

# Green Data, Green Future: Effecting Sustainability in Financial Services through Data Intelligence

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**Abstract:** *This paper examines how data intelligence can drive sustainability in the financial services industry. It investigates how data analytics can be leveraged to enhance sustainability efforts, mitigate environmental risks, and inform investment decisions. Key findings include the importance of aligning financial institutions with global sustainability goals, the impact of sustainable investment decisions on environmental, social, and financial outcomes, and the challenges and opportunities associated with data - driven sustainability initiatives. Ultimately, it is observed that integrating data intelligence with sustainability efforts offers promise for a greener future. This can drive favourable environmental outcomes and generate long - term sustainable value for investors and society.*

**Keywords:** Sustainability, Data Intelligence, Financial Services, Investment Decisions, Environmental Impact, Global Goals, Long - term Value

## 1. Introduction

The urgency of combating climate change has put planet Earth on red alert, with companies at various stages of transitioning to net - zero emissions. In this whitepaper, we aim to explore the intersection of sustainability and financial services, focusing on the role of data intelligence in driving environmental responsibility within the industry. This whitepaper aims to analyse how the financial services sector can leverage data analytics to enhance its sustainability efforts, mitigate environmental risks, and make informed clean investment decisions. Furthermore, this whitepaper explores the existing regulatory frameworks and emerging standards that are integral in shaping the sustainable finance landscape. Lastly, this paper proposes a roadmap by aligning the financial regulations and environmental objectives aiming for a greener, more sustainable future of the financial services industry.

### Data Intelligence and Sustainability in Financial Services

The exponential growth of big data, machine learning, and artificial intelligence in recent years has although revolutionized several industries but also raised significant concerns about their environmental impact. Forbes noted that COVID - 19 sped up the use of data and AI as companies pushed their digital transformation forward. However, this increased demand of computational power comes at a cost to the environment. For example, BlackRock, the world's leading provider of investment, integrated sustainability into its investment strategies through the Aladdin platform [1]. It uses data intelligence to assess Environmental, Social, and Governance (ESG) factors in investment decisions. This assists Blackrock to offer sustainable investment options to their clients.

In the financial services sector, sustainability challenges arise due to a lack of standardization, making data comparisons difficult and reducing their reliability and value. Sustainable finance emerges as an important subject for decarbonizing the economy, with ESG data serving as a gold mine to understand where stakeholders stand in their net - zero journey. However, the abundance of ESG data has

also led to what some would term as the “Data Curse” [2]. A significant number of investment management firms, asset owners and managers reveal that *inconsistent and incomplete* data is a primary barrier to ESG investing. This highlights the critical role of data quality and standardisation in aiding informed decision - making and promoting transparency in ESG investment strategies.

### Aligning Global Sustainability Goals

Sustainability helps financial institutions manage environmental and regulatory risks more effectively and align with global net zero goals. The imperative for the financial industry to align with global sustainability goals is driven by the following:

- Encouraging the development and adoption of green finance instruments, such as green bonds, green loans, and green investment funds, to fund environmentally sustainable projects and initiatives.
- Advancing sustainable banking practices that promote responsible lending, risk management, and corporate governance standards.
- United Nation's 17 Sustainable Development Goals (SDGs) adoption will help financial institutions invest in agricultural development, support health infrastructure, provide funding for education, promote emerging technologies and finance sustainable urban development projects [3].
- Enhancing access to financial services for underserved and marginalized populations including low - income individuals, small, and medium enterprises (SMEs) and rural communities.

### The Role of Data in Sustainable Finance

#### Data Utilization in Assessing and Managing Environmental Risks

Data helps measure environmental impact, identify green finance opportunities, and analyze climate risks. The role of data in sustainable finance is for fostering assessment of risks, scenario analysis, environmental data collection, climate stress testing, and ESG reporting. Sustainable finance channels capital towards projects and initiatives that contribute to environmental protection, social inclusion, and

economic development. Promoting sustainable finance will encourage investors to incorporate ESG factors into their investment decision - making process.

