



The Value of Integrating Operations, Financial, and Environmental Data through a connected EH&S Approach

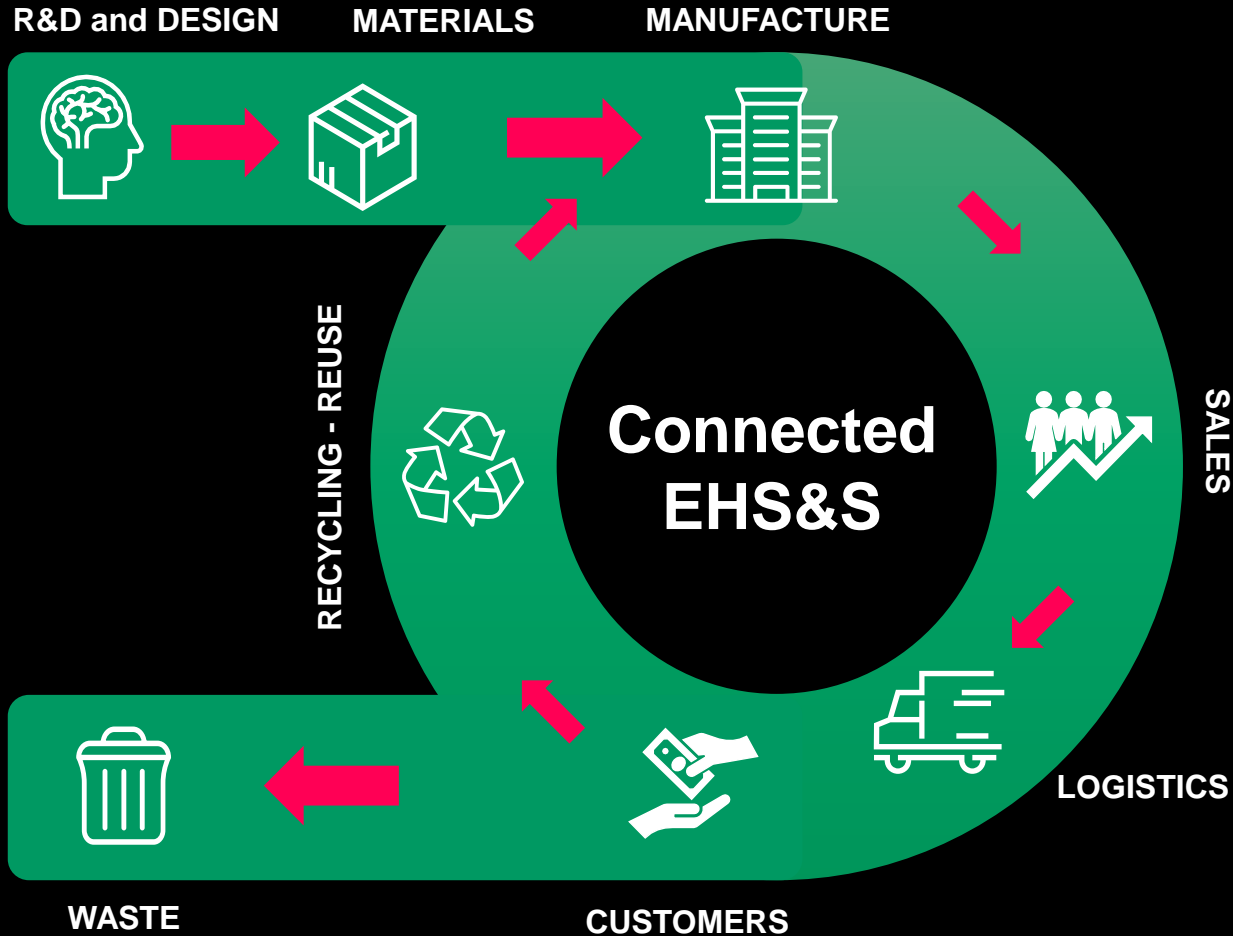


It's always been important, now it's business critical



GHD Connected EH&S

An ecosystem approach to value creation

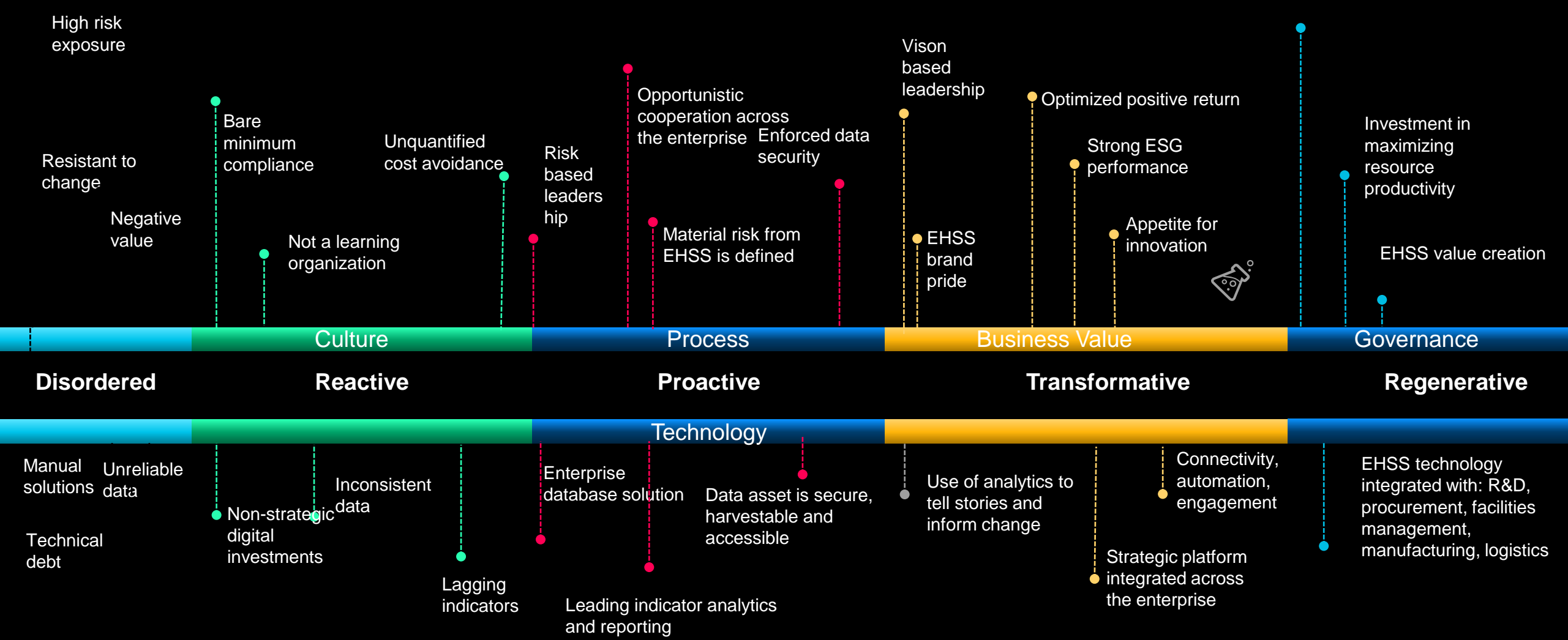


Improves performance by driving productivity, resilience and innovation

Connecting EHSS into R&D, supply chain, logistics, sales and operations.

Transitions from reactive to regenerative while transforming digital infrastructure from systems of record to systems of engagement.

GHD EHS Digital Maturity Map



What might the integration of EHS&S, Operations and Financial data tell us?

Reveal opportunities and Liabilities

Direct capital investment

Divulge exposure

Quantify benefits

