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2021**



**AI Based Automated PDF to XBRL Solution –  
The Secure ESG Reporting Network**

1 September 2021

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## AI Based Automated PDF to XBRL Solution – The Secure ESG Reporting Network

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## AI Based Automated PDF to XBRL Solution – The Secure ESG Reporting Network

Formal Submission - Team Zabel: Martin Zabel, Jiro Olcott, Dr Glenn Frommer

1 September 2021

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### 1. Purpose

1.1 The purpose of this document is to:

- Provide the context for our submission entitled **AI Based Automated PDF to XBRL – The Secure ESG Reporting Network**;
- Present an overview of our submission by demonstrating a Proof of Concept and a Roadmap of further supplementary material; and
- Provide insights as to the scalability and feasibility of The ESG Secure Reporting Network.

### 2. Background

2.1 It is widely recognized internationally that there are substantial insufficiencies regarding the collection, verification, and disclosure of non-financial or environmental, social and governance (ESG) data. This results in inconsistencies, data gaps and a lack of reliable and attributable data for sustainable finance.

- There is no single acceptable international standard for reporting ESG data, resulting in a multitude of standards and frameworks with inconsistent and incomparable sets of indicators and metrics;
- The lack of trustworthy data from Small and Medium Enterprises (SMEs), private companies and firms raises significant uncertainties in the data sets available to banks and investors impacting the subsequent assessments and risk analyses. This is akin to ‘flying blind’;
- Large listed and few private multinational business groups voluntarily disclose ESG data. The metrics and quality of information provided varies substantially, as does the scope of assurance;
- Open access to digital ESG data is generally not available as there is no generally accepted taxonomy in use;
- Many SMEs do not measure or report any ESG data;



- ESG data is accessible primarily in printed format, and though financial data is reported digitally by some private companies, the data provides a very limited set of records (if any); and
- There is no reliable resource for sharing collected ESG data.

2.2 The Bank of International Settlement (BIS) recognizes the criticality of these crucial challenges and have launched the G20 TechSprint competition to encourage innovative solutions resolving operational problems in green and sustainable finance.

### 3. **Our Submission: AI Based Automated PDF to XBRL Solution - The Secure ESG Reporting Platform and Network**

Our submission provides the foundation for a secure ESG Reporting Network for collecting, storing, and distribution of financial and ESG data, consisting of the following:

- An application to scan paper-based non-financial and financial reports using a hybrid of ESG taxonomies to provide digital representations of the printed data; and
- A data platform and network encompassing
  - the assignment of report tokens in the form of Non-Fungible Tokens (NFT) using digital ledger technology, DLT (Blockchain), to permit securitization, storage and usage of the associated scanned data combined with
  - a secured payment system for authorizing and recording data transactions.

Figure 1 summarizes the methodology in our platform and the steps involved.

#### 3.1 Scanning Methodology

3.1.1 A methodology to scan intelligently written and / or PDF formatted documents and extract a unique cluster of financial data and non-financial or ESG, into a digital format using optical character recognition, OCR, and Artificial Intelligence (AI) software has been developed. We are actively working with several companies to leverage the extraction software through an open interface.

An example of a company we have been collaborating with is diSCIS who provide an AI based information extraction system from PDF files. A brief demonstration is



provided in the following video: <https://www.youtube.com/watch?v=3Y5SxzTAfto>

We plan to incorporate tools like this using our Open Integration Bus (OIB) in subsequent phases of the Secure ESG Reporting Network project.

3.1.2 The scanning and extraction for our submission are achieved as follows.

3.1.2.1 Step 1

- A report file issued by a company is identified and received for processing. This can be an annual report, sustainability report or other printed or electronic documents. The information can be provided annually or more frequently as needed.
- The application advises the selection of key financial and non-financial data for a specific reporting period, the taxonomy to be applied and the format and detail of charts or spreadsheets for output data presentation.
- Using extensions or hybrid tags, the taxonomy to be used for digital equivalents can refer to any existing standard for the identification and scope of financial information (IFRS, GAAP) or ESG information (SASB, GRI, EU Taxonomy, UN SDGs, TCFD) or other customized classifications e.g., banks.

3.1.2.2 Step 2: The taxonomy selected above is applied to the reports or other selected source documents, the designated information extracted and a XBRL file created.

3.1.2.3 Step 3: A conversion of the data and context information is converted into human readable format.

3.1.2.4 Step 4: A Public Key is issued by the application to protect user data.

The following are highlighted.

- Use Case, Sector and Country;
- Input / Output Table detailing the standards and indicators used; and
- The key data extracted. Appendix A consists of:
  - Results of applying Steps 1 – 3 for BASF, (Figures A1 – A5)
  - Steps 1 + 3 for EnBW (Figures A6 – A9), and Mahle (Figures A10 – A13).

The additional PDF files entitled ‘Scan Software Solution Parts 1 and 2’ provides further detail of the process featuring the application of IFRS, SASB and GRI Taxonomies, the automatic data extraction, and the output table. Part 1 presents the High-end AI based scanning solution using OCR recognition and applied to BASF, and



Part 2 illustrates an Easy digitizing approach applied to EnBW and Mahle. The PDF file is supplemented by a further explanatory video:

- Video: Scan Software Solutions, prepared by Martin Zabel explains background, concepts and network integration of the applied scanning solutions.

3.1.3 The AI software employed is most well suited for large data sets for Multinational Enterprises (MNEs) and use of open source XBRL platforms like Arelle to convert to standard reporting frameworks (BASF) using XBRL/iXBRL. We note that the performance of the software improves with repetition over time.

Smaller data sets with a limited number of metrics would not need a full AI application, and a simplified methodology has been applied.

Its application is presented for EnBW and Mahle with data selection, extraction, and presentation using identical input / output tables.

## 3.2 Creation of Tokens and Data Management

3.2.1 Using Hedera Hashgraph Digital Ledger Technology, we have developed a platform that allocates a token for the associated scanned data. We use Hedera Hashgraph software as it encompasses and combines a solid governance structure with a most inclusive portfolio of languages together with speed, cost-effectiveness, and is Green-DLT compliant.

3.2.2 The Secure ESG Reporting Network incorporates digital-Euro payments (or similar currency), registered in an electronic wallet allocated to all Network members. The wallet accounts for payments to and from the data provider and provides a record of transaction exchanges (uploading of documents, tokens, permission of use, etc.).

3.2.3 Given the content, control, privacy concerns and transaction fee setting required by the platform and its ongoing operations, a decision must be taken regarding the Administrator. The responsibilities and protocols would need to be discussed, agreed, and incorporated into the next step of platform development.

## 3.3 The Secure ESG Reporting Network platform

The report scanning and data extraction noted in Section 3.1 are incorporated into the platform as noted below. Screen shots of the practices involved refer to the steps are presented in Appendix B.