**What is Environment Risk Assessment?**

*Environmental risk assessment is a process for businesses to identify, assess, and mitigate potential environmental hazards and impacts.*

Once environmental risks are identified in a company’s process, it is crucial to explore the potential harm they could cause to the environment. For this purpose, the identification of appropriate precautions to reduce or eliminate the risks becomes imperative. Data can help quantify and assess the potential harm they could cause to the environment.

Data analytics enables investors to monitor the environmental performance of portfolio companies and projects in real time. Further, by analysing environmental data such as carbon emissions and pollution levels, investors

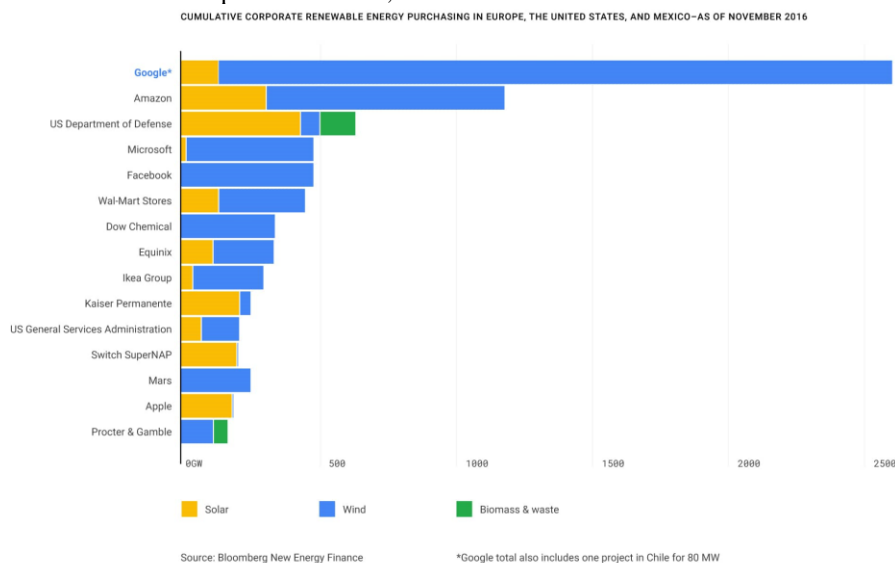
can evaluate the environmental performance of companies and projects. This enables them to identify high - risk investments and prioritize sustainable alternatives.

**Impact Of Sustainable Investment Decisions**

Sustainable investment decisions not only contribute to addressing pressing global challenges such as climate change, resource depletion, and social inequality but also generate long - term value for investors and society. Several impacts of sustainable investment decisions can be:

**Environmental Impact**

Sustainable investment decisions can lead to reductions in environmental degradation and promote transition to a low - carbon economy. Investing in renewable energy projects can help reduce greenhouse gas (GHG) emissions and mitigate climate change. Investors can use data analytics such as *predictive modelling* techniques to forecast the potential environmental impacts of investment decisions.



**Figure 1: Renewable Energy Purchase by Companies [4]**

Google made a sustainable decision to become the largest corporate purchaser of renewable energy (100%) by leveraging data analytics to analyse energy conservation patterns. It emerged as the world’s largest corporate buyer of renewable power with commitments totalling 2.6 gigawatts of wind and solar energy [4]. By directing purchasing wind and solar energy for every unit of electricity consumed, Google is making substantial contributions to reducing greenhouse gas emissions and addressing climate change.

**Social Impact**

Sustainable investment decisions can also generate positive social impacts by promoting social inclusions, economic development, and improving the well - being of communities. Google’s commitment to renewable energy procurement has also effected positive social implications including job creation, economic development, and community investment. Data analytics can track community engagement and evaluate the effectiveness of sustainable investment initiatives. It can also calculate Social Return on Investment (SROI) to measure the social value generated relative to resources invested, using techniques such as cost -

benefit analysis, social cost valuation, and outcome mapping.

