chain entities such as information about the material used. This boosts the transparency and accountability of the stakeholders' operations. High-quality disclosure signifies that the firm and its supply chain assume its social responsibilities and strive to achieve corporative representation. The evaluation of information also helps supply chain entities measure the level of sustainability of the firm.

Number of Incidents :

In the supply chain network, each entity is expected to execute its task safely. Examples of incidents include both death or injuries that occur at different facilities along the supply chain network. As mentioned previously, social sustainability aims to raise the quality of life and emphasizes an effort to reduce the number of injuries and deaths.

Health and Safety :

Health and safety are core values in a supply chain which is why stakeholders strive to adhere to proper health and safety practices with relevant regulations (Marshall et al., 2015a, Marshall et al., 2015b; Mani et al., 2016a, Mani et al., 2016b). Social sustainability focuses on human well-being, including health and safety. Consequently, developing and recommending appropriate health and safety practices is considered a pivotal step towards sustainability. According to the literature, several researchers such as Ahmadi et al. (2017), Jilcha and Kitaw (2017), and Amindoust et al. (2012) have highlighted the significance of health and safety for achieving social sustainability in a work environment.

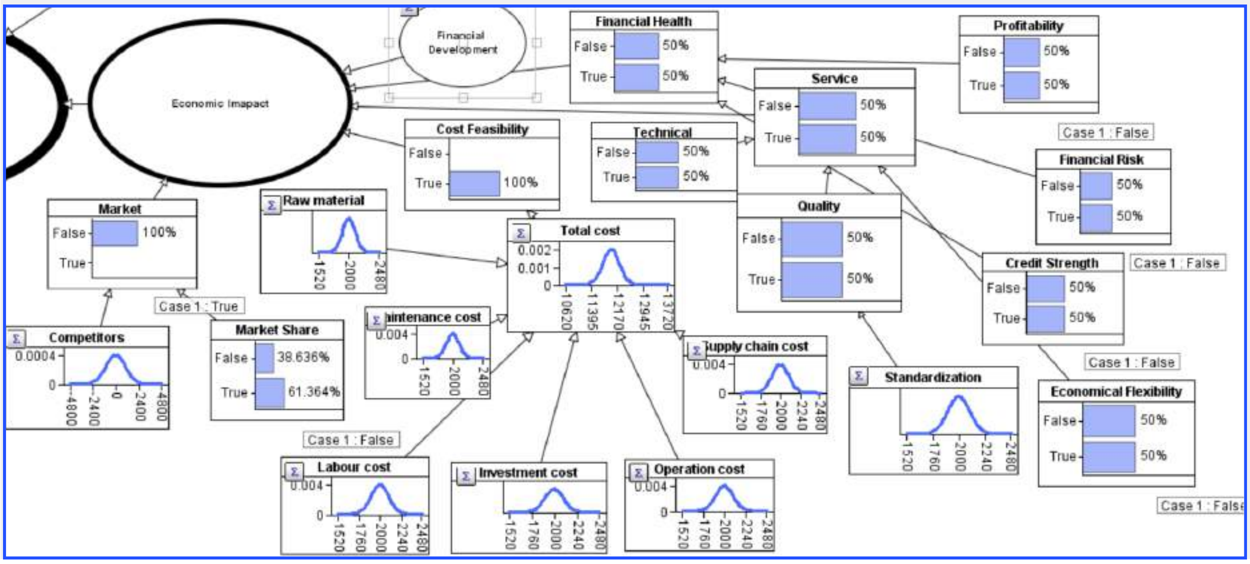
Staff Training :

Staff training, also known as safety training, refers to practices and knowledge provided to the workforce to accomplish work in a safe environment. Safety training encompasses guidelines to assess risks and deal with accidents. Because of the nature of the supply chain network it is exposed to many risks, and the prevention of all unexpected events is impossible. However, risks can be minimized through several procedures, such as training. Training aims to build a strong and well-trained workforce that will raise health and safety awareness and boost supply chain performance. The implementation of training would ultimately make the supply chain network more sustainable from a societal perspective.

Economic Sustainability

Economic sustainability is the use of sustainable production and consumption patterns to enable economic development, profit, and prosperous governance. These methods seek to mitigate the detrimental effects on the community's social and environmental components. A similar definition of economic sustainability calls for sustaining long-term income for people as well as a consistent supply of natural, social, and human capital. However, Mota et al. noted the paucity of research examining the supply chain from the standpoint of economic sustainability, which is the capacity to create profit in amounts sufficient and equitable throughout the various supply chain segments. The purpose of this idea is to build a reliable and resilient supply chain that respects coming generations. According to the research, the following elements significantly affect the supply chain network's ability to sustain its economic viability.

Sample Bayesian Model*



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Now lets gain a deeper understanding of how each of these parameters impact on the final decisive node :

Profitability :

Profitability is a measure of a company's or a supply chain's effectiveness and performance and is a crucial component of the economic viability of a supply chain network. In truth, the majority of firms aim to achieve long-term profitability, which can be attained through the integration of sustainability. Profitability is the capacity of a system to generate a profit. Obviously, appropriate profitability is the foundation of a successful and sustainable supply chain.

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parameters related to Economic Impact to generate accurate Impact

Financial health :

While a person's financial position is referred to as their financial health, the financial health of the supply chain refers to the supply chain as a whole. Financial stability, in the opinion of Saeed and Kersten (2018), is a crucial element of economic sustainability. As was already noted, the economic aspect of sustainability strives to maintain a person's long-term and steady financial health, which is applicable to the supply chain as well. According to the literature, financial health is measured by profitability, financial stability, and the creditworthiness of supply chain network partners.

Financial Stability :

Financial stability is the state of being immune to any economic downturn for the supply chain financing. In other words, it refers to developing a reliable, powerful financial system. The optimization of capital for all businesses is ensured by the supply chain's financial stability. According to, the ability to maintain a system's typical financial climate for a set amount of time is what is meant by financial stability. From the standpoint of the supply chain, this concept of financial stability is also appropriate.

Credit Strength (Solvency) :

Credit strength is a metric that assesses a stakeholder's ability to pay off debts and handle other financial obligations. Credit strength, sometimes referred to as solvency, typically takes the form of a complete report that details the borrower's financial background. Debts, in general, endanger the financial security and expansion of any supplier's economy. Being unable to pay debts puts economic sustainability at risk because it is necessary to be able to preserve resources and financial stability. For instance, the supply chain economy will encounter an imbalance if businesses are unable to pay their debts, which would halt sustainability.