Provide best practices

Benchmark Marking

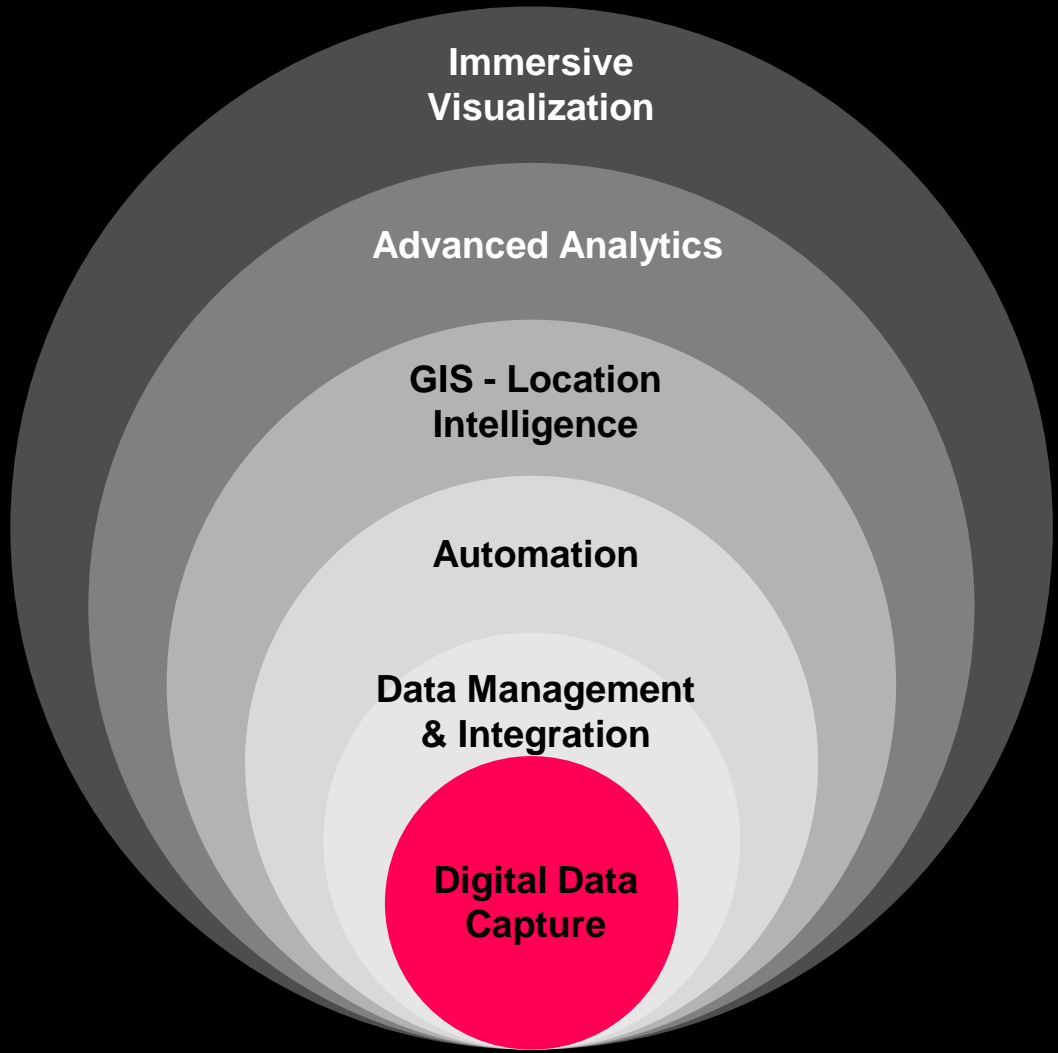
Risk Quantification and Mitigation Strategies





Transforming the Value of EHS&S Data

Digital Data Onion

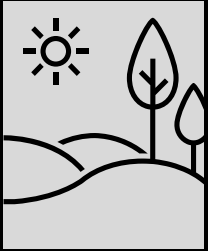


↑
INCREASING VALUE

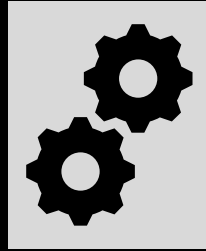
- Interactive dashboards and visualization of data. Bringing data to life.
- Insights from connected data sets and creating descriptive / predictive / prescriptive solutions.
- Spatial analytics, remote sensing, GIS as a service.
- Data Analytics: Application of Data Science, Machine Learning, Artificial Intelligence
- End-to-end management of data in a central data environment - providing one source of truth.
- Digital data collection to improve accuracy, accessibility, usability of data.