**Financial Impact**

The financial impact of sustainable investment decisions can enhance an organization’s accessibility to capital by attracting socially responsible investors and lenders. Data analytics can support organizations in differentiating themselves in the market by demonstrating their commitment to sustainability. For instance, Google’s investment in renewable energy contributes to cost savings, and financial predictability and attracts capital by enhancing the company’s long - term financial performance in the market.

**Strategies for Sustainable Data Management**

**Best Practice for Collecting, Processing, and Utilizing Green Data**

In the financial service sector, adopting best practices for collecting, processing, and utilizing green data involves

integrating sustainability considerations into data analytics processes. Here are some best practices:

#### Data Collection

- Collaborate with environmental agencies and research institutions to ensure access to up - to - date and comprehensive datasets.
- Leverage environmental indicators to identify risks on the sustainability performance of investment portfolios and financial products.
- Utilize multi - purpose databases that are accessible and relevant to stakeholders to facilitate accurate analysis and decision - making.
- Implement user - friendly interfaces and search functionalities to facilitate easy retrieval of green data.
- Maintain online databases that provide easy access to environmental statistics and indicators for financial professionals, investors, and researchers [5].
- Produce thematic reports and analytical publications that analyse environment statistics highlighting trends, opportunities, and risks.
- Conduct statistical surveys including censuses and sample surveys to collect green data through government, and non - government agencies, and retrieve data on population demographics, economic activities etc.

#### Data Processing

Green Data is processed through Data centres involving key steps that prioritize energy efficiency, sustainability, and environmental responsibility. Here's how green data is processed:

- Leveraging certifications like EDGE (Excellence in Design for Greater Efficiencies) and standards like EN50600 series and ISO/IEC 22237 series provides best practices for the design, construction, and operation of data centres with a focus on green data processing and optimization.
- Setting quantifiable baseline metrics and concrete targets, such as reducing energy consumption or minimizing GHGs serves as a foundation for green data processing efforts.
- Engaging all stakeholders within the organization to participate in green data processing initiatives, fostering a culture of environmental responsibility and encouraging contributions towards sustainable data centre operations.
- Utilizing reporting and monitoring mechanisms like Energy Management Systems (EMS) and Carbon Footprint Tracking to forecast the future impact of data centre facilities, enabling operators to anticipate

challenges, prioritize initiatives, and allocate resources effectively to achieve sustainability goals.

#### Utilizing Green Data

Green data is used effectively in the financial service sector for informed decision - making, risk assessment and investment strategies. For instance, Green Banking, also known as ethical banking, utilizes green data to assess the environmental factors and social responsibility in the banking sector. The main focus of Green Banks is [6]:

- To promote eco - friendly practices
- To develop sustainable banking
- To mitigate the carbon footprint
- To promote ethical banking

Green banking is similar to regular banking functions with an edge of taking into account all social and environmental factors. The best practices that it considers are:

- Green banks utilize green data to assess the potential impact of projects and investments regarding sustainability. This includes the assessment of carbon emissions, energy efficiency etc.
- Green data is used to optimize banking operations and reduce environmental impact. Banks analyse data on customer transactions to identify opportunities for digital banking solutions such as online banking and mobile banking.
- Green banks promote development of banking products such as *green loans, green mortgages, and green credit cards*.

Overall, green data is essential in guiding green banking practices, ensuring that financial institutions prioritize environmental sustainability and contribute to a more sustainable economy.

## 2. Case Studies on Successful Sustainable Data Initiatives

Goldman Sachs is a leading global investment banking, securities, and investment management firm. The firm has been proactive in incorporating sustainable practices into its operations. The company has allocated \$750 billion over ten years to include sustainability in its financing, investing, and advisory services. It uses data analytics to evaluate the environmental impact of green bond - funded projects. Goldman Sachs has outlined firmwide sustainability goals focused on advancing climate transition and driving inclusive growth. These goals are supported by a Sustainable Finance Framework, which identifies nine subthemes to guide their efforts [7].