- 3.3.1 Step 1: The data provider registers as a user and is provided with a unique identification and an electronic wallet, or signs into the network as an account holder, Figure B1.
- 3.3.2 Step 2: The data provider records their company details (industrial sector, region, company size, location, taxonomy code, timing, assurance details, etc.) and uploads their PDF report(s). The submitted PDF report is translated automatically into XBRL (or other selected taxonomy) and provided with a unique token (NFT), Figure B2.

The NFT and the record of the transaction exchange generated are stored into the electronic wallet. Reports can be provided by SMEs, Asset Managers, Private and or Listed Companies, Banks, Ratings Agencies, Supply-Chain collaborators, etc. A list of the relevant reports can be selected, Figure B3.

The data provider can naturally view their own information as submitted and view the XBRL file if desired, Figure B4.

- 3.3.3 Step 3: A data user, say a bank, makes an electronic request for accessing the data. Their identity is verified through a standard 'Know Your Customer' (KYC) application, Figure B5.
- 3.3.4 Step 4: Once received, the data provider/reporting organisation can grant access to the data and a digital-Euro micropayment is made by the reviewer for access. Again, a transaction exchange record is generated into the wallet, Figure B6.
- 3.3.5 Step 5: With permission granted, the data reviewer can then access and view the data through the network in purpose-designed Dashboards displaying financial and ESG information as desired (Figures 3, 4 and 5).

#### 3.4 Incentivization for Reporting

As described, payment for accessing the data is already included into the DLT platform. The consequence is that expanded data provision would allow additional income for the data provider and is globally scalable. This can provide additional incentive for SMEs and others to provide and pool their information.

#### 3.5 Provision of Assurance

- 3.5.1 The platform is designed to include assessments and certifications by assurors and auditors with further tokens (NFT) being attached to the initial one. An additional token can certify that the paper-based information is correctly scanned into digital format.

Discussions with TÜV Süd and Grant Thornton regarding forms of assurance and necessary qualifications are positive and nearing completion. These auditors and certifiers do not appear to have objections to the methodology outlined herein.



- 3.5.2 A further supplementary token can also be attached indicating that the data and its collection process has been checked. This can be a 'limited assurance' (Level 1) or 'reasonable assurance' (Level 2). These assurances may entail a separate process independent from the platform and would need to be agreed with assurance providers as a further development of the platform.

This is shown diagrammatically in Figure 2.

### 3.6 Regulators and Governments

Regulators and governments would thus have an open and verifiable network to share and compare ESG and financial data across national boundaries, tracking and allowing audits of performance. An initial application envisioned is that for the reporting of Green House Gas (GHG) emissions in our Proof of Concept.

## 4 Proof of Concept – Prototype

Our Proof of Concept demonstrates the prototype application of the platform described above in Section 3 with screenshots of the steps referring to Appendix B. We focus our demonstration applying the software and payment utility for a fictitious company, Danhoff for 2017 - 2020.

### 4.1 Dashboard Review of Submitted Information

Figure 3 is a Dashboard screenshot showing financial data for Danhoff over the reporting period 2017 - 2020: Revenue, EBIT and EBITDA, Full Time Employees (FTEs), and Capex and R&D Expenses.

Figures 4 and 5 are Dashboard screen shots showing ESG information for Danhoff:

- Figure 4: Environmentally Sustainable Business (as defined by the EU Corporate Sustainability Reporting Directive CSRD), Scopes 1, 2 and 3 GHG Emissions including the company and EU targets for the years in question, GHG Emissions Intensity, Total energy consumption and Net water consumption.
- Figure 5: Solid waste produced, Number of minorities on the Board, Total training per Full Time Employee and the Ration of CEO pay to median pay.

- 4.2 Reviewers are welcome to test the prototype software with sample files noted below. Guidance and instruction are provided in the following documents and videos.



## 5 Roadmap of Supplementary Material

The website Landing Page for Team Zabel is: <https://hederacoe.com/G20-techsprint.html>

The source code for our prototype software is located at GitHub Repository: <https://github.com/G20-TechSprint>

**(Note** that the source code is not public open source therefore to gain access to the source code, a Git Hub user ID approved by G20 TechSprint will have to be issued to the Team Zabel Administrator to authorize access).

Otherwise, the source code is directly accessible through the G20 TechSprint in the following Zip File: **Source Code The Secure ESG Reporting Network-Team Zabel.ZIP**

To ensure a more comprehensive appreciation of our submission, a further set of supplemental documents have been prepared. The documents are itemized below.

Item No.	Title	Content
1	Formal Submission (This paper):  <i>Submission Paper - Team Zabel G20 TechSprint.PDF</i>	Context with all figures, Tables and Appendices
2	Scan Software Solutions:  <i>SCAN SOLUTIONS - Presentation Team Zabel - Part 1.pdf</i> <i>SCAN SOLUTIONS - Presentation Team Zabel - Part 2.pdf</i>	Two PDF documents (Part 1 and Part 2) Illustrating the High end and truncated approaches for automatic data extraction and creation of XBRL files.
3	Video: Scan Software Solutions:  <a href="https://vimeo.com/594758173/6049469cb1">https://vimeo.com/594758173/6049469cb1</a>	Overview and further details referring to the PPT Scan Solutions, Parts 1 and 2
4	Technical White Paper and Architectural Overview:  <i>TECHNICAL WHITEPAPER The Secure ESG Reporting Network - Team Zabel .pdf</i>	Software approach, Hedera Hashgraph software and related technical issues.
5	ESG User Manual – User Guide for Reporting Organization:  <i>USER GUIDE The Secure ESG Reporting Network - Team Zabel).pdf</i>	Step by step guide for: <ul style="list-style-type: none"> <li>- Account Creation</li> <li>- Wallet Top-up</li> <li>- Transformation of PDF reports into digital Structured Data Format</li> </ul>



		- Authorization to View XBRL Reports Dashboards
6	Video: Demonstration of The Secure ESG Reporting Network running on Hedera Hashgraph DLT and IBM Cloud Services:  <a href="https://vimeo.com/594332489">https://vimeo.com/594332489</a>	Illustrating how NFTs work in Hedera and how the IBM Cloud is used for the ESG Secure Reporting Network.
7	Video: Account Creation and PDF Report Creation:  <a href="https://vimeo.com/593886941">https://vimeo.com/593886941</a>	Illustrates how the User Manual is applied to create an account upload reports, extract data, and how an outside institution requests access and receives permission.
8	Domo AB ESG Reports 2017 – 2021:  <a href="#">DOMO AB ESG Reports 2017-2012 (virus scanned).zip</a>	Zip file containing ESG Reports for use by the Reviewer for testing the ESG Secure Reporting Network

Table 1. Table of Supplementary Documentation for the Submission

## 5.1 Scan Solution

Section 3.1 details a general description of the scanning methods employed in our submissions. As noted, a comprehensive AI methodology has been summarized for the extraction of a selected financial and ESG dataset (BASF) and a truncated method utilizing a tabular format of information has been applied in the demonstration of the platform and network. This also demonstrates the flexibility of our approach.

Item 2 presents two supplementary PDF documents, Parts 1 and 2, detailing the employed methodologies, methods, and workflow for document scanning and XBRL extraction.

