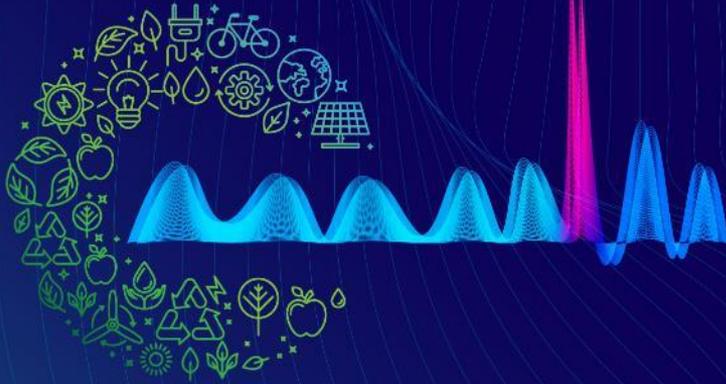


ERA Environmental Management Solutions Presentation



Suppliers Partnership Innovation Summit 2022

📍 The Ohio State University

📅 July 27 – 28th, 2022



SUPPLIERS PARTNERSHIP
FOR THE ENVIRONMENT

Agenda



01

Introduction of ERA

Presented by Erin Manitou (ERA Lead Project Analyst)

2

02

Importance of data accuracy & risks of potential uncaught data issues

Presented by Dave Steedly (Toyota Regional Environmental Manager at TMMK)

03

Using AI for Data Anomaly Detection In Big Data

Presented by DJ Kim (Concordia University)

04

Case Study: Toyota Kentucky Facility Data Anomalies & Analysis

Presented by Sarah Sajedi (ERA Chief Technology Officer, Co-Founder)

05

Introduction of Sustainability Basic Concepts

Presented by Sarah Sajedi (ERA Chief Technology Officer, Co-Founder)

06

ERA Software Demonstration – Master Sustainability Database

Presented Chelsea Scalia (ERA Sustainability Team Lead)

07

ERA Software Demonstration of Automated Sustainability Acquisition

Presented Chelsea Scalia (ERA Sustainability Team Lead)

08

ERA Software Demonstration of Dashboard / KPI Analytics

Presented Chelsea Scalia (ERA Sustainability Team Lead)

Meet our Presenters



Sarah Sajedi

Chief Technology
Officer & Co-
Founder
ERA Environmental



Dave Steedly

Regional Environmental
Manager Toyota Motor
Manufacturing Kentucky



Gary Vegh

President & Co-Founder
Senior Environmental
Toxicologist
ERA Environmental



Erin Manitou

Managing Partner /
Lead Project Analyst
ERA Environmental



Chelsea Scalia

Sustainability
Specialist & Project
Manager
ERA Environmental



DJ Kim

Ph D Candidate
Concordia
University



More than 27 years of committed service



Centralized cloud-hosted platform



Dedicated client database



Built-in & updated chemical and regulatory library



Built-in analytics & reports



Routine updates & upgrades - No software versioning



ERA Awards & Accolades



Top 10 automotive solution providers 2022



SP Shinning Star award Gary Vegh



Stevie Woman of the Year Award 2013



Royal Bank of Canada Women of the Year Award



Top product of the year 2016



Best Environmental Management Solutions Tech Company 2022



Women of inspiration Sarah Sajedi



Featured in smart innovations - 2016



Canadian's top small & medium employers



Sara Kirk Award for Innovation and Entrepreneurship

ERA's Automotive Client Snapshot



Over **20 years** experience with automotive industry

Over **200** automotive / truck manufacturing facilities using the **ERA software**

ERA Modules in use:

Environmental Management, Waste Container Tracking, Compliance Task Management, Audits/Inspections, Refrigerants Management, Product Approval

ERA's Automotive Supply Chain Snapshot



ERA initiated **Coating Vendor Partnership** to expedite **electronic** transfer of **product compositional data** from vendor to client