Figure 2: Goldman Sachs' Sustainable Finance Framework [7]

The implementation of this framework and related data initiatives led Goldman Sachs to successfully integrate ESG across its investment offerings. The firm leveraged AI/ML to interpret extracted data, which allowed investors to understand and analyse the implications of sustainability - related information more efficiently. AI is being used in the firm to accelerate competitive performance and identify risks associated with sustainability factors [7]. Climate change affects assets and prompts investors to consider it in their strategy. AI can model climate scenarios to help investors understand the potential impact on returns and adjust their asset allocation accordingly.

Triodos Bank is a leading ethical bank founded in the Netherlands in 1980 with a mission to promote sustainability, social equity, and cultural enrichment through innovative banking practices. The bank recognized the importance of integrating sustainability practices into its operations. Data analytics played a crucial role in the development of green financial products such as green loans, mortgages etc. Triodos Bank used market insights and customer data to customize these products to meet the evolving needs of environmentally conscious consumers.

Protecting client's data is a top priority for Triodos Bank as it holds certain beliefs like data is an abstraction of reality and should not reduce individuals to mere data points. Every individual has the right to express different aspects of themselves in various situations. Moreover, individuals should retain control over their data. This emphasizes the bank's sustainable perspective in adopting fairness and transparency in data collection, processing, and usage.

The bank took an early and significant step towards addressing the urgent challenge of climate change by joining the *Net - Zero Banking Alliance (NZBA)*. Triodos Bank committed to aligning its operational emissions from its portfolios to achieve net zero by 2050 or sooner. This commitment reflects the bank's dedication to sustainable practices and its recognition to transition into a green bank.

The bank aims to achieve its mission as a sustainable bank in three ways [8]:

- By offering sustainable products and services to develop transparent relationships with its customers.
- As a relationship bank, it creates community events to meet co - workers face - to - face with customers and understand their environment and economic needs.
- As a frontrunner in responsible banking by promoting the conscious use of money through its organization.

### 3. Challenges to Data - Driven Sustainability

#### Data Collection Challenges

There are challenges such as lack of reliable data where sustainability is limited, especially in the emerging markets. The challenge of ESG data gathering is recognised by Accenture, which suggests that data processing may skew results, mislead stakeholders, and waste resources, leading to poor decisions [9]. It is worth noting that only larger public companies are required to disclose ESG data in their annual reports. This creates a limited pool of data

based on self - disclosure. Moreover, the absence of a universal system to verify reported ESG data contributes to reliability concerns of disclosure reports. Addressing these challenges requires concerted efforts from regulators, companies, investors, and rating agencies to establish standardized reporting frameworks.

#### Data Quality Issues

Data quality involves five characteristics which are particularly important in sustainable practices such as accuracy, coverage, completeness, access, and governance. A survey by Deloitte highlights a gap between the accuracy and verifiability of sustainability data compared to financial data among consumer companies. This is due to the inconsistent data collection methods and reporting frameworks which leads to discrepancies and inconsistencies in ESG data sets. It is important to note that ESG data can be inaccurate due to errors in data collection, validation, or interpretation. Additionally, data overload is a common issue that affects data quality as managing large volumes of data can be overwhelming. This can lead to information overload, making it critical to generate relevant insights and trends.

#### Regulatory Compliance Obstacles

Data processing takes place in data centres which must adapt regulations surrounding sustainability and green IT to continue to evolve and expand. The European Union (EU) Energy Efficiency Directive (EED) is a legislative framework which promotes efficiency and sustainability across EU member states. Amendments to the framework are proposed mandating that individual datacentres facilitating over 500 kilowatts (kW) of installed IT equipment are required to report operational data and metrics. In this case, there is a challenge in meeting the requirement as several data centres may not have previously tracked or reported this level of operational data, establishing systems to accurately measure and report sustainability metrics. Overall, the challenge of implementing regulatory frameworks like the EED is compounded by the lack of research and guidance on practical implementation strategies.