Item 3 is a video presenting further details of the employed scanning methodologies and methods following the content of Item 2, Parts 1 and 2.

## 5.2 Creation of Tokens, Data Management and The Secure Reporting Platform

### 5.2.1 Sections 3.2 and 3.3 describe the general working methods involved in: uploading a report for scanning, the extraction of ESG data into XBRL and the allotting of NFTs, requesting and granting access to the ESG data through the NFT, and a transaction and payment facility incorporated in the DLT platform.

Item 4, the *Technical Whitepaper and Architectural Overview* outlines our platform's approach to the software and the choice of Hedera Hashgraph software. In addition, further details are presented of the following:

- Cybersecurity involved;



- Microservices architecture;
- Sequence of reporting operations
- Business model and Payment gateway employed; and
- Further Value-add to the Secure ESG Reporting Network

5.2.2 Item 5 is the *User's Manual for Reporting Organization*. This manual provides detailed instructions for Reviewers who are interested in experiencing the ease and efficiency of uploading reporting information, the processing of the extracted information into financial and ESG Dashboards, and the requesting and granting of data access.

5.2.3 Item 6 is a video illustrating how NFTs work in Hedera Hashgraph and the IBM Cloud in connection with the Secure ESG Reporting Network. Of note is the speed of transaction with the NFTs and the global reconciliation.

5.2.4 Item 7 is an *Account Creation and Report Creation video* demonstrating the account establishment, login procedure and uploading of reports into the platform using the reports included in the DOMO AB ESG Reports Zip file, Item 8.

The video in Items 7 and 8 detail the specified steps identified in the User's Manual in Item 5 and how they are to be followed. Please note that the current software is only a prototype and errors in processing may occur. We apologise for any interruptions beforehand.

## 6 Scalability

### 6.1 Data Provider Protection

As described above, we propose a data collection and dissemination platform that can be as inclusive of XBRL taxonomies and data presentation as needed. The financial and / or ESG data is true and certifiable and can only be amended by the original data provider. As formed, the prototype engenders a high degree of security and trust with provided data, not available elsewhere.

### 6.2 Extended Hybrid Taxonomies and Other Reporting Formats

The ESG Extended Hybrid taxonomies used in formulating the token have been developed following the guidelines of the European Single Electronic Format (ESMA) and the European Single Access Point (ESAP) for structured data formats. The information can thus be used by any organisation, including regulatory organisations such the European Securities and Markets Authority (ESMA).

### 6.3 Software Flexibility



The extendable architecture and programming language allows amalgamation of the platform with a host of other currently used filing and reporting systems. The flexibility of the software allows extensions to include any file format/XBRL taxonomy, including direct integrations with corporate ERP (Enterprise Resource Planning) systems if required.

#### 6.4 Additional Information Sources

Additional applications providing data obtained from Internet of Things (IoT) providers or satellite mapping information suppliers can also be developed and included.

#### 6.5 Wider and Related Further Financial and ESG Indicators

6.5.1 As the Proof of Concept demonstrates, assessments of similar ESG metrics can be undertaken for individual firms and assets within and across sectors. This removes the critical uncertainty in using undetermined simulated data, modelling, and trends.

A wider dataset including further metrics can be applied to bio-diversity data, other environmental indicators (water use and discharge), social (safety incidents, staff turn-over) and governance indicators (number of minorities on Boards). This would allow true integration of ESG with financial performance, permitting financial and regulatory assessment and an apportionment of risk exposure and appetite.

6.5.2 Other graphs and data can be fashioned with the core data displayed in Figures 3 through 5 combining related indicators within and outside of national boundaries. For example, Emissions per sector per time ( $E_{s,t}$ ) and Outstanding loans on a sector basis ( $L_{s,t}$ ) can be generated with actual data and the true performance of Carbon Critical Sectors (CCrS) can be confirmed and tracked.

6.5.3 It is noted that at present there is no mandatory reporting of ESG indicators within the EU. The platform and network described in our submission has been designed to allow full reporting of the expected metrics and indicators when required by the EU Corporate Sustainability Reporting Directive (CSRD).

6.5.4 It is further noted that the AI software used herein would not pose a significant risk as defined the EU Regulation concerning artificial intelligence (AI) (Draft).

#### 6.6 Environmental Benefits

Given that Hedera Hashgraph is Green DLT-compliant, our submission demonstrates a serviceable platform that uses a minimum of electricity to secure, store, and share accredited data in real time. Other DLT software, particularly that used with



blockchain, is known to be very energy intensive with a large carbon footprint and very slow.

Reviewers will note that actual tokens, transaction records and payments are being created and exchanged quickly in real time with the submitted software prototype.

## 7. Feasibility

7.1 As outlined and demonstrated in our accompanying videos and presentations, our submission meets the following challenges.

- A solution is demonstrated that automatically scans the current paper-based reporting of limited or extended financial and ESG indicator sets and extracts that information digitally into XBRL or related software languages;
- The use of a hybrid ESG taxonomy for recognizing the scanned data encompassing a wide portfolio of well-known and used ESG taxonomies, not relying on any one in particular;
- The platform encompassing the DLT (Digital Ledger Technology) issues tokens including the financial and ESG data allowing the storage and permitting use of the data within a secure network by SMEs, private and public companies, regulators, and financial institutions;
- Combined with Non-Fungible Token creation, a Fully-Fungible digital-Euro payment and transaction exchange has been created with records included into an electronic wallet;
- Additional NFTs can be attached to the main token to demonstrate accreditation and certifying assurances as needed;
- The business case noted herein incentivizes reporters to account for their non-financial performance and increase their reporting and scope of metrics and data. The network also permits confirmation by IoT and satellite technology observations and provides a resolution for the data currently unknown.

## 8. Conclusion

We have satisfied the aims of our submission:

- Provided the context for our submission entitled **AI Based Automated PDF to XBRL – The Secure ESG Reporting Network**;



- Presented an overview of our submission by demonstrating a Proof of Concept and a Roadmap of further supplementary material; and
- Provided insights as to the scalability and feasibility of The ESG Secure Reporting Network.

With further resources and time, we are prepared to extend the existing platform to a full production software. We believe this solution can resolve the crucial issues regarding data collection and disclosure facing financial and investments institutions and governments.