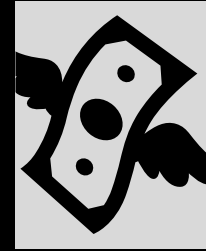
$1+1+1 = X^{10}$



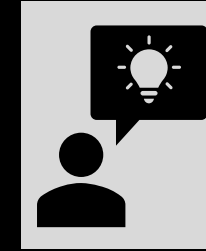
EHS&S
Data points



Operations
Data Points



Financial
Data Points



Data Derived
But what is revealed?

Air Emissions

Production

Revenue

Carbon Intensity

Water Quality

Energy consumed

EBITA

Productivity

Waste Generation

Water consumed

COGS

Efficiency

Wastewater

Raw materials

Material costs

Risk

Safety Incidents

Labor hours

Insurance rates

Opportunities

Near Misses

Products produced

Cost of capital

Environmental Releases

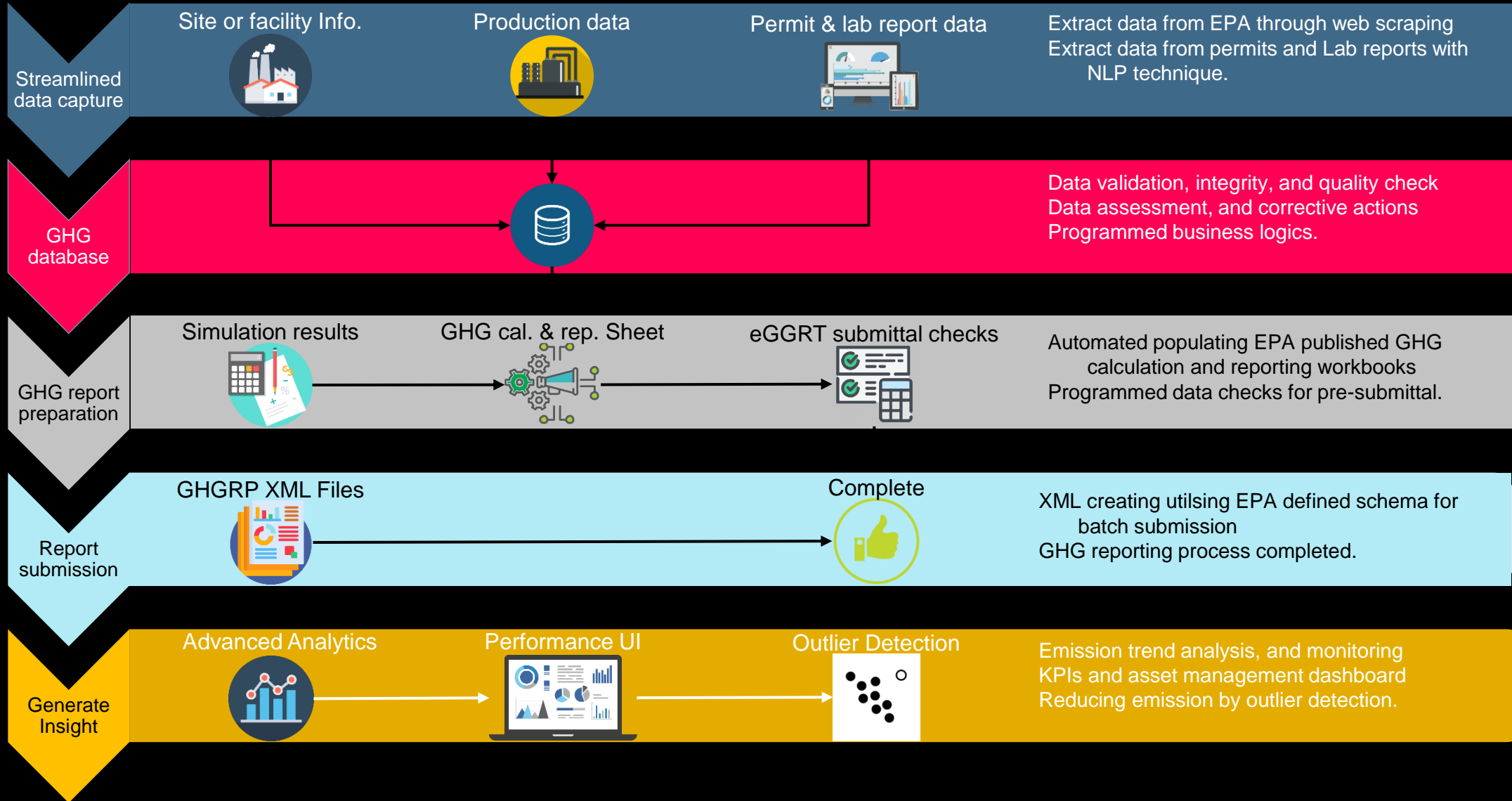
Down time

Stakeholder demands



Case Study 1: Industrial & Manufacturing Sector

Integrated Operations and Environmental Data in Reporting



GHD Case Study 3: Vendor Supply Chain Waste Management

234,050.00

Volume Weight in Pounds

3412

Waste Shipments Handled

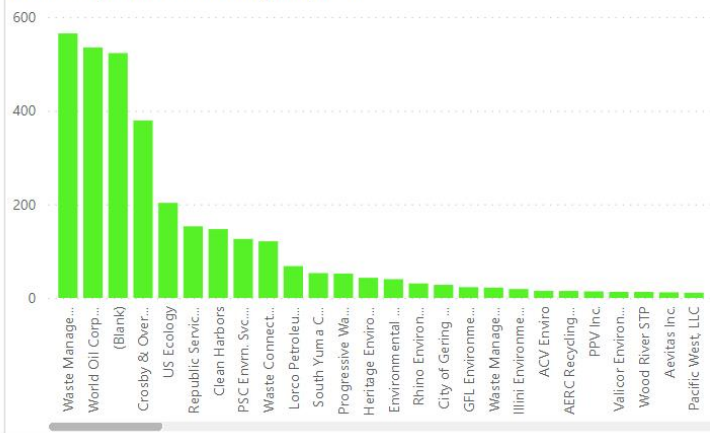
1474

Count of VendorNa...