#### Data Silos and Integration Complexities

The fragmentation of data across various departments, systems, and formats presents several challenges for enterprises, including the formation of data silos and duplication. These issues often result in data inaccuracies and inconsistencies which impacts the decision - making processes. The HPE's Global Data Maturity Survey revealed that 21% of producers acknowledge that their data deficiencies could have adverse effects on their energy efficiency and environmental sustainability efforts [10]. Integrating data can be a complicated process due to the scattered nature of data across various departments and systems, as it raises concerns about data security and privacy. Data that is kept in separate silos may also lack quality, which could ultimately result in unreliable integrated datasets. Without the integration of dependable sustainability data, organizations may find it challenging to make informed decisions about their sustainability

strategies. This lack of clarity can hinder their meaningful progress towards sustainable development.

### Leveraging AI and Machine Learning

#### Transformation in Sustainability Analytics

Transformation in sustainability analytics involves data - driven approaches to drive meaningful and measurable sustainability initiatives within organizations. Organizations need to understand the advantages of gathering ESG data and reporting systems. The Deloitte Sustainability Analytics Platform offers solutions to address the growing need for effective sustainability management and reporting. It offers ESG reporting, benchmarking, predictions and simulations to help organizations track investments towards sustainability development goals. Scope 1, Scope 2 and Scope 3 emissions are crucial components of sustainability analytics transformation which includes the following:

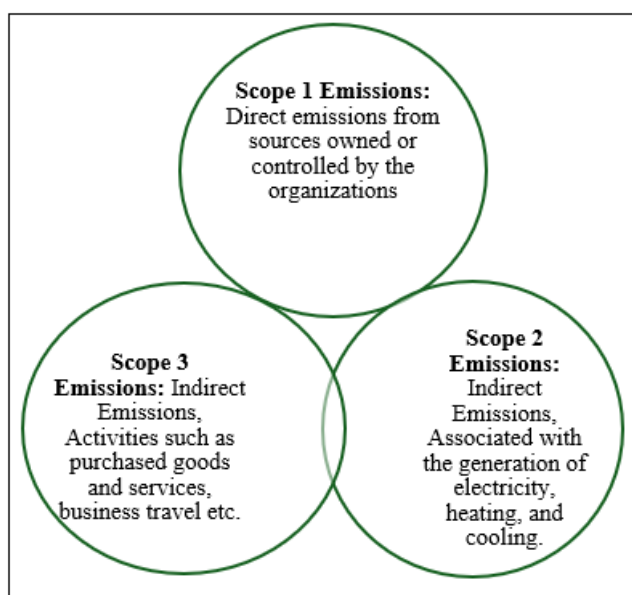


Figure 3: Scopes [11]

Sustainability analytics platforms enable organizations to accurately measure, monitor and analyse their Scope 1 emissions data. Leveraging analytics tools such as scenario modelling can enable organizations to optimize their energy source decisions as per Scope 2. When assessing sustainability, measuring a company's carbon footprint is crucial (Scope 3) [11]. To achieve this, life cycle assessments, supply chain mapping, and carbon accounting are necessary techniques. The integration of sustainability analytics tools and platforms allows organizations to streamline their data and reporting processes, enabling data - driven decision - making and transformation in sustainability analytics.

#### Predictive Models

AI predictive models can forecast energy demand and consumption patterns. It can also be used to optimize the management of energy grids, allowing for more efficient

distribution of renewable energy sources. Experts analysing AI models for sustainability, emphasize the role of AI in understanding climate change and developing effective mitigation strategies. There are widely used predictive models like Neural Networks, Regression and Decision Trees [12]. Neural Networks are most ably placed to support sustainability analytics because:

- Neural Networks excel at recognizing complex patterns and relationships within larger datasets. It is a type of machine learning process which develops a layered structure to resemble the human brain.
- Sustainability issues are often characterized by nonlinear relationships, where small changes in one variable can lead to significant impacts on others. Neural Networks are capable of capturing nonlinear relationships and customising for modelling the interconnected nature of sustainability.