**Team Zabel**

**1 September 2021**



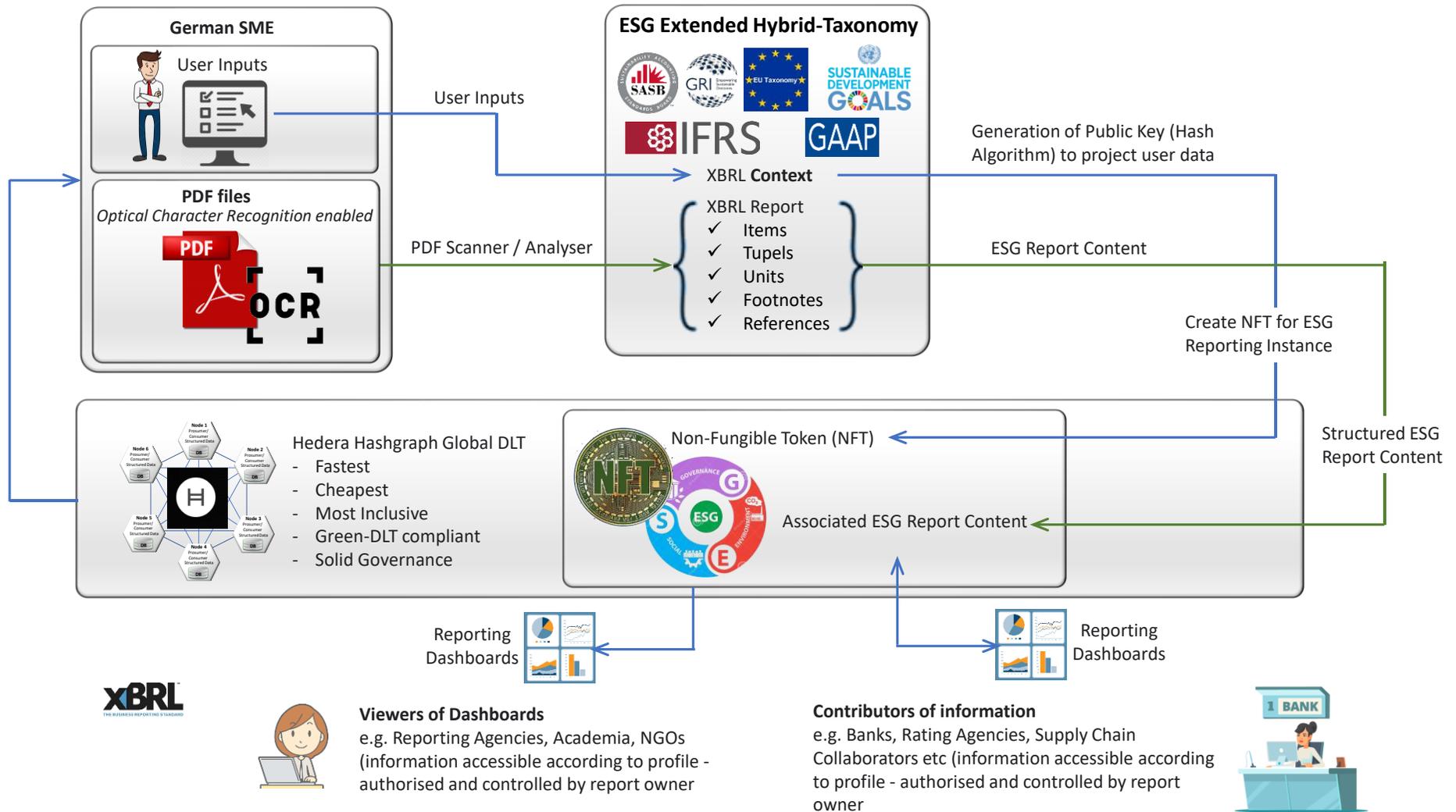


Figure 1. Diagramme describing the Secure ESG Reporting Platform and Network



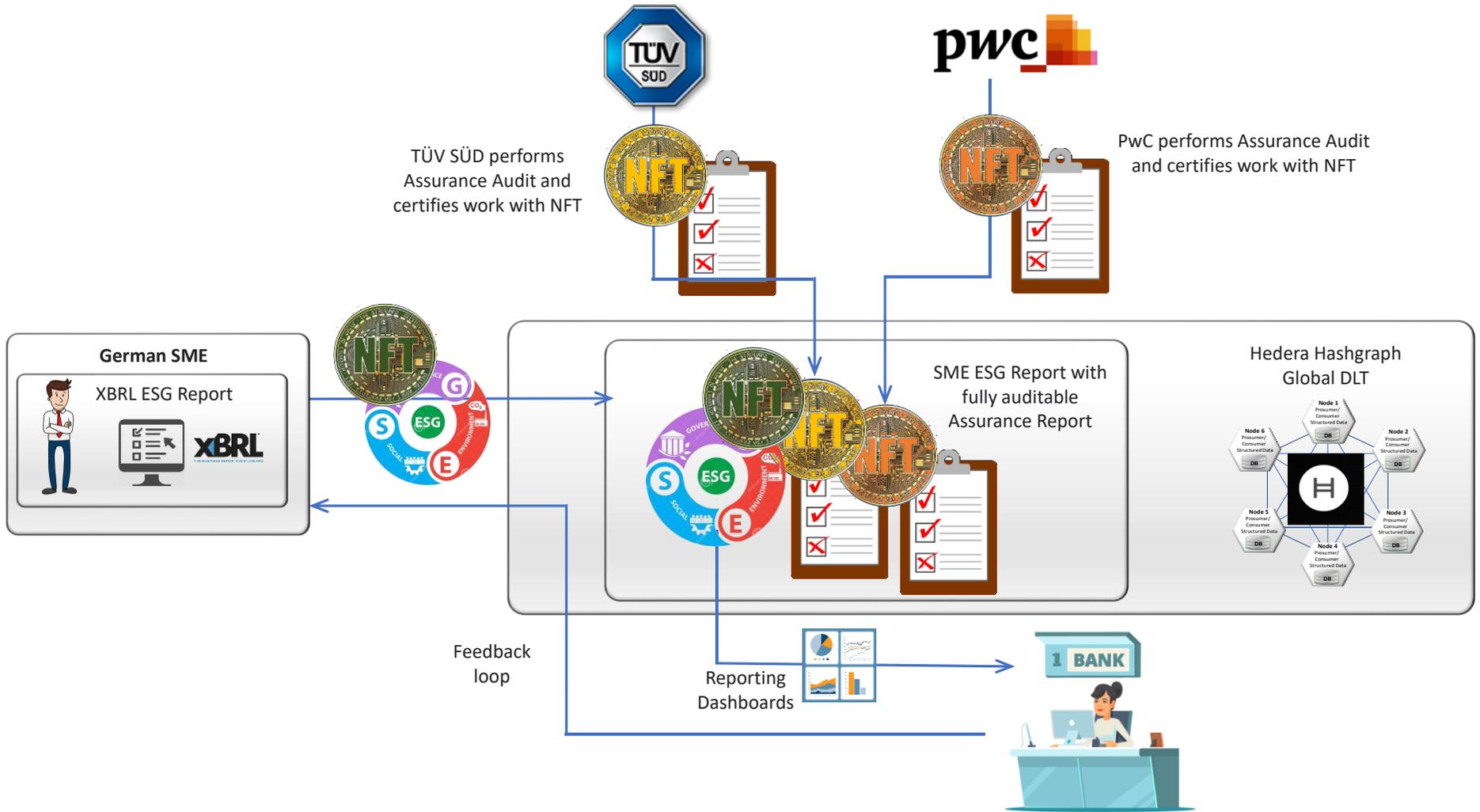


Figure 2. Methodology showing how assurors and auditors would use the network and attach assurance tokens to the main reporting token