Service :

The ability of a company to plan, cope with order modifications, and fulfil after-sales commitments is known as service. It is an essential part of a networked supply chain. The supply chain network's entire service capabilities must be defined in terms of the product quality, service flexibility, and adaptability. Businesses today work to incorporate the sustainability concept into their operations in order to deliver high-quality services and a positive customer experience. Sustainability in the context of services refers to the determination of the key attributes that the client wants. However, in order for the supply chain and business to be profitable, those qualities must be fair.

Flexibility :

Flexibility in the context of supply chains refers to how quickly they respond to changes. In order to stay competitive, a flexible supply chain can quickly modify its operations to satisfy the client. This clearly shows that implementing sustainability necessitates adaptations in response to client expectations. Thus, it is possible to classify flexibility as a sub-factor of supply chain sustainability.

Quality :

In order for a firm to survive and prosper, quality is crucial. Customer happiness and providing high-quality services are connected ideas since both are necessary for a business to operate, grow, and attain sustainability. Quality is also a crucial component in supply chain management to maintain competitiveness. As a result, the economic sustainability of the supply chain depends on the quality of the services provided.

Adaptability :

The capacity of a system or component to modify itself in response to external factors is known as adaptability. Regulations and labour prices, for instance, may change quickly, necessitating a review of the viability of moving the firm or activities. Sustainability, according to this definition, is the capacity of enterprises to adapt to changes using three strategies: ecological, social, and economic. Sustainability can be seen as a greater feature of flexibility as a result. In the age of globalisation, adaptability is crucial for a company to succeed. The necessity of adaptation for supply chains to achieve sustainable competitiveness was underlined. In actuality, the supply chain network's operational performance and cost are significantly impacted by adaptability.

Cost :

The amount of money necessary to keep a sustainable supply chain network operating is referred to as the cost. Businesses research the expenses involved with any new tactics, such as sustainability measures, before implementing them. As a result, it's important to understand the various expenses associated with the sustainable supply chain. The most frequent expenses related to a supply chain network are listed below.

Technological Advancement Rate :

Technological progress refers to the discovery of new and improved methods of producing goods. Changes in technology lead to an increase in productivity of labor, capital and other factors of production. Technology refers to the process through which inputs are transformed into outputs.

Raw Material Cost :

Raw materials are the substances used to produce and manufacture goods, while raw material costs refer to the cost of the life cycle of a final manufactured product.

Investment Cost :

The total financial amount required to implement a facility/project (e.g., the depot for biomass supply chain) within a supply chain network is known as the investment cost. Investment can be made with equity and/or credits.

Labor Cost :

The cost of labor is the sum of the employees' wages, the cost of employee benefits as well as the taxes paid by the employer during a specific period in any supply chain network.

Transport Cost :

The transport costs are the costs incurred in the transfer of inventory or assets from one location to another (such as the payment of a truck to ship certain products) of a supply chain network. Transport cost or delivery cost is a requirement for sustainable development.

Maintenance Cost :

The maintenance costs refer to the expenses needed to carry on the maintenance processes of any facility point in the supply chain network.

Operational Cost :

An organization's daily maintenance and management are accompanied by operating costs. Direct costs of goods sold (COGS) and other operational costs, also known as selling, general, and administrative (SG&A) costs, are included in operating costs. These costs include rent, payroll, and other overhead expenditures, as well as costs for raw materials and maintenance. Non-operating financing costs like interest, investments, and currency exchange are not included in operating costs.

Revenue :

Revenue in accounting refers to the entire amount of money made through the sale of products and services that are essential to the company's core operations. Sales or turnover are other terms used to describe commercial revenue. In general usage, revenue is the total amount of income by the sale of goods or services related to the company's operations.

Return of Investment (ROI) :

Return on investment (ROI) is a performance metric used to assess an investment's effectiveness or profitability or to compare the effectiveness of several investments. ROI aims to quantify the amount of return on a specific investment in relation to the cost of the investment.

Market Competitiveness:

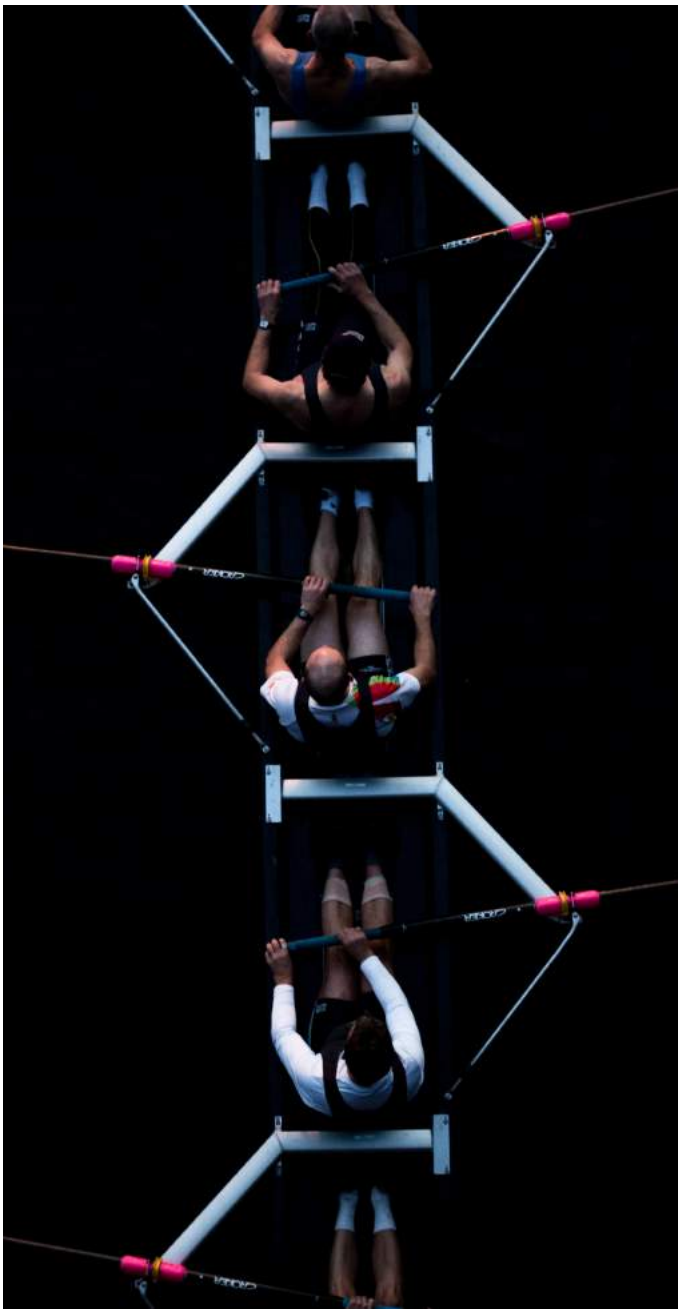
Market competitiveness refers to the ability to provide goods and services that are creative and more efficient than the ones produced by competitors. Market competitiveness is an essential part of reaching sustainability. This factor can be decomposed into the following sub-factors:

Technological Capability :

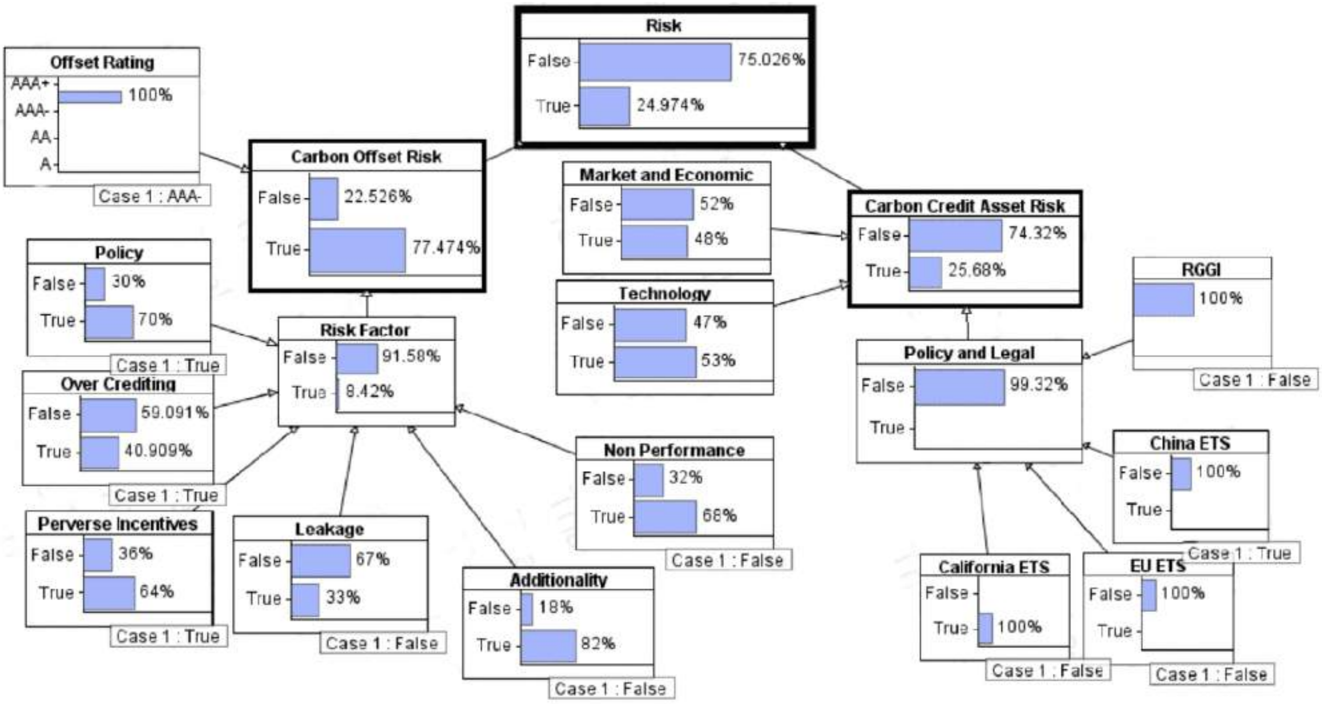
Technology competence refers to an organization's ability to acquire new technology to advance its operations and processes. Technology capability is a supply chain network organization's ability to enable technological innovation. Green and sustainable technologies are increasingly popular because of their numerous environmental, financial, and social advantages, such as better air quality, lower prices, and improved human health. By using these technologies, a supply chain can be steered towards sustainability.

Market Share Performance :

Market share is the proportion of total industry sales that a certain company generated over a given time period. It is a metric used to assess how well a company performs in comparison to its rivals. Market competitiveness analysis includes market share performance, which is used to assess a firm's or supply chain's efficacy and efficiency. Sustainability is evolving to be the spotlight of market competitiveness. In other words, the market share performance and sustainability are somehow related. Consequently, we can say that the more sustainable the supply chain, the higher the market share performance.



Analyzing Risk : Carbon Credit and Offset Assets



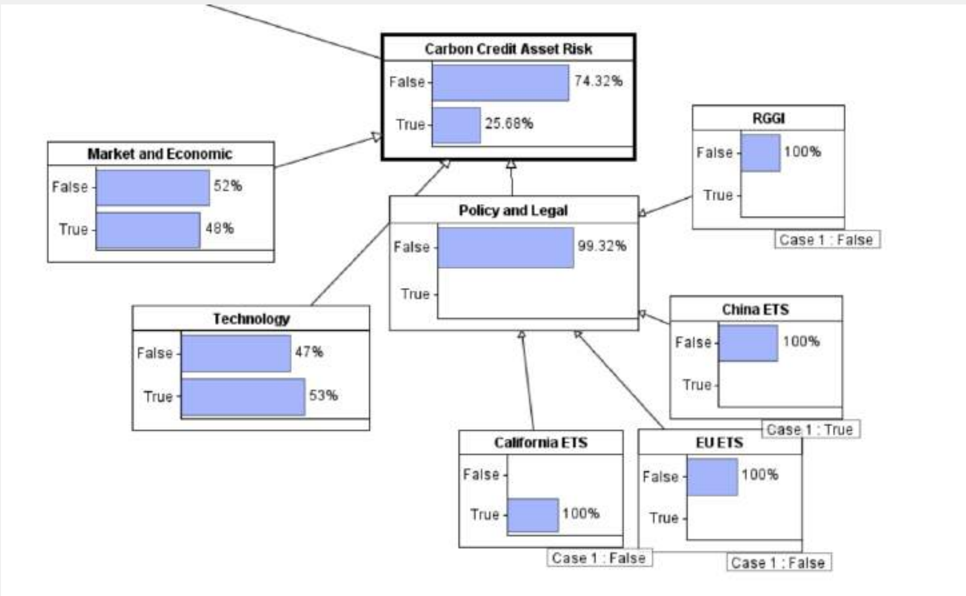
Carbon credits and offsets are financial instruments that are used to offset greenhouse gas emissions by investing in clean energy or carbon reduction projects. These credits and offsets are created through various mechanisms such as the Clean Development Mechanism (CDM) under the United Nations Framework Convention on Climate Change (UNFCCC), or through voluntary markets. The idea behind carbon credits and offsets is that businesses and individuals can invest in these credits and offsets to balance out their own carbon emissions, effectively neutralizing their impact on the environment. When it comes to analyzing risk, there are several key factors to consider with carbon credits and offsets. Firstly, it's important to assess the quality of the carbon reduction projects being invested in, including their likelihood of achieving the emissions reductions claimed.