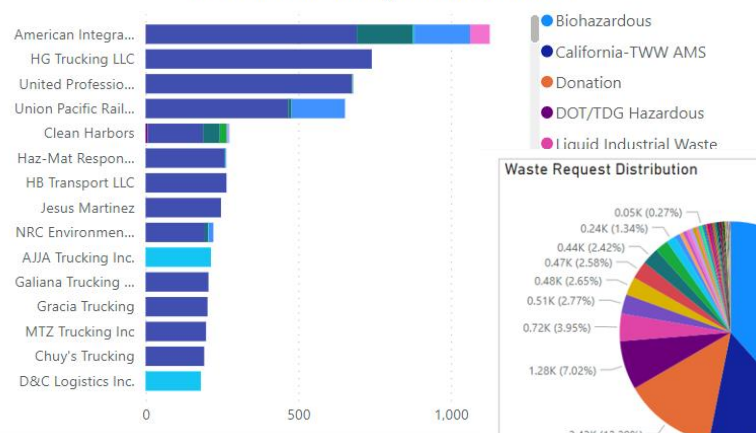
Waste Generator Address



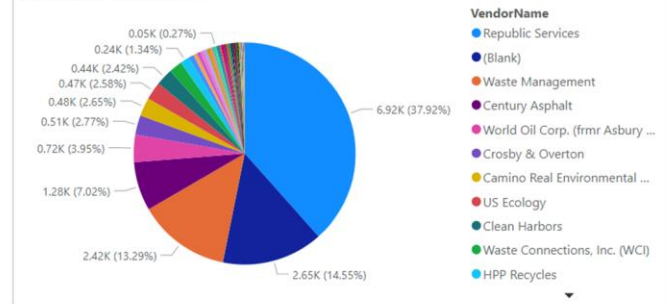
Waste Shipments handled by Disposers



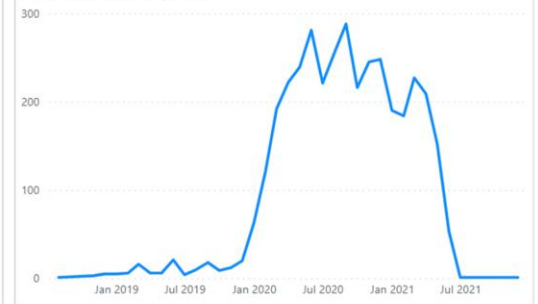
Waste Vendors and Type of Waste handled



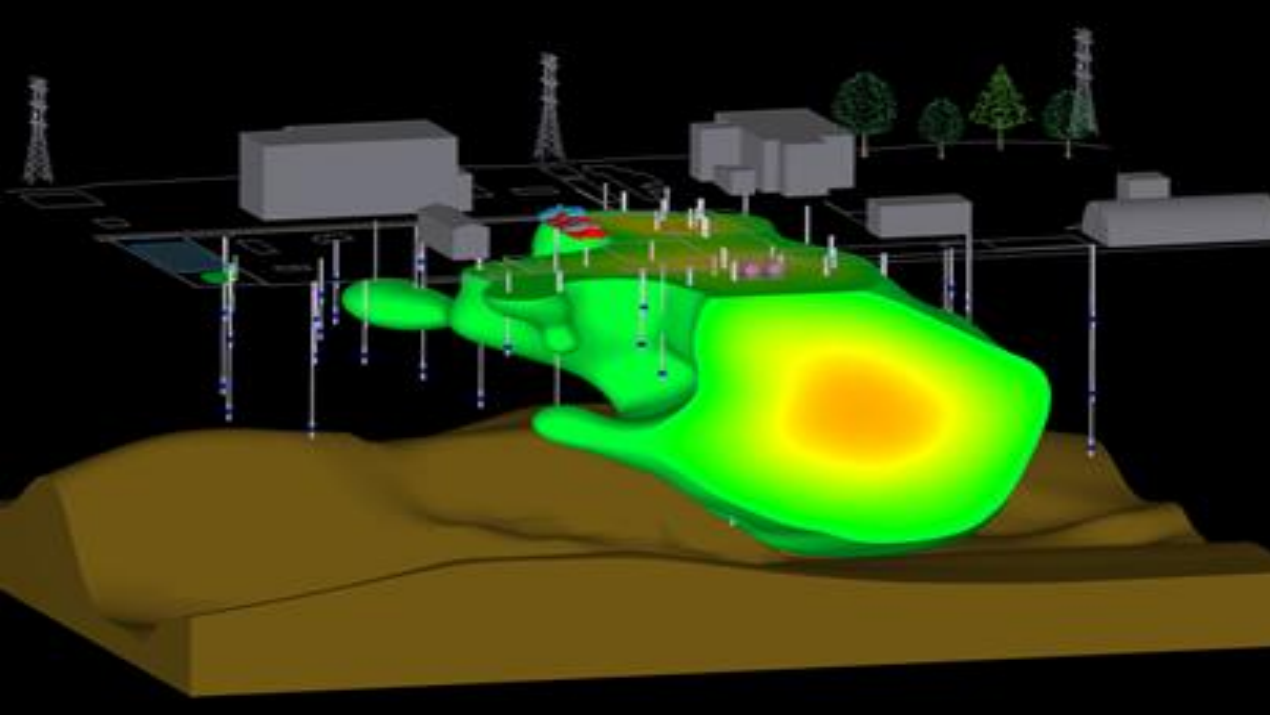
Waste Request Distribution



Waste Shipments by Month



WasteRequestNo	ShipmentDate	VendorName	Waste Type	LocationName
18	1/22/2020 5:00:00 AM		Used Oil	Bedford Park, IL
14	1/28/2020 3:00:00 PM		Used Oil	Charleston, SC
15	1/28/2020 3:00:00 PM		Used Oil	Fairburn, GA
16	1/28/2020 3:00:00 PM		Used Oil	Savannah, GA
19	4/14/2020 8:00:00 AM		Used Oil	Jacksonville, FL
2191	9/4/2020 12:00:00 AM		Used Oil	Edroy, TX
2903	11/19/2020 12:00:00 AM		Used Oil	Tucson, AZ - 8th St.
3717	1/21/2021 12:00:00 AM		Used Oil	North Little Rock, AR
4336	6/2/2021 12:00:00 AM		Used Oil	Klamath Falls, OR - 1585 Oak Street
2203	3/16/2021 12:00:00 AM	Aaron Oil Company, Inc.	Used Oil	Baton Rouge-Anchorage Site(Refinery)
3099	3/26/2021 12:00:00 AM	American Advanced Technologies LLC	Used Oil	Addis, LA - 4366 Main Street



Case Study 4: Power Generation Data Visualization

Let your Data Speak

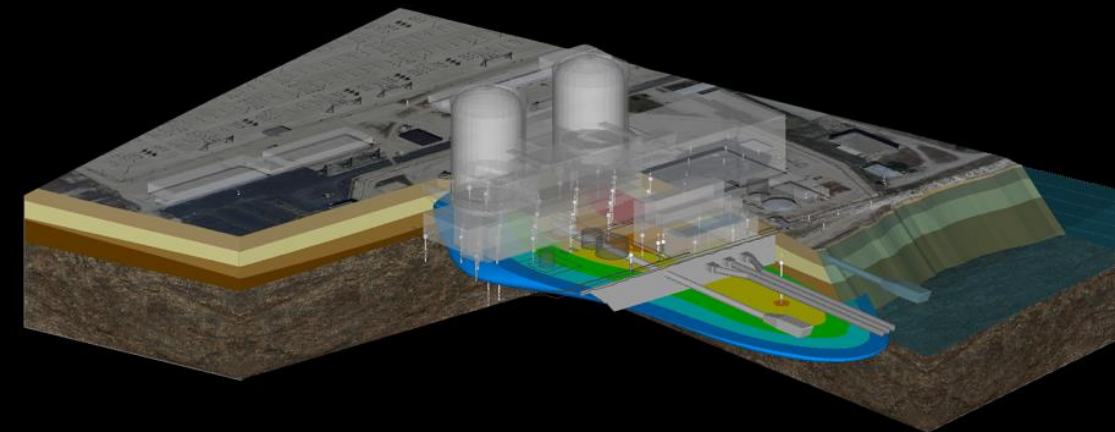
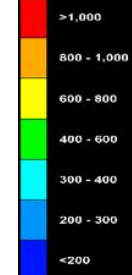
- Maximize the visual representation of the data
- Can be used as adaptive field investigation tool to identify data gaps and determine investigation “step-outs”
- Delivers an improved understanding of the Conceptual Site Model (CSM) for remediation sites
- Permits stakeholders to view the site data in a way that enhances data retention and site understanding