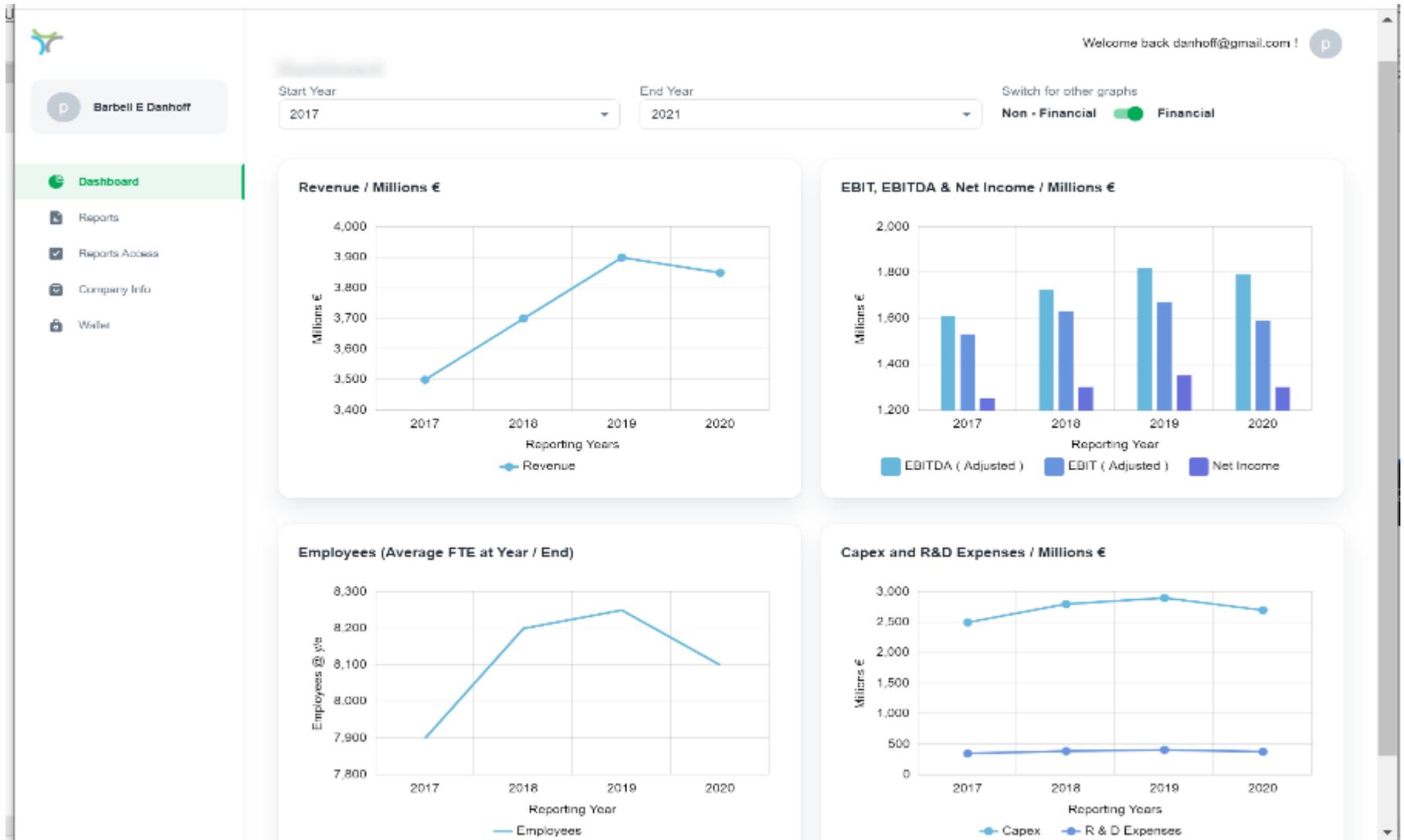


Figure 3. Prototype Dashboard screenshot showing sample financial reporting data for Danhoff 2017-2020





Figure 4. Sample Prototype Dashboard screenshot showing non-financial information for Danhoff 2017-2020: Environmentally sustainable business according to the EU CSRD, Carbon emissions, Energy intensity and Water consumption. GHG Emissions also includes self-established targets and the EU target.