Secondly, the regulatory environment for carbon credits and offsets can be complex and subject to change, so it's important to stay informed about developments in this area. Finally, it's important to consider the reputation of the organizations involved in the carbon credits and offset market, including the verifiers and intermediaries who oversee the transactions.

In conclusion, while carbon credits and offsets can be a useful tool for mitigating greenhouse gas emissions and mitigating the impact of carbon emissions, it's important to analyze the risks associated with these investments, including the quality of the carbon reduction projects, the regulatory environment, and the reputation of the organizations involved.

Carbon Credit Asset Risk

Sample Bayesian Model*



*This Bayesian model was made to develop a better understanding on how our parameters are related to Carbon Credit Asset Risk. Data are not accurate.

Now lets gain a deeper understanding of how each of these parameters impact on the final decisive node :

7

Parameters related to Carbon Credit Asset Risk to generate accurate Impact

European Union Emission Trading System (EU ETS):

Profitability is a measure of a company's or a supply chain's effectiveness and performance and is a crucial component of the economic viability of a supply chain network. In truth, the majority of firms aim to achieve long-term profitability, which can be attained through the integration of sustainability. Profitability is the capacity of a system to generate a profit. Obviously, appropriate profitability is the foundation of a successful and sustainable supply chain.

California Cap-and-Trade Program:

California Cap-and-Trade Program is the second-largest carbon market in the world, it was established in 2013. Covers around 85% of the greenhouse gas emissions in California. California held cap-and-trade auctions in 2020 and raised around $2.5 billion. The biggest sources of greenhouse gas emissions, including those from industrial operations, transportation fuels, and energy generation, are covered by this programme.

Regional Greenhouse Gas Initiative (RGGI) in the US:

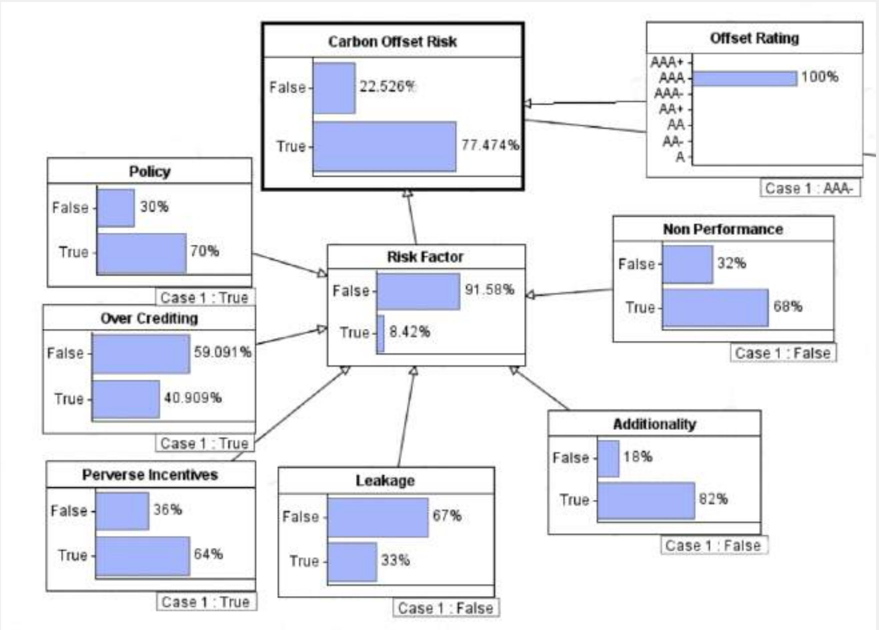
This Scheme covers nine Northeastern and Mid-Atlantic states; founded in 2005, focuses on the region's greatest source of greenhouse gas emissions, the power sector.
The estimated $487 million in auction proceeds generated by RGGI states in 2020 will be used to fund initiatives promoting renewable energy, energy efficiency, and consumer bill relief. Nine northeastern and mid-Atlantic states in the US are working together to cut greenhouse gas emissions from the power sector.

China National Emissions Trading System (CNETS):

The world's largest carbon market China National Emissions Trading System (CNETS) was established in 2017, focuses on the power sector, which in China is the main source of greenhouse gas emissions. The overall number of allowances exchanged in CNETS in 2020 was close to 4 billion. The current scope of China's developing carbon trading scheme is the electricity industry. `The right to emit one metric tonne of carbon dioxide or its equivalent is represented by carbon credits, which are units of measurement for greenhouse gas emissions. They are utilised in a number of carbon reduction initiatives with the intention of lowering emissions and advancing environmentally friendly behaviours.

Carbon Offset Risk

Sample Bayesian Model*



*This Bayesian model was made to develop a better understanding on how our parameters are related to Carbon Offset Risk. Data shown are not accurate.

Now lets gain a deeper understanding of how each of these parameters impact on the final decisive node :

Offset Ratings:

Carbon Credits that are offset in the voluntary carbon market are rated according to the probable carbon that it captures to the proposed amount of carbon offset. Sue to various ambiguities of practically calculating carbon offset, 3rd party firms have developed a rating system to make carbon credits a more sustainable and a risk free asset to purchase.

8

parameters related to Carbon Offset Risk to generate accurate Impact

Probability of the proposed offset to capture a Tonne of Carbon reduces as we move along the line

AAA +	AAA	AAA -	AA +	AA	AA -	A

Risk Factors

Additionality:

The risk that a credit purchased and retired does not lead to a tonne of CO_2e being avoided or sequestered that would not have otherwise happened.

Over-crediting:

The risk that more credits than tonnes of CO_2e achieved are issued by a given project due to factors such as unrealistic baseline assumptions.

Over-crediting:

The risk that more credits than tonnes of CO_2e achieved are issued by a given project due to factors such as unrealistic baseline assumptions.

Leakage:

The risk that emissions avoided or removed by a project are pushed outside the project boundary.

Perverse incentives:

The risk that benefits from a project, such as offset revenues, incentivise behaviour that reduces the effectiveness.

Policy:

The risk that the policy environment undermines the project's carbon effectiveness.