SITE FEATURES

Groundwater Chemistry - Tritium

Clean-up Criterion Level - 200 pCi/L

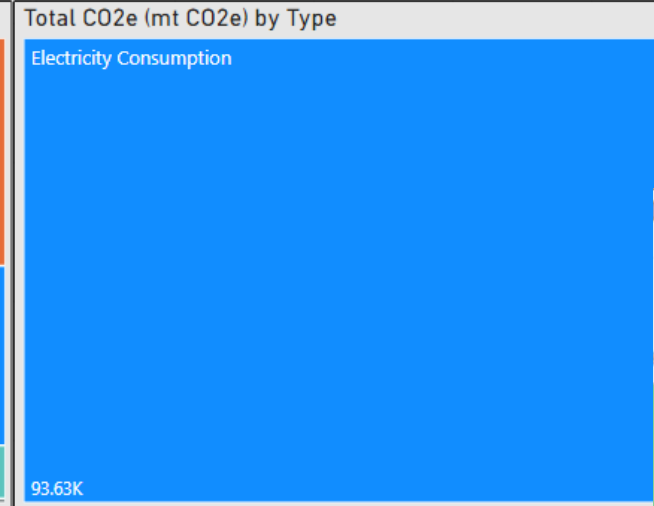
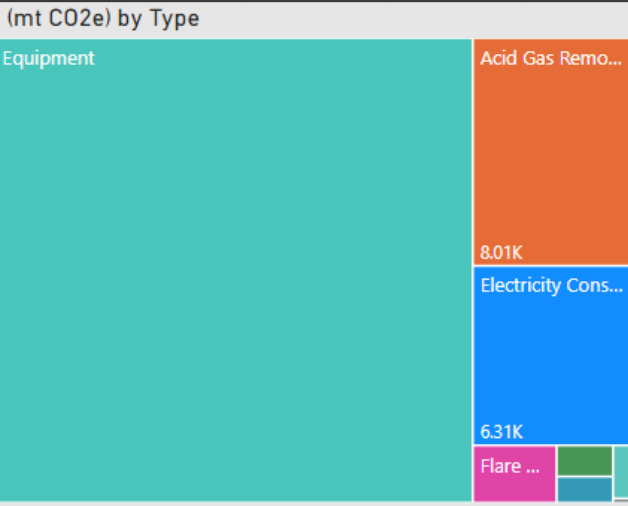
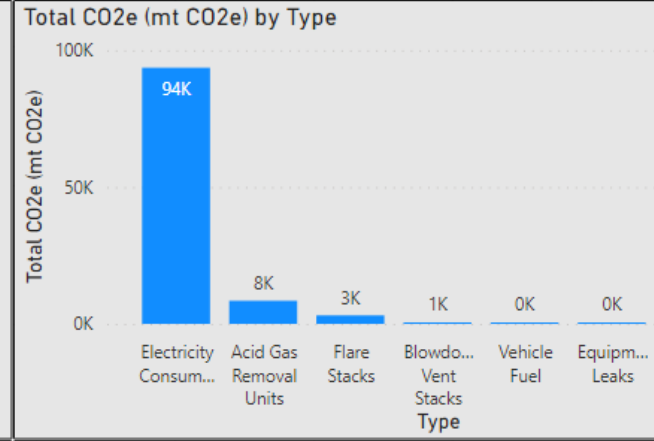