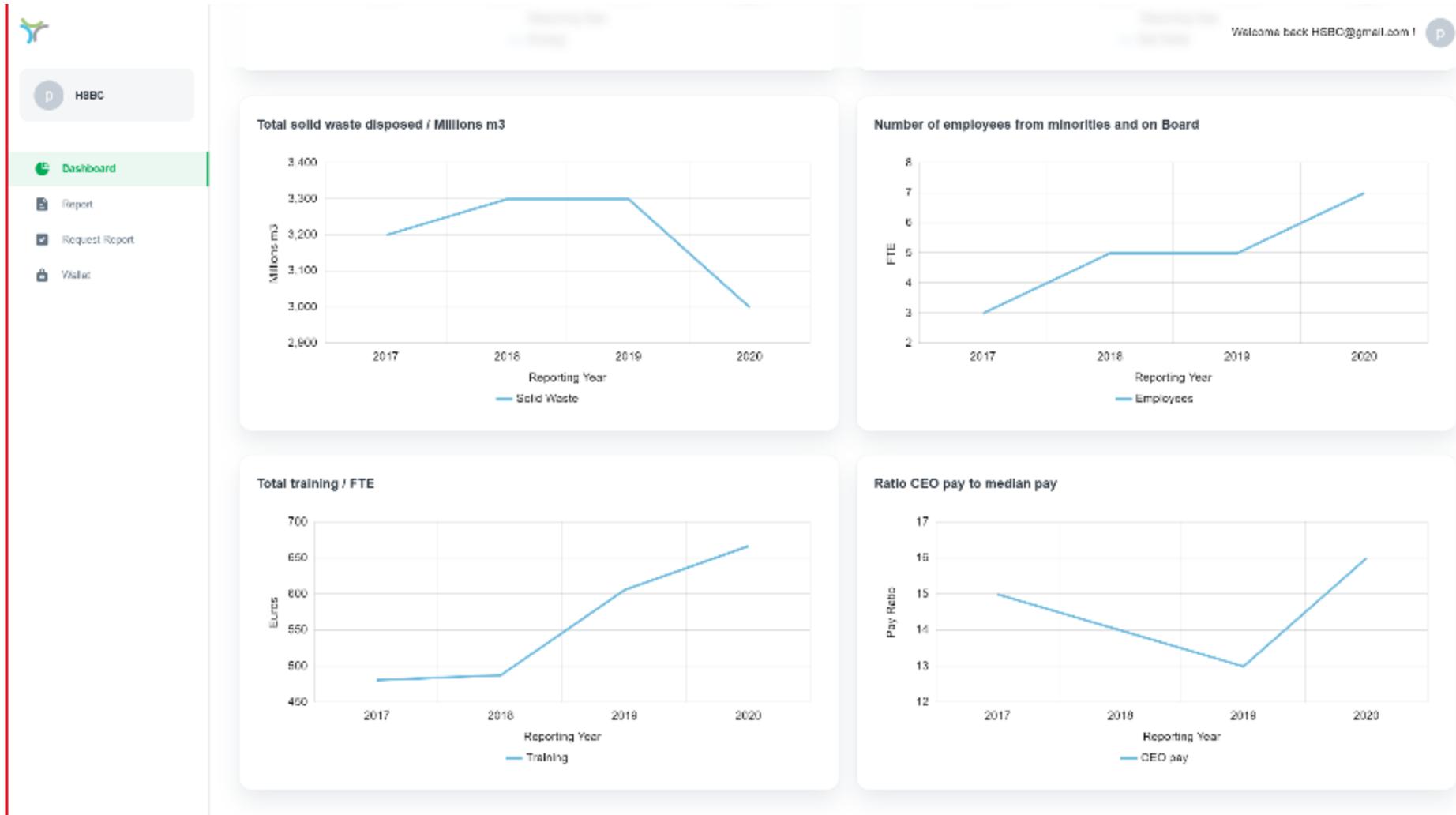


Figure 5. Sample Prototype Dashboard screenshot showing non-financial information for Danhoff 2017-2021: encompassing Solid waste produced, Number of minorities on the Board, Total training per Full Time Employee and the Ratio of CEO pay to median pay.





Use Case Listed multinational

Global No. 1

Integrated annual reports best-in-class

Separate Scope 3 GHG Emissions report  
diverse Engagements (WEF, Value Balancing  
Alliance, ...)

Sector Chemicals

Country Germany

Figure A1. BASF Information





## Context info:

### Size information

Employees:	110.000
Business segments:	6
Fully consolidated cc	> 400
# Suppliers	70.000
# Customers	90.000

### Financial reporting

IFRS

### ESG reporting

SASB

GRI

CDP

### ESG Ratings/Scorings

MSCI ESG

CDP

### Audit

2020 group f/s IFRS

### Assurance

Reasonable

2020 selected ESG KPIs

Non-financial declaration

Limited

2020 ESG disclosures

Specific audits

2020 TfS compliance

2020 JV (human rights)

Figure A2. BASF Information





# 1 Input/Output Table

BASF Group	Standard	Item	XBRL taxonomy	Industry segment	Indicator / KPI	Metric	2020	2019	2018 (Base year)
<b>Context Info</b>				Chemicals					
<b>Financial</b>	IFRS " "		'ITI-2021-by-fs " "		Revenue Research and development cost Number of employees y/e	€ Mio. € Mio. #			
<b>Environmental</b>	SASB GRI "	110a.1 305-2 305-3	SASB n/a = custom "		Scope 1 emissions Scope 2 emissions Scope 3 emissions	metric tonnes CO <sup>2</sup> e metric tonnes CO <sup>2</sup> e metric tonnes CO <sup>2</sup> e			
<b>KPIs</b>	GRI	305-4	n/a = custom		GHG Emissions Intensity	scope 1+2 metric t CO <sup>2</sup> e/metric t sales products			

Figure A3. BASF Input / Output table





## 2 Key financial data –actual (1)

Key data of the BASF Group					
I. Economic data					
		2020	2019	2018	% (3y.)
Sales	mio. €	59.149	59.316	60.220	-1,8%
EBITDA before special items <sup>a</sup>	mio. €	7.435	8.324	9.271	-19,8%
EBITDA <sup>a</sup>	mio. €	6.494	8.185	8.970	-27,6%
EBIT before special items <sup>a</sup>	mio. €	3.560	4.643	6.281	-43,3%
EBIT <sup>a</sup>	mio. €	-191	4.201	5.974	-103,2%
Net income	mio. €	-1.060	8.421	4.707	-122,5%
ROCE	%	1,7	7,7	12,0	-85,8%
Earnings per share	€	-1,15	9,17	5,12	-122,5%
Equity	mio. €	34.398	42.350	36.109	-4,7%
Investments including acquisitions <sup>b</sup>	mio. €	4.869	4.097	10.735	-54,6%

Figure A4. BASF Key financial data





## 2 Key financial data –actual (2)

Key data of the BASF Group					
II. Sustainability data					
Employees at year-end		110.302	117.628	122.404	–9,9%
Employees (average)		115.973	119.200	118.371	–2,0%
Personnel expenses	mio. €	10.576	10.924	10.659	–0,8%
Research and development expenses	mio. €	2.086	2.158	1.994	4,6%
GHG emissions (scope 1+2) <sup>c</sup>	mio. t CO <sup>2</sup> eq	20,8	20,9	22,7	–8,6%
Scope 1	mio. t CO <sup>2</sup> eq	17,5	16,6	17,8	–1,9%
Scope 2	mio. t CO <sup>2</sup> eq	3,3	3,5	4,1	–19,4%
Scope 3	mio. t CO <sup>2</sup> eq	92,0	100,0	n/a	–8,0%
GHG Emissions intensity <sup>d</sup>	#	0,6	0,6	0,6	10,7%
Primary energy demand	GWh	60,3	58,5	60,6	–0,5%
Water consumption	mio. m <sup>3</sup>	63	61	70	–10,0%
Total air pollutants	1.000 t <sup>3</sup>	23,8	25,0	26,9	–11,5%
Energy efficiency in production processes	kg of sales product/MWh	540	598	626	–13,7%
<sup>a</sup> Restated figures 2019; for more information, see the Notes to the Consolidated Financial Statements <sup>b</sup> Additions to property, plant and equipment and intangible assets <sup>c</sup> Excluding sale of energy to third parties <sup>d</sup> Scope 1 + 2 in metric t CO <sub>2</sub> eq / metric t sales product					

Figure A5. BASF Key financial data





Use Case Listed business group

No. 3 in Germany, No. 1 regenerative energy  
Strong focus on ESG, renewables & charging  
Infrastructure in GER and Europa

Green bond issuer

Case study – EU sustainable finance taxonomy

Sector Energy Supply

Country Germany

Figure A6. EnBW Company information





## Context info:

### Size information

Employees:	ca. 25.000
Business segments:	3
Fully consolidated co's:	217

### Financial reporting

IFRS

### ESG reporting

SASB

GRI

CDP

### ESG Ratings/Scorings

MSCI ESG

CDP

### Audit

2020 group f/s IFRS

### Assurance

Reasonable

2020 selected ESG KPIs

Non-financial declaration

Limited

2020 ESG disclosures

Specific audits

2020 TfS compliance

2020 JV (human rights)

Figure A7. EnBW Context Information





# 1 Input/Output Table

EnBW	Standard	Item	XBRL taxonomy	Industry Segment	Indicator / KPI	Metric	2020	2019	2018
<b>Context Info</b>				Energy supply					
<b>Financial</b>	IFRS		'ITI-2021-by-fs		Revenue	€ Mio.			
	"		"		Capital Expenditures	€ Mio.			
	"		"		Number employees (FTE) y/e	#			
<b>Environmental</b>	GRI	305-1	n/a = custom		Scope 1 emissions	metric t CO <sup>2</sup> e2			
	"	305-2	"		Scope 2 emissions	metric t CO <sup>2</sup> e2			
	"	305-3	"		Scope 3 emissions	metric t CO <sup>2</sup> e2			
	"	302-1	"		Energy consumption	GWh			
<b>KPIs</b>	EU Taxonomy		"		Sustainable Revenues	in %			
	"		"		Sustainable Capital Expenditures	in %			