Neural Networks can be scaled to accommodate large and complex datasets. As the data volume increases, neural networks offer a flexible and scalable approach to analytics. Neural networks can be trained for sustainability analytics using supervised learning which involves the following steps:

- 1) **Data Collection:** Gather a large dataset relevant to sustainability analytics. For instance, if the task is to predict energy consumption based on various environmental factors, the datasets would consist of historical data on energy consumption.
- 2) **Data Preparation:** Clean and prepare the collected data to ensure it is in the format for training the neural network.
- 3) **Model Selection:** Choose an appropriate model network architecture which depends on factors such as the complexity of the problem, the size of the dataset, and computational resources availability. For example, for predicting energy consumption, a recurrent neural network (RNN) may be suitable.
- 4) **Training:** Split the datasets into training and validation sets. This process involves adjusting the network's weights and biases to minimize prediction errors.
- 5) **Validation and Testing:** Once training is complete, the final model is evaluated and validated to ensure generalization to unseen data.
- 6) **Deployment:** Deploy the trained neural network to perform the desired sustainability analytics tasks such as assessing environmental impact, predicting energy consumption, and optimizing resource allocation.

### 4. Regulatory Frameworks and Standards

#### Overview of Existing and Emerging Regulations and Their Impact

The emerging regulations are shaping the financial landscape towards ESG considerations. Here's a global overview of some key regulatory frameworks and standards:

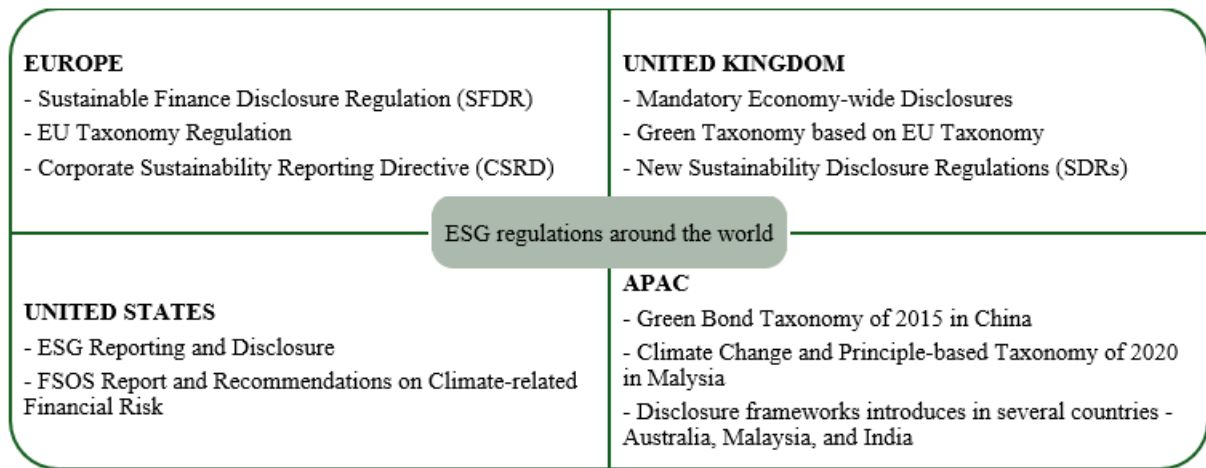


Figure 4: ESG Regulations around the world

1) **Sustainable Finance Disclosure Regulation (SFDR)**

- SFDR was adopted by the EU in 2019 as part of the European Commission’s sustainable finance action plan.
- It became effective in March 2021 with a phased implementation approach.
- The regulation aims to promote transparency and sustainability in financial markets. It aims to provide investors with consistent information to make informed investment decisions.
- It mandates the publication of pre - contractual disclosures ensuring that investors receive relevant information on sustainability - related matters.