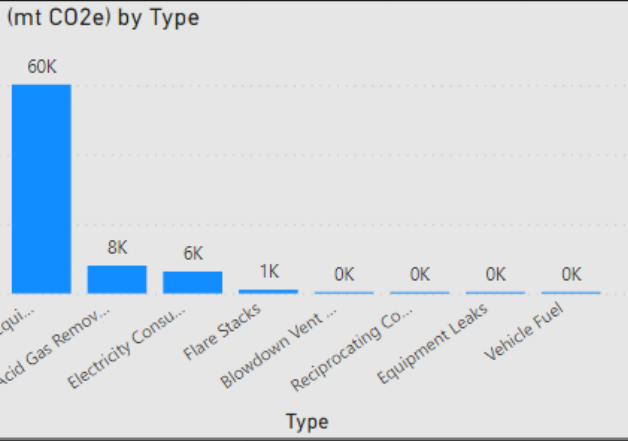
(pCi/L)



Plume Extent at 200 pCi/L

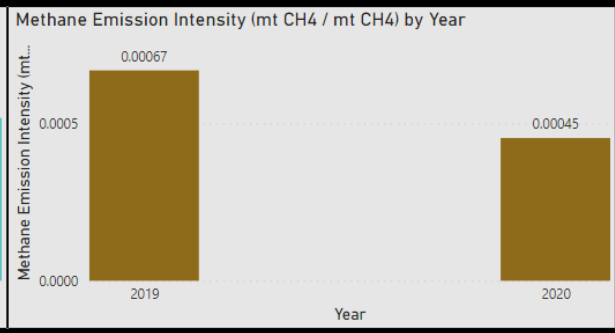
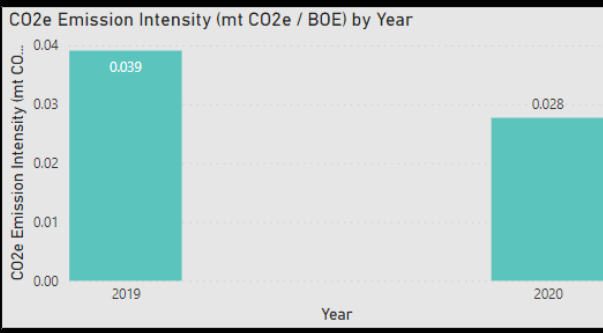
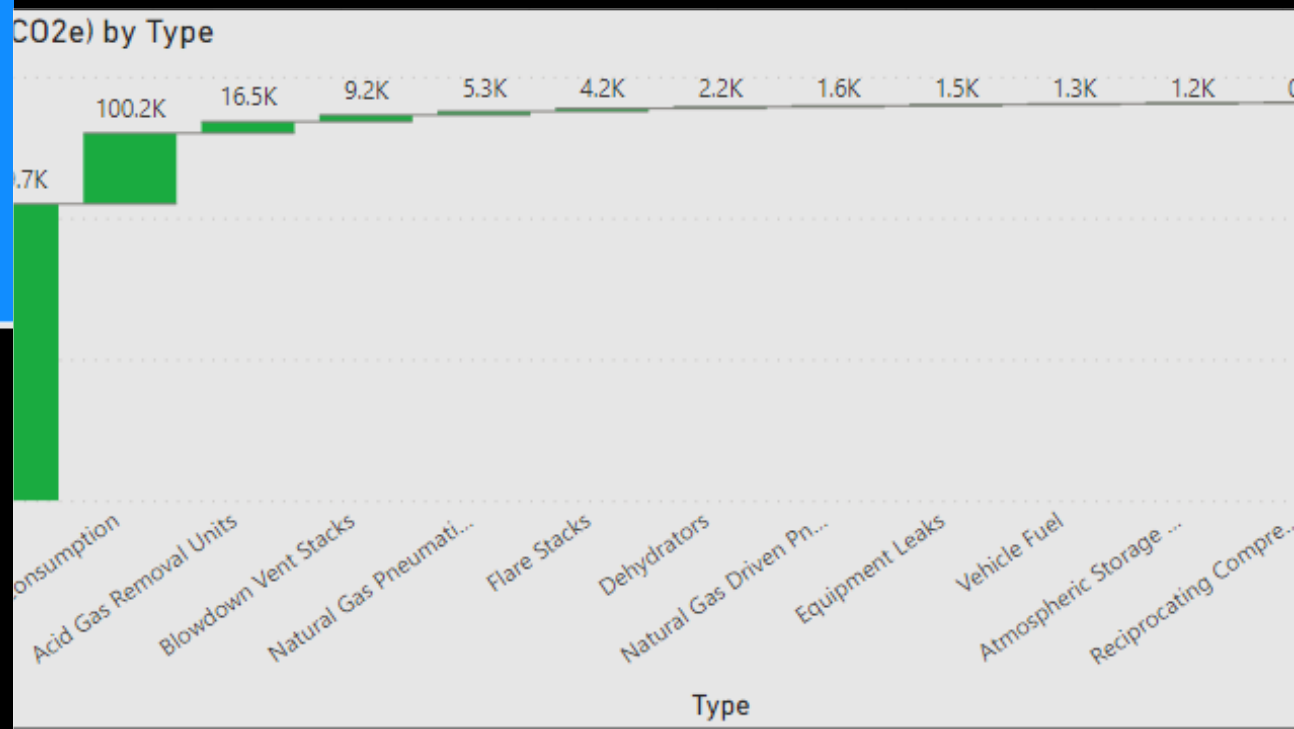
76.49K
Total CO2e (mt CO2e)