Figure A8. EnBW Input / Output table





Key data of the EnBW Group					
<b>I. Economic data</b>					
		<b>2020</b>	<b>2019</b>	<b>2018</b>	<b>% (3y.)</b>
External revenue <sup>1</sup>	mio. €	19.694	19.436	20.815	-5,4%
Adjusted EBITDA	mio. €	2.781	2.432	2.158	28,9%
Adjusted EBIT	mio. €	1.392	945	958	45,3%
Adjusted group net profit	mio. €	683	787	438	55,9%
ROCE	%	6,3	5,2	6,5	-3,1%
CAPEX <sup>2</sup>	mio. €	2.178	1.801	1.370	
<b>II. Sustainability data</b>					
Employees at year-end		24.655	23.293	21.775	13,2%
Employees (FTE; average)		23.078	21.843	20.379	13,2%
Personnel expenses	mio. €	-2.179	-2.007	1.872	-216,4%
Research and development expenses	mio. €	70,6	54,4	40,6	73,9%
Direct GHG emissions (Scope 1)	mio. t CO <sup>2</sup> eq	9,6	10,8	16,6	-42,4%
Direct GHG emissions (Scope 2)	mio. t CO <sup>2</sup> eq	0,8	0,9	1,0	-24,0%
Other indirect GHG emissions (Scope 3)	mio. t CO <sup>2</sup> eq	49,5	42,0	16,8	193,6%
CO <sub>2</sub> -intensity of own electricity generation <sup>3</sup>	g/kWh	372	419	553	-11,2%
Total final energy consumption <sup>4</sup>	GWh	2.919	2.799	3.252	-10,2%
Share of renewable energies of final energy consumption	%	54,6	53,2	51,1	6,8%
Water consumption	Mio. m <sup>3</sup>	34,2	40,0	53,5	-36,1%
Proportion of women in overall workforce	%	27	26,8	26,4	2,3%
Environmentally sustainable revenue (prelim.)	in %	18	15	N/A	20,0%
Environmentally sustainable CAPEX (prelim.)	in %	26	24	N/A	8,3%

<sup>2</sup> 2019 restated  
<sup>2</sup> Additions to property, plant and equipment and intangible assets  
<sup>3</sup> excluding nuclear

Figure A9. EnBW Key Financial data



# MAHLE

Use Case Non-listed family owned multinational  
Global business and representation  
Top-of-Class ESG reporting

Sector Automotive Supply

Country Germany

Figure A10. Mahle Company Information



# MAHLE

<b>Context info:</b>	<b>Size information</b>		<b>ESG reporting</b>	
	Employees:	> 70.000	GRI	
	Business segments:	5	CDP	
	Fully consolidated co's:	> 150		
	<b>Financial reporting</b>		<b>ESG Ratings/Scorings</b>	
	German GAAP		Ecovadis	
			CDP	
	<b>Audit</b>		<b>ESG Assurance</b>	
	2020 group f/s		Reasonable	n/a
			Limited	n/a
<b>XBRL Taxonomy</b>		Specific audits	n/a	
n/a				

Figure A11. Mahle Context Information





## 1 Input/Output Table

Mahle	Standard	Item	XBRL taxonomy	Industry segment	Indicator / KPI	Metric	2020	2019	2018
<b>Context Info</b>				Automotive supply					
<b>Financial</b>	EU (German) GAAP		German GAAP		Revenue	€ Mio.			
	EU (German) GAAP		"		Capital Expenditures	€ Mio.			
	EU (German) GAAP		"		Number employees y/e	#			
<b>Environmental</b>	GRI (+CDP)	305-1	SASB		Scope 1 emissions	t CO2e			
	GRI (+CDP)	305-2	n/a = custom		Scope 2 emissions	t CO2e			
	GRI (+CDP)	302-1	"		Primary energy consumption	MWh			
<b>KPIs</b>	GRI (+CDP)	305-4	n/a = custom		Relative emissions	#			
	GRI (+CDP)	302-3	n/a = custom		Relative energy consumption	#			

Figure A12. Mahle Input / Output Table





## 2 Key financial data -actual

Key data of the Mahle Group					
I. Economic data					
		2020	2019	2018	% (3y.)
Sales	mio. €	9.774	12.049	12.581	-22,3%
CAPEX <sup>a</sup>	mio. €	433	549	609	-28,9%
Employees at year-end		72.184	77.015	79.564	-9,3%
Research and development expenses	mio. €	644	751	751	-14,2%
I. Sustainability data					
Own greenhouse gas emissions <sup>b</sup>	t CO <sup>2</sup> e	not avail.	1.450.135	1.642.803	-11,7%
Scope 1	t CO <sup>2</sup> e	not avail.	217.081	253.003	-14,2%
Scope 2	t CO <sup>2</sup> e	not avail.	1.233.054	1.389.800	-11,3%
Relative emissions <sup>b</sup>	t CO <sup>2</sup> e/EUR mio. sales	not avail.	120,4	130,6	-7,8%
Primary energy consumption <sup>c</sup>	MWh	not avail.	3.180.128	3.494.632	-9,0%
Relative energy consumption <sup>c</sup>	MWh/EUR mio. sales	not avail.	264	278	-5,0%
<sup>a</sup> without first consolidation <sup>b</sup> .... <sup>c</sup> as measured against sales					

