



A case study on **emission analysis** and **accounting** in the **Waste Management Industry** 



## My background

- Bachelor in Computer Engineering (USN)
- Master in Systems Engineering (USN)
- Two years of experience in developing Industrial IoT applications
- Transitioned towards project management



#### Case background

- Envir **(The industry partner)** is a waste management company located in Bergen
- In a renewing process
- They wanted to automate emission reports, gain emission awareness and provide emission data to customers
- Digitread Connect has a data management platform and specializes in retrieving data from industrial equipment
- We wanted to gain knowledge on how to automate emission reports









"There is a lack of **knowledge** on **collecting** and **analyzing emissions data**. This is partly due **to inadequate regulations** and **standards**, which in turn is a **complication** for **analysis** and **data collection**."



### Literature Review Highlights

Industry standard for material reuse is 0.9%

Norway must reduce its emissions by at least 55% by 2030

The UN has SDG's connected to sustainable waste management

30% of all nature on land should be protected 30% of partly damaged nature should be restored by 2030 SDG 12, Responsible Consumption and Production

SDG 13, Climate Action

SDG 15, Life of Land

New and strengthened emission reporting rules were implemented in 2023



Site Visit



Got a feel of the operations





# Workshop - Gigamapping



DIGITREAD

#### Workshop results -> Flowchart



University of South-Eastern Norway

### Flowchart -> Concept of Operations





#### **Emission Scope Definitions**



**Scope 1** (Direct emissions): Mainly fuel oil



#### Scope 2

(Indirect emissions by owned equipment): Mainly electricity



#### Scope 3 (Indirect emissions by not owned equipment): All types



#### Identified Data Sources

CONNECT



### ScopeOps? Concept of Scoperations? Categorization of Emissions?





#### Research Methodology

DIGITREAD

CONNECT

University of

South-Eastern Norway



### Highlights from the Semi-Structured Interviews



Interviewees report on Scope 1 & 2 emissions



The GHG Protocol was the most used reporting framework



Motivation to report comes from owners, customers, and regulators



#### Table 1: CO2 accounting industry partner February 2023

Scope	Emission source	Emissions [kg CO2]
Scope 1 (Direct emissions)	5 966L Biodiesel	14 974* <sup>1</sup>
Scope 2 (Indirect emissions)	23 897kWh electricity	263* <sup>2</sup>
Scope 3 (Indirect emissions)	N/A	-

\*<sup>1</sup> Biodiesel has an emission factor of 2,51kg CO2/liter (Norwegian Environment Agency., 2021)

\*<sup>2</sup> Electricity has an emission factor of 0,011kg CO2/kWh (Norwegian Water Resources and Energy Directorate et al., 2022)











#### Discussion



What are the primary sources of emissions data?



How can IoT technology retrieve accurate energy consumption?



What is the industry standard for emission accounting for waste management companies in Norway?



What measures can the industry partner take to automate the emission accounting process?



What measures can the industry partner take to decrease emissions?



### Limitations of the study



Small sample size



Focus on benefits

No filtering



#### Conclusion



Formal accounting rules fail to pinpoint exact measures



There is a lot of data available – the problem is making sense of it all



#### Contribution to knowledge and practice



Site visit -> Workshop -> ConOps -> Categorization of Emissions -> Concept



**Emission reports can be automated** 



DIGITREAD CONNECT

#### Future Work



Investigate the adoption of IoT technology for emission accounting in other industries

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Research ways to automate the current manual task



Examine long term effects of IoT-based solutions in reducing emissions



Experiment with different workshop approaches



#### Thanks for listening!

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