106.
Total CO2e



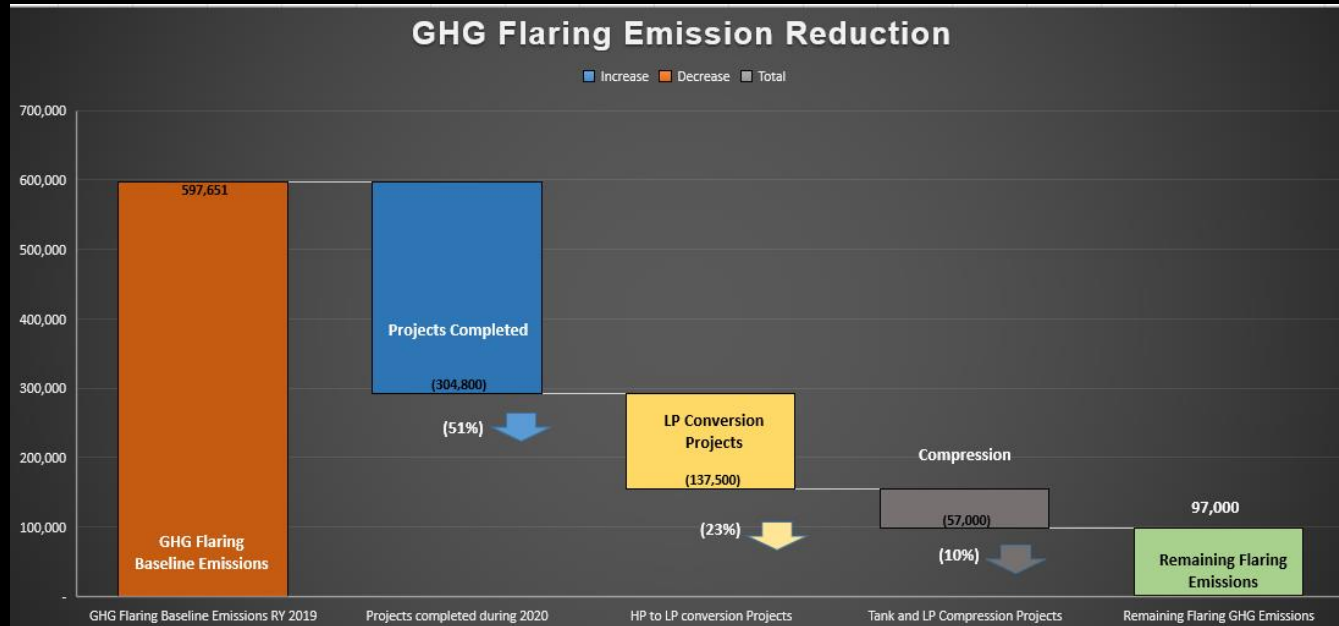
Case Study 7: Decarbonization Strategy – Oil and Gas Midstream

- Develop Carbon Intensity Management
- Identify opportunities for decarbonization
- Review current capital projects and develop ROI
- Evaluate additional projects and operational changes



Case Study 8: Flare Reduction Strategies

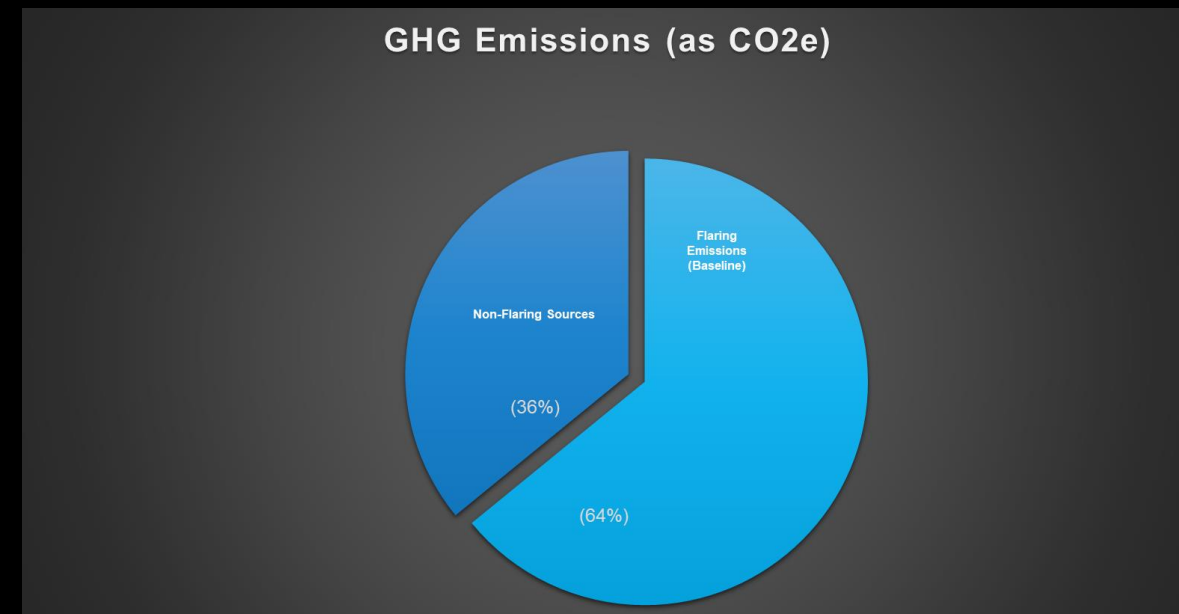
Develop technically feasible and economically viable strategies to minimize the greenhouse gas (GHG) emissions associated with routine flaring events.