Figure A13. Mahle Input / Output Table



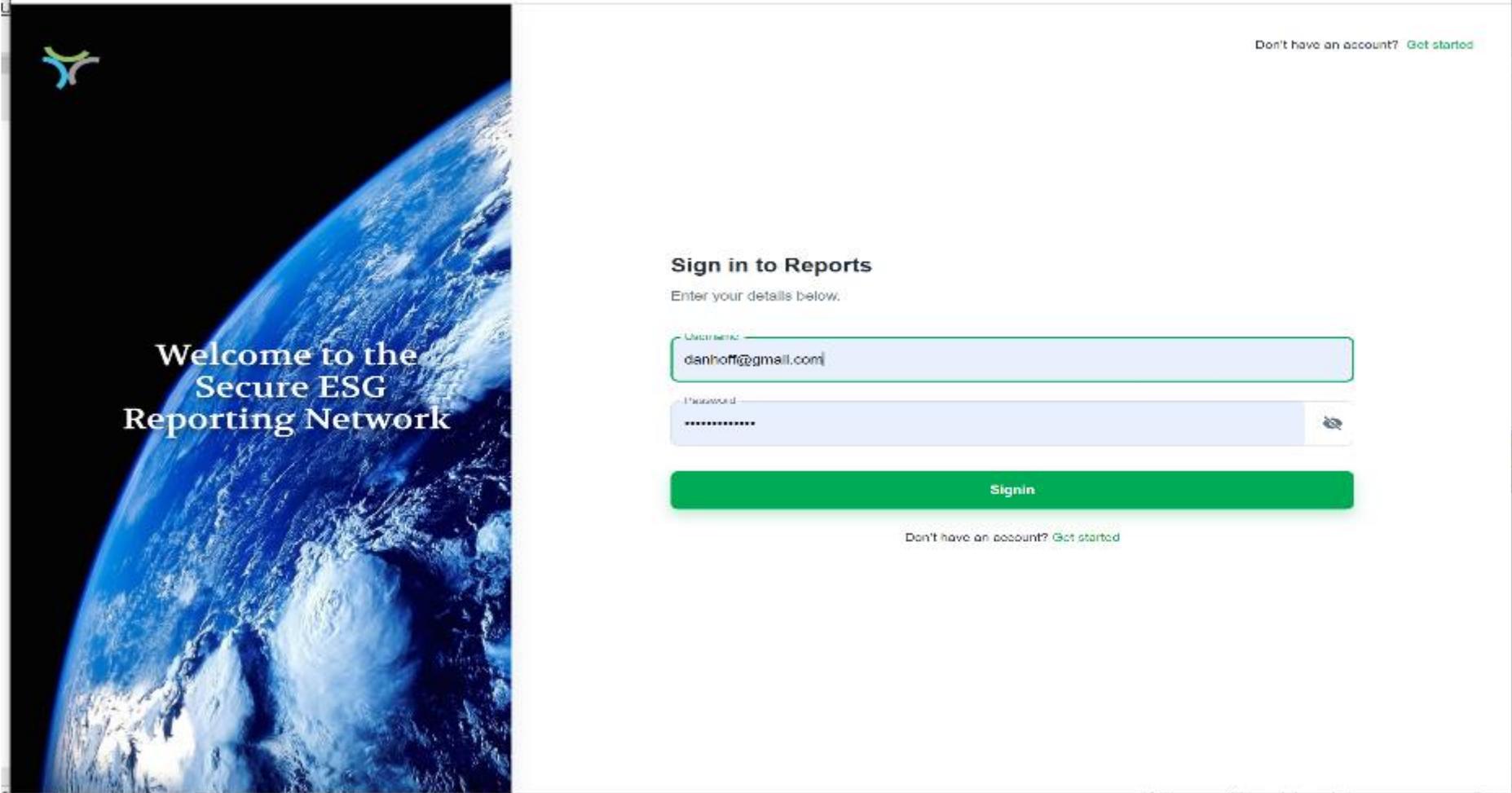


Figure B1. Screenshot of login page for the Secure ESG Reporting Network



Welcome back danhoff@gmail.com |

Barbell E Danhoff

## Reports

[+ New Report](#)

### ESG Platform

Report Title	Report Year	File Path	NFT Token Id	Sector	Region	Company Size	HQ Location	Action
Danhoff ESG Report 2017	2017	/root/Dit/inf_reports/config/7fe07744-5bfb-4174-b64b-f2f8fad57842/Xis/FilePath/2017 Danhoff AB Summary Reporting App Data (v1).xlsx	0.0.2270518	Infrastructure	Southern Germany	Mullinational	Munich	
Danhoff ESG Report 2018	2018	/root/Dit/inf_reports/config/7fe07744-5bfb-4174-b64b-f2f8fad57842/Xis/FilePath/2018 Danhoff AB Summary Reporting App Data (v1).xlsx	0.0.2270523	Infrastructure	Southern Germany	Multinational	Munich	
2019 DANHOFF ESG Report	2019	/root/Dit/inf_reports/config/7fe07744-5bfb-4174-b64b-f2f8fad57842/Xis/FilePath/2019 Danhoff AB Summary Reporting App Data (v1).xlsx	0.0.2270537	Renewable Resources & Alternative Energy	Southern Germany	Mullinational	Munich	
2020 DANHOFF ESG Report	2020	/root/Dit/inf_reports/config/7fe07744-5bfb-4174-b64b-f2f8fad57842/Xis/FilePath/2020 Danhoff AB Summary Reporting App Data (v1).xlsx	0.0.2275566	Infrastructure	Southern Germany	Mullinational	Munich	

Rows per page: 5 ▾ 1-4 of 4 < >

Figure B2. Screenshot showing uploading of Danhoff reports. Note the tokens allocated, sector, region and company size.



**Reports**

**Danhoff ESG Report 2017 - 2017** [View XBRL File](#)

Data Name	Disclosure Label	Taxonomy Code	Value In Year	Units	Audit / Assurance	Action
Key economic data	Reporting Year	F2.107	2017	Year	yes	
Key economic data	Revenue	IAS-1.102	3500.00	mic. €	yes	
Key economic data	(Adjusted) EBITDA	F2.108	1610.00	mic. €	yes	
Key economic data	(Adjusted) EBIT	F2.109	1530.00	mic. €	yes	
Key economic data	Net income	IAS-1.106.d.i	1250.00	mic. €	yes	
Key economic data	ROCE	F2.110	0.09	%	yes	
Key economic data	Total assets	IAS-1.78.e	900.00	mic. €	yes	
Key economic data	Equity	IAS-1.55	20000.00	mic. €	yes	

Figure B3. Screenshot showing Disclosure labels for Danhoff, the taxonomy code, value and audit / assurance



The screenshot shows a user interface for 'Reports' with a modal window titled 'Key economic data'. The modal displays the following information:

- Disclosure Label:** (Adjusted) EBITDA
- Report Title:** Danhoff ESG Report 2017
- Report Year:** 2017
- Data Name:** Key economic data
- Taxonomy Code:** F2.108
- Value In Year:** 1610.00
- Units:** mio. €
- Audit / Assurance:** yes
- Audit / Assurance Level:** Quarterly Review
- Auditor / Assurer:** Internal
- Information Source:** SRs

The background shows a table of reports with columns: Data Name, Value In Year, Units, Audit / Assurance, and Action. The table contains several rows of key economic data.

Figure B4. Screenshot showing the Danhoff Key Economic Data extracted from the XCBRL file



The screenshot shows a user interface for a reporting system. On the left is a sidebar with a logo at the top and a user profile for 'Barbell E Danhoff'. Below the profile are navigation links: 'Dashboard', 'Reports', 'Reports Access' (highlighted with a green bar and a checkmark), 'Company Info', and 'Wallet'. The main content area is titled 'Pending Report Viewing Requests' and contains a table with the following data:

Name of Organization	Location	KYC Verified	Type of Organisation	Requested Reports
HSBC Bank Ltd	25 Rose Lane	Yes	BANK	

Figure B5. Screenshot showing HSBC requesting to view Danhoff information





Figure B6. Screenshot showing Access Granted for HSBC to view Danhoff information