For reference : Click Here

Carbon credits made Tesla profitable

Shocking? Perhaps, but there's no getting around the fact that Tesla walked away with a little over $1.6 billion in carbon credit revenue in 2020. That's a full six quarters of profitability, in large part due to ZEV credit. That ZEV credit is arguably the capstone of California's cap-and-trade program. Every car maker who sells vehicles in California needs to sell a certain number of Zero Emissions Vehicles; if they don't sell enough, or if those sales are outweighed by internal combustion engine vehicles, then they need to purchase additional ZEV credits. So if you're Tesla, and you sold an estimated 60,000 vehicles in 2020, then you could be sitting on an accumulated pile of ZEV credits. And by selling those credits, Tesla has powered its way to profitability.

As other car makers roll out their own EVs, Tesla's margin for massive ZEV credit sales will diminish. But in the meantime, Tesla is a clear winner in California's carbon credit market.

Data - Driven Solutions

Automating the Decision Making Process with Data

Bayesian Networks :

A Bayesian network (BN) is a probabilistic visual model for expressing knowledge about an uncertain domain where each node denotes a random variable and each edge denotes the conditional probability for the related random variables [9]. BNs are also known as Bayes nets or belief networks. A BN resembles a directed acyclic graph (DAG) with no loops or self connections due to dependencies and conditional probability.

Applications for Bayesian networks are numerous , and Bayesian statistics is pertinent to current methods in data mining and machine learning . The interested readers can consult more specialised literature on Bayesian technique for neural networks information theory, and learning algorithms.

A Bayesian network is a probabilistic graphical model based on the Bayes theorem that assesses the conditional dependence structure of a set of random variables:

$$P(A \mid B) = \frac{P(B \mid A)P(A)}{P(B)}.$$

The objective is to compute P [Cause I Evidence], which stands for posterior conditional probability distribution, for each of the potential unobserved causes given the observed evidence. In actuality, we are frequently only able to acquire the P [Evidence I Cause] conditional probability distribution of witnessing evidence given the cause. The Bayes theorem, on which the entire idea of Bayesian networks is based, enables us to describe the conditional probability distribution of cause given observed evidence using the inverse conditional probability of perceiving cause given observed evidence:

$$[\text{Cause} \mid \text{Evidence}] = \text{P}\,[\text{Evidence} \mid \text{Cause}] \cdot \frac{\text{P}\,[\text{Cause}]}{\text{P}\,[\text{Evidence}]}$$

Any node in a Bayesian network, given its parents, is always conditionally independent of all of its nondescendants. In light of this, the joint probability distribution of all the random variables in the graph factorises into a number of conditional probability distributions of random variables given their parents. As a result, by just providing the conditional probability distribution at each node, we may construct a complete probability model.

Returning to our example, let's assume that computer malfunctions occur with probability 0.2 and electrical failures, represented by E and M, respectively, occur with probability 0.1 and 0.2, respectively. It is fair to believe that a computer problem and an electrical failure are unrelated. Furthermore, we presume that the computer will function normally if there is no electricity-related issue. Therefore, P [C = yesl E = no, M = no] = 0 if C represents the computer failure.

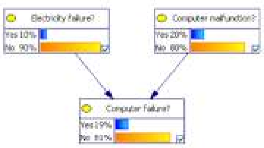
The likelihood of computer failure is 0.5 if there is no electrical issue but there is a problem with the computer, or P [C = yesl E = no, M = yes] = 0.5.

The computer won't start if the electricity is turned off, regardless of any potential fault, therefore P [C = yesl E = yes, M = no] = 1 and P [C = yesl E = yes, M = yes] = 1. The likelihood of computer failure in this scenario, P [C = yes], may be estimated as

$$\begin{aligned} \mathrm{P}\,[C = \text{yes}] &= \sum_{E,M} \mathrm{P}\,[C = \text{yes},\ E,\ M] \\ &= \sum_{E,M} \Big(\mathrm{P}\,[C = \text{yes} \,|\, E,\ M] \cdot \mathrm{P}\,[E] \cdot \mathrm{P}\,[M] \Big) \\ &= 0.19 \end{aligned}$$

Before we see any proof, the probability P [C = yes] = 0.19 can be seen as a prior (generic) likelihood of computer failure. Figure 2 shows the graphical model with prior probability distribution, or before seeing any evidence.

Figure 2: Directed graphical model representing two independent potential causes of computer failure with prior probability distribution, i.e. before observing any evidence.

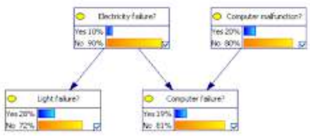


Note that the observed failure has induced a strong dependency between the originally independent possible causes; for example, if one cause could be ruled out, the other must have occurred, Cowel et al. (1999). Nevertheless, the above results are still not very helpful.

Assume an extension of the example by incorporating another piece of evidence in the model, specifically a light failure L. We assume that light failure is independent of computer malfunction. As before, if the electricity is shut off, the light will not shine under any circumstances, P [L = yesl E = yes] = 1.

If there is no problem with the electricity, we assume still a 0.2 chance that the light will go off (broken light-bulb), P [L = yesl E = no] = 0.2. Using the same algorithm as before, we obtain that the prior probability P [L = yes] = 0.28. The extended graphical model with prior probability distribution, before observing any evidence, is depicted in figure 4. Figure 5 shows changes in posterior probability distribution after observing evidence for all four combinations of light failure and computer failure outcomes. For example, if we observe both computer failure and light failure, i.e. we observe both C = yes and L = yes with probability 1 (top right graph in figure 5), we obtain P [E = yesl C = yes, L = yes] = 0.85 and P [M = yesl C = yes, L = yes] = 0.33.

Figure 4: Directed graphical model representing two independent potential causes of computer failure a one potential cause of light failure with prior probability distribution, i.e. before observing any evidence.



NoisyOR Operators:

As an extreme illustration, suppose we are attempting to model and predict failure in a system with n independent components. Any one of these components can fail the system, and the system can only fail due to component failure. The CPT for y is simply defined by the logical OR function if y represents the Boolean variable "System fails" and xi represents the Boolean variable "ith component fails." We do not need to elicit individual probabilities for each parent state combination.

However, the assumptions required here for the OR function might not be true in practice. It's possible that there are additional, unidentified causes of system failure, as well as uncertainty regarding whether a component failure will result in a system failure. However, assuming that the components continue to fail independently, this is an illustration of a very typical situation in which the child's relationship with its parents is "similar" to the logical OR function.