2) **Corporate Sustainability Reporting Directive (CSRD)**

- CSRD is an amendment to the Non - Financial Reporting Directive (NFRD) and part of the EU’s sustainable finance strategy which was proposed in April 2021.
- It covers a wide range of sustainability disclosures including ESG factors.
- It extends reporting obligations to more companies including SMEs and provides a broader coverage in sustainability reporting.
- CSRD aligns with international reporting and frameworks such as the Task Force on Climate - related Financial Disclosures (TCFD) to promote consistency in reporting practices.

3) **Sustainability Disclosure Regulation (SDR)**

- SDR was introduced by the UK Financial Conduct Authority (FCA) to address greenwashing concerns in the investment sector.
- It aims to empower retail investors to make informed decisions at both product and entity levels.

**Achieving a Green Future**

**Roadmap for Integrating Data Intelligence with Sustainability Efforts**

In the journey towards achieving a greener future, the integration of data intelligence with sustainability efforts establishes a crucial roadmap:



Figure 5: Roadmap for data intelligence driving sustainability

Data analytics can help organizations gain insights into environmental impacts and risks, enabling them to develop effective strategies and initiatives. Sustainable investment decisions have a significant impact on addressing global challenges such as climate change and social inequality while generating long - term value for investors and society. Data intelligence plays a crucial role in this process by enabling the evaluation of investments based on ESG criteria. By integrating ESG considerations, investors can allocate capital towards environmentally friendly projects and businesses, thereby driving positive environmental outcomes.

Organizations can leverage data analytics to gain deeper insights into environmental impacts and risks. Data - driven approaches facilitate proactive risk management, enabling early identification and mitigation of environmental risks. Furthermore, ensuring compliance with environmental standards like SFDR and TCFD enhances credibility in the financial market. Data - driven insights can help organizations identify opportunities for reducing environmental impact and contribute to climate mitigation efforts. Integrating data intelligence with sustainability efforts not only strengthens the resilience of the financial sector but also accelerates progress towards a more sustainable future.

## Benefits for the Financial Sector and the Environment

Benefits for the Financial Sector	Benefits for the Environment
Informed decision - making for investments	Reduction of GHG emissions and climate change impact
Allocation of capital to sustainable projects	Optimization of resource usage and waste reduction
Compliance with regulatory standards	Preservation of natural resources and ecosystems
Enhanced transparency and credibility	Preservation of renewable energy and sustainable practices
Generation of long - term value for investors	Mitigation of environmental risks and liabilities

## 5. Conclusion

The integration of data intelligence with sustainability efforts offers guidance towards a greener future. Organizations can leverage data analytics to make informed decisions, allocate capital to sustainable projects, and ensure compliance with regulatory standards. This provides long - term value and enhances credibility for the financial sector while also reducing greenhouse gas emissions, optimizing resource usage, and preserving natural resources and ecosystems.

Organizations can use sustainable data analytics techniques to accurately measure, monitor, and analyze their environmental impacts. This helps them identify risks and opportunities that were previously overlooked, enabling proactive risk management and strategic investments in sustainable projects. Such investments drive positive environmental outcomes and generate long - term value for investors. Therefore, financial institutions need to invest in cutting - edge technologies and analytical tools that enable comprehensive ESG analysis.

Data - driven approaches enable financial organizations to gain deeper insights into environmental impacts and risks. Moreover, compliance with regulatory standards such as SFDR and TCFD not only enhances credibility but also strengthens the resilience of the financial sector. In combination, data intelligence and sustainability have the potential to create significant opportunities for transformative change. By working together through collaboration, innovation, and a shared commitment to environmental responsibility, we can build a better world where economic prosperity and ecological sustainability can coexist.

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