Results

Overall GHG Reduction – 80% over RY 2019 baseline Emissions

Remaining 20% - Contributed by safety and malfunction issues.



Note: EPA Reported GHG Emissions RY 2019 - 932,236 mt

Strategies

Predictive modeling techniques to reduce the likelihood of equipment failure (and resulting flaring events)

City Water Utility Client Example -Lead Pipe Replacement Project

Disparate Public Data Sources



Data Science Solution Framework

Likelihood of High Replacement Cost (for example cost > \$12,000)

Likelihood of Lead Pipe

5%	3%	2%
30%	20%	10%
20%	5%	5%

Assuming 5% of service connection belong to bucket (High, High) category which translates to 4,000 water service lines.

Assuming \$10,000 replacement cost per service line, city would need approx. \$40M capital budget to do the replacement of lead service line.



Data Integration Plan

Decide What Matters

- Performance
- Access to Capital
- Resiliency and Future Proofing
- Carbon Transition
- Stakeholder Sentiments

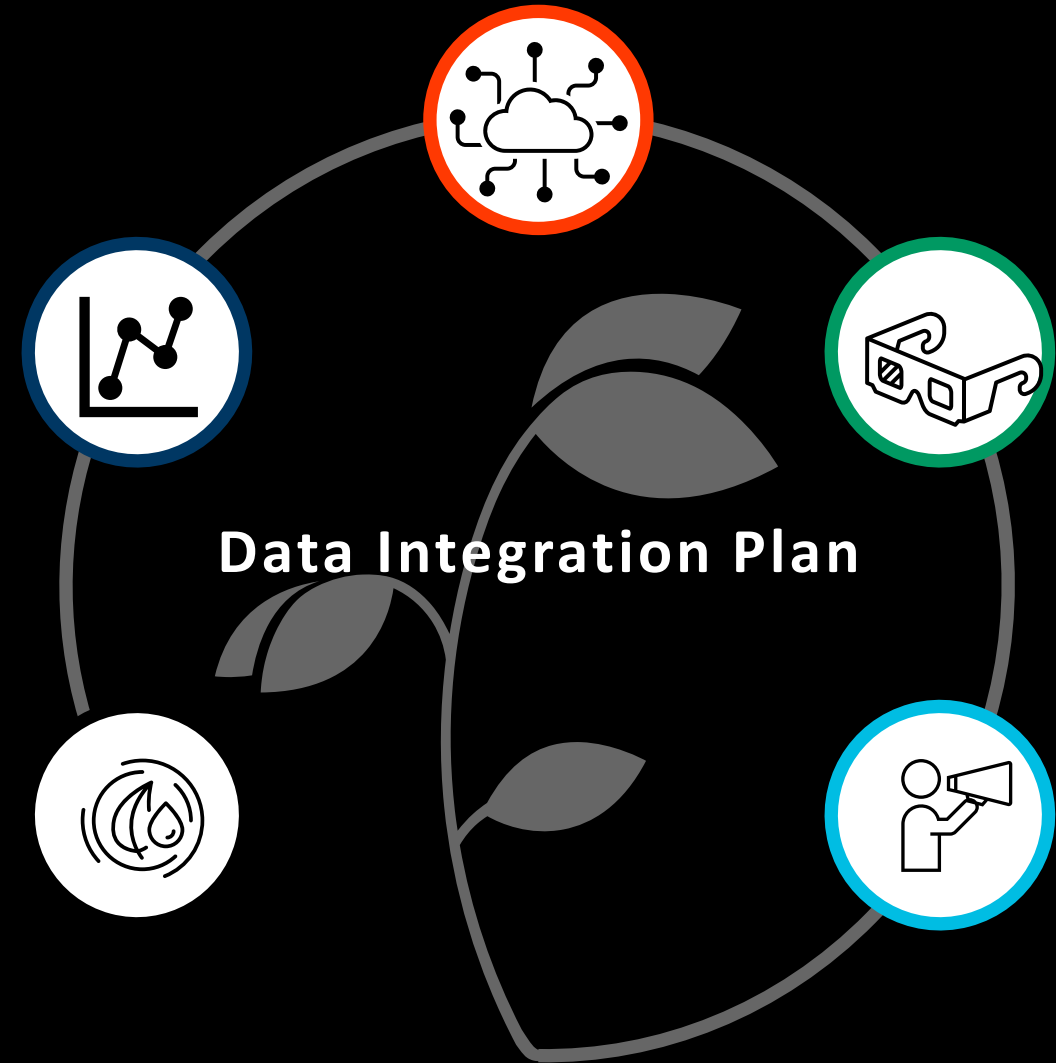
Develop metrics for risk & opportunity

Develop a data management strategy

- Data Availability
- Data Capture Methods
- Data Quality
- Compiling and Validating

Data Interpretation and Visualization

- Communications





Thank You