Medical risk is another common type of situation in which "smoking," "lack of exercise," "poor diet," "stress," and "family history of heart failure" are five possible independent causes of a heart attack in a person under the age of 65, but none are certain to be the cause. In addition, it is still possible for a person to have a heart attack before the age of 65, even if all of the factors are false.

The NoisyOR function, which is simplified in equation, is employed in the proposed BN model, as shown in Fig. 1, to determine the posterior probability of the "environmental sustainability".

The equation suggests that in order to achieve the necessary environmental sustainability of the associated biomass supply chain network, both green management and resource management are equally accountable (75%), and other hidden elements are contributing to the remaining 25%. Fig. 2 shows the NoisyOR operator example with its two conditional nodes.

$$Enviromental\ Sustainibility = NoisyOR$$
$$(Green\ Management,\ 0.75,\ Resource\ Management,\ 0.75,\ 0.25)$$

Fig 1

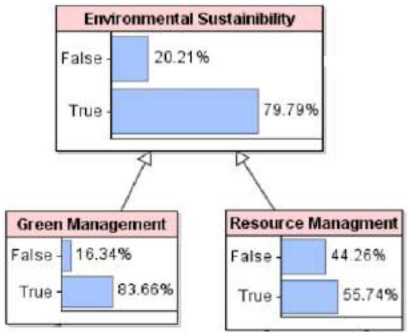


Fig 2 : NoisyOR operator for environmental sustainability node.

Quantifying Parameters :

A BN model was created using the stated sustainable supply chain criterion and sub-criteria. This section describes how the many factors that make up the suggested BN were quantified. We investigate the biomass supply chain as a whole in this study, covering various types of biomass, notably those focusing on the corn stover, because the supply of biomass feedstock is greatly influenced by seasonality.

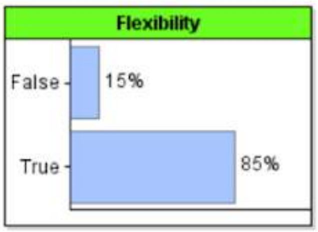
Most BN works in the body of literature create a node probability table for boolean variables and forecast the result of the child node based on the conditional probability of the parent boolean node.In our research, we take into account a variety of variables and nodes in addition to Boolean variables while creating the Bayesian Network (BN) model.

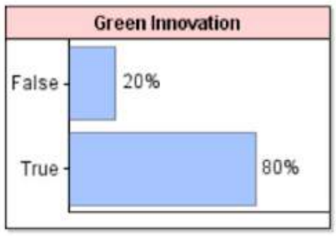
For instance, "weight" is a labelled node that calculates the average weight of the three primary pillars of sustainability: economic, environmental, and social to forecast the overall sustainability of the supply chain. "labor cost" and "number of injuries" are two instances of continuous nodes. In addition to these variables and nodes, we also make use of several functions and distributions, including NoisyOR, comparative expression, discrete distribution, and beta distribution, to more effectively and precisely estimate the overall sustainability of the supply chain network. These characteristics increased our model's sturdiness and gave it a competitive edge over other BN techniques already in use.

Boolean parameters (BV) :

A Boolean variable has dichotomous responses and is expressed as True or False in order to show the outcomes that are positive and negative. However, depending on the intended circumstance, the states' appearance can be changed. The prior distribution of "flexibility" under the service node in our base model, is described in terms of the Boolean node, i.e., True = 85% and False = 15%. This means that there is a chance that 85% of the flexibility of the service would increase the level of economic sustainability, while there is a chance that it would not.

Green innovation is another example of a Boolean node, with True = 80% and False = 20%. According to this, there is an 80% possibility that the supply chain network will succeed in achieving the green innovation, but there is also a 20% risk that it won't. In other words, green innovation management has an 80% chance of directly enhancing the green management performance of a supply chain network, and a 20% chance of not doing so. Two Boolean node instances are shown. The same reasoning is used to evaluate each of the additional Boolean nodes in the suggested model.





Continuous variables (CV) :

Through the use of random variable probability distribution, continuous variables can have continuous values (Hossain et al., 2019c). An illustration of a continuous variable is the cost of labour. Utilizing a truncated normal distribution, this node was generated (TNORM). A normal distribution with a mean value, a finite range with lower and upper bounds, and a variance, 2, is referred to as a truncated normal distribution (Perkusich et al., 2015). Other continuous variables in the suggested model have been treated with the same reasoning.

Table4. Modelling of port responsiveness and its contributors.

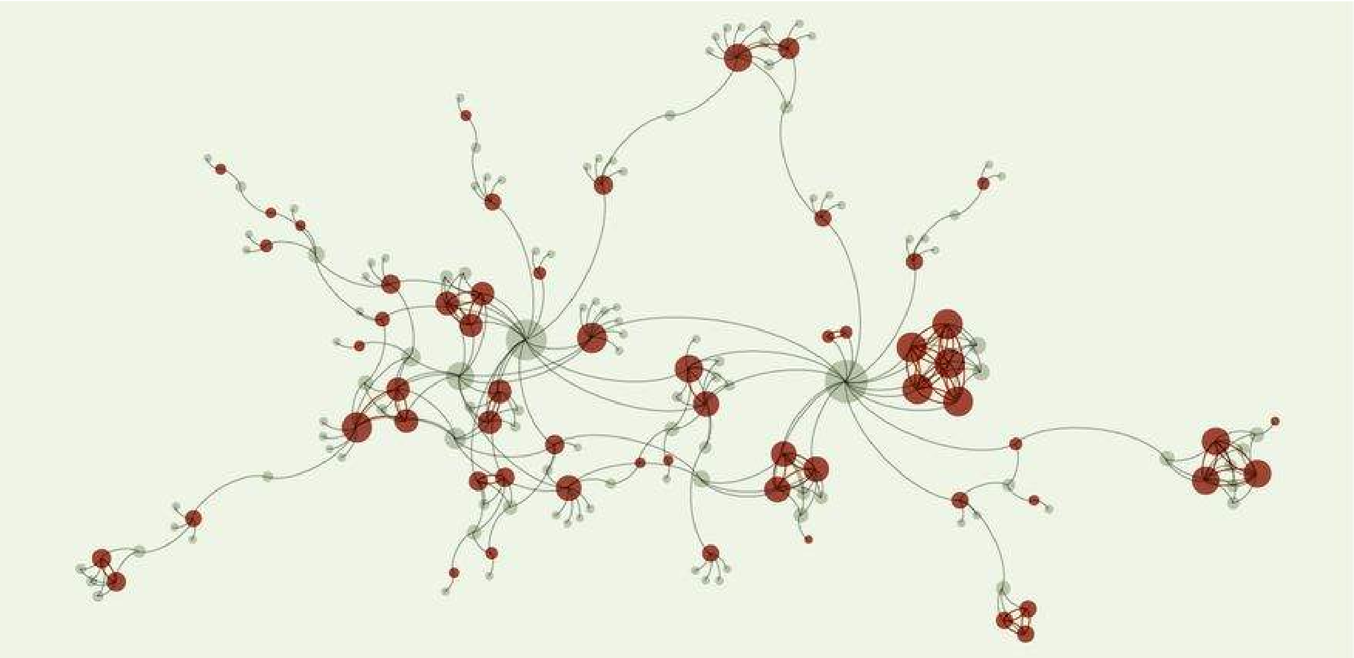
Variable Name	Modelling Technique	Modelling Description
Raw material Cost	TNORM	Based on the statistics, raw material (e.g. corn stover) cost varies from $38 to $45 with an average of $40. Variance is approximated as 0.75 (Quddus et al., 2017).
Labor Cost	TNORM	Based on the techno-economic analysis, it is estimated that the labor cost of the depot facility ranges from $10/hr to $20/hr with an average of $15.88/hr (Lamers et al., 2015).
Investment Cost	TNORM	Total investment costs vary in terms of biomass depot facility. For instance, Conventional Pelleting Process (CPP) and High Moisture Pelleting Process (HMPP) depots require about $3 million and $4.7 million investment cost, whereas the total investment cost for Ammonia Fiber Expansion process (AFEX)) depot is nearly $8.2 million. (Lamers et al., 2015).
Transportation Cost	TNORM	Transportation cost is designed by a truncated normal distribution with an average of $42 for one-way truck transportation for biomass supply chain network (Brechbill et al., 2011).
Maintenance Cost	TNORM	Based on the statistics, it is estimated that maintenance cost varies from $120 to $650 per hour with an average of $250, based on the type of the facility ton of feedstock (USDA, 2019).
Standard Product	Beta Distribution	The standard of the biomass product follows a beta distribution with (α=0.35, β=40, LB=1, UB=1).
Total Cost	Arithmetic Expression	Total cost is a summation of the raw material, labor, investment, transportation, and maintenance cost.
Material Efficiency	TNORM	Material efficiency is often impacted due to material loss during the densification process at the biomass depot. It is estimated that material efficiency would vary from 65% to 80% with an average of 70%, and variance is considered as .05.
Energy Efficiency	TNORM	Biomass energy is approximately 75–80 percent efficient (BERC, 2009).
CO_2	TNORM	The level of CO_2 emission (lb/Kwh) follows a truncated normal distribution (TNORM) with an average of 1.55 and variance of 0.75 (Quddus et al., 2017). According to the historical data for the biomass supply chain network, the level of CO_2 emission (lb/Kwh) never goes below 1.40 (lower bound), and the maximum is 18.5 (upper bound).
Other Gases	TNORM	The level of other gass emissions, such as No_x, So_x, is assumed to follow a truncated normal distribution (TNORM) with an average of 0.85 lb/kWh and variance of 0.075.
Death and Injuries	TNORM	Based on past thirty years' historical data, it is observed that on average, three deaths and around 25 different types of injuries occurred annually in the biomass supply chain network.
Incident	Arithmetic Expression	An incident is the summation of death and injury that happened to the corresponding supply chain network.
Staff Training	Discrete Expression	It is estimated that four training sessions/per year for the worker would maintain the standard and safety practice of the biomass supply chain network.

Constructing the decision tree

Mapping out the Input parameters and decision making process

Constructing the decision tree involves mapping out the input parameters and decision making process. This involves identifying key variables that influence the sustainability of a company and determining the relationships between these variables. In order to do this, mathematical techniques such as regression analysis, decision theory, and optimization methods may be used. The goal of this process is to arrive at a set of sustainable practices and investments that can be used as financial instruments for company growth. The decision tree serves as a visual representation of the relationships between the variables and the decision making process, allowing for a clear and comprehensive analysis of the potential impact of different sustainability strategies. Ultimately, this will help companies make informed decisions about sustainability and contribute to a more sustainable future for all

The decision making process in the project can be represented as a decision tree, where the input parameters are used to inform the decisions made. The connection between parameters and decisions is established by mapping out the input parameters and linking them to the decision making process through mathematical models and algorithms. The mathematical models can be used to analyze data, simulate scenarios, and quantify the impact of different decisions. The goal is to use this information to arrive at decisions that are both economically and socially optimal, while also considering the environmental impact of the decisions. By combining data analysis, mathematical models, and decision-making algorithms, we can create a comprehensive and automated approach to sustainable decision making.



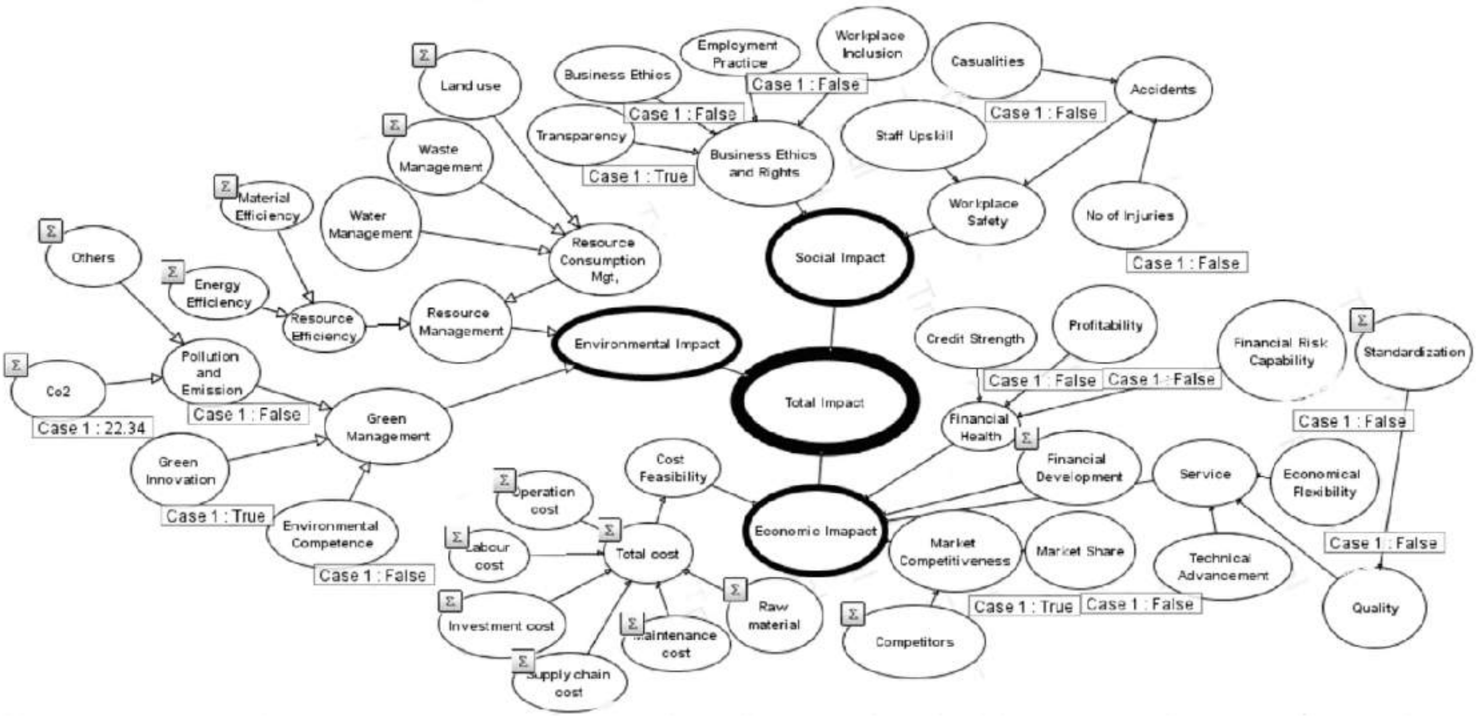
Graphical Representation of the Model

Visualizing the Journey: A Graphical Representation of the Sustainability Model

In order to effectively address the challenges posed by sustainability and its impact on businesses, it is crucial to understand the various factors that play a role in the decision-making process. This involves mapping out the various input parameters and their relationships to the decisions that need to be made.

This section of the report, titled "Building the Blueprint," will delve into the process of identifying the key parameters that impact sustainability in the corporate world and how they can be used to automate decision-making.

We will explore the types of data and information that will be used to build the decision model and highlight the importance of involving all stakeholders in the sustainable practices. This will include an examination of the role of regulations, technology, and supply chain management in creating a truly sustainable business environment.



Exploring the Capabilities

Understanding the type of decisions our model can make

In the context of our project, the automated decision model for corporate sustainability advisor will have the capability to analyze various parameters and make informed decisions that promote sustainability. These decisions are based on a multi-dimensional analysis of sustainability, taking into account factors such as carbon credits, environmental impact, and social parameters.
The model will use mathematical algorithms and decision tree analysis to map out the input parameters and decision-making process. This will allow us to connect the parameters and decisions, making it possible to arrive at informed, data-driven decisions.

The types of decisions that our model can make include:

1. Assessment of sustainability practices and initiatives, and identification of areas for improvement.
2. Analysis of carbon credits and offset assets to determine their impact on sustainability.
3. Recommendations for reducing the carbon footprint of operations and mitigating the environmental impact of business activities.
4. Evaluation of social sustainability initiatives and assessment of their impact on the community.
5. Prioritization of sustainability initiatives based on their potential impact and feasibility.
6. Identification of opportunities for collaboration with other companies and organizations to achieve sustainability goals.

Overall, the model will be designed to provide decision-making support for companies looking to improve their sustainability practices and achieve their sustainability goals.

Unpacking the Influence

Examining the Impact of Input Parameters and Decision Making Process

The impact of the model is the effect that its output and decision-making process have on various stakeholders and the environment. It involves examining how the input parameters and decision-making process of the model influence the outcomes and impact of sustainable development initiatives. This can be assessed in terms of economic, environmental, and social impacts. The model can help companies and organizations make more informed and sustainable decisions that have a positive impact on all stakeholders, including employees, customers, suppliers, and the environment. The model can also help companies better understand the impact of their operations on the environment, and identify areas for improvement. Ultimately, the goal of exploring the influence of the model is to understand the full range of impacts it has and to continuously improve it to maximize its positive impact.

Correlating carbon credits and our sustainability score

Carbon credit and sustainability score are related as carbon credit is a financial instrument used to mitigate climate change by reducing greenhouse gas emissions. It represents a specific amount of carbon dioxide that has been reduced or avoided from being emitted into the atmosphere. On the other hand, the sustainability score is a metric used to assess the overall sustainability performance of a company, organization, or product.

A company's sustainability score can take into account various factors such as energy consumption, waste reduction, and carbon emissions, among others. Thus, the use of carbon credits can positively impact a company's sustainability score by reducing its carbon footprint and contributing to the mitigation of climate change. By having a lower carbon footprint, a company can demonstrate its commitment to sustainability and contribute to a better tomorrow.

Correlating carbon credits and our sustainability score

Carbon credits and sustainability scores can both be related as they both play a role in promoting sustainability and reducing the negative impact of business operations on the environment. The focus on social impact and diversity highlights the importance of considering not only environmental factors but also the effect of business practices on society, including the well-being and diversity of employees and the wider community. This requires a multi-dimensional approach that takes into account not only environmental concerns but also social, economic, and governance factors.

In order to effectively measure and improve sustainability, it is important to consider all of these elements and how they interact with one another. By taking a comprehensive approach to sustainability and considering the social impact and diversity of business practices, organizations can work towards a more sustainable and equitable future.

Conclusion and Future Recommendations

"Setting the Standard: Concluding Thoughts and Recommendations for a Better Tomorrow"

In conclusion, our project aimed to develop a decision model for corporate sustainability advisor that could help companies make informed decisions about their sustainability efforts. The project started by analyzing the risk involved in carbon credits and offset assets, and then moved on to exploring the impact of sustainable development on multiple dimensions like the economy, environment, and society. We constructed the decision tree, mapping out the input parameters and decision making process to arrive at decisions. Our model was designed to explore the capabilities of decision making and to understand the type of decisions it could make. We also examined the influence of input parameters and decision-making process to understand their impact on the model's outcomes.

In light of the findings and insights, we would like to offer some recommendations for a better tomorrow. Firstly, it is important to continue refining and improving the model to make it more effective in supporting companies with their sustainability efforts. Secondly, it is crucial to invest in education and awareness programs for companies, as it will increase the adoption of sustainable practices. Finally, companies must be encouraged to adopt sustainable practices, not only as a moral obligation, but also as a profitable business strategy.

In conclusion, the future looks bright for the growth of sustainable practices and the development of sustainable technologies. We hope that our project has contributed in some small way to this effort and we look forward to seeing its impact on the world.

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