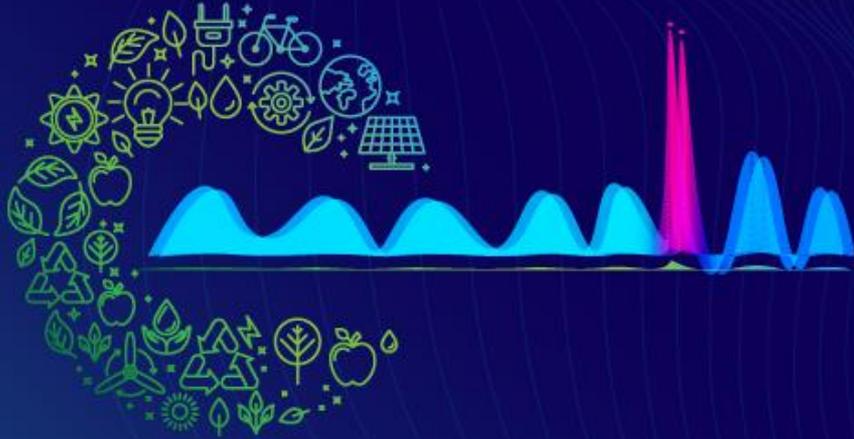


Accuracy increased / truck manufacturing facilities using the **Manhours decreased**



Improved product revision tracking and batch specific data management





The Importance of Data Accuracy and Risks of Data Anomalies



TOYOTA

**Presenter: Dave Steedly, Regional Environmental
Manager (Toyota Motor Manufacturing Kentucky)**

Environmental Management Challenges of TMMK



Plant Size



**QA/QC of Data
collected**



**Collection of Raw
Data**



Finding Data Gaps



Large Data volume



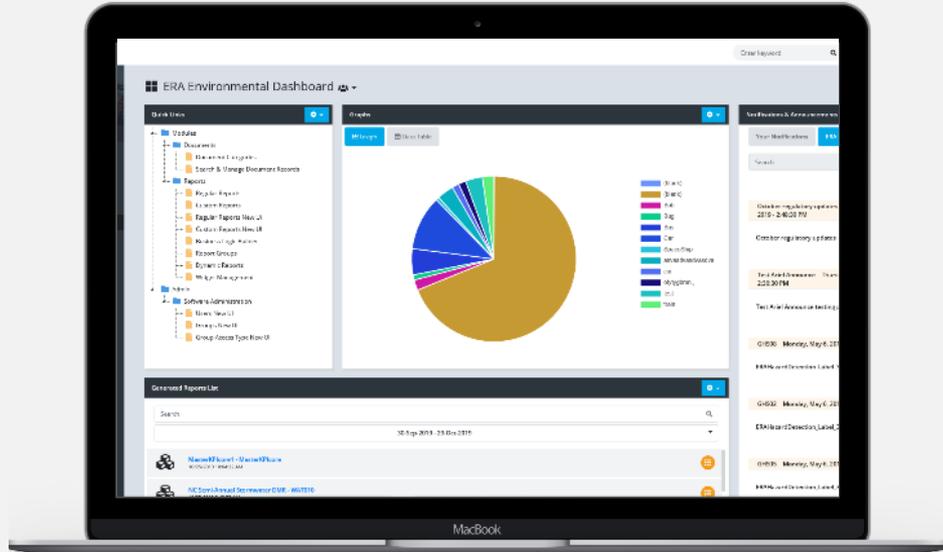
**Keeping data
consistent across
multiple Reports**

Big Data Challenge

Year	Number of records for Finishing Dept
2021	13,252
2020	13,525
2019	17,013
2018	16,939
2017	17,280

JctIndex	Description	StartDate	EndDate	Amount	UnitId	UserAn	UserUn	EditDa
1289091	TEROSON PV 2626	11/1/2021 0:00	11/30/2021 0:00	233431.8	1	233431.8	1	09:20.1
1289091	TEROSON PV 2626	11/1/2021 0:00	11/30/2021 0:00	15961.15	1	15961.15	1	09:20.6
1280241	ADDITIVE,ACTICIDE LA 1209,55 GALLON DRUM	11/1/2021 0:00	11/30/2021 0:00	440	3	440	3	56:39.5
1279468	ADDITIVE,GYLCOL ETHER PNB,55 GALLON DRUM	11/1/2021 0:00	11/30/2021 0:00	540	3	540	3	50:05.2
1286808	PAINT,BASECOAT,AR3020-1,1HI BUMPER,DRUM	11/1/2021 0:00	11/30/2021 0:00	23.088	1	23.088	1000214	42:26.0
1286808	PAINT,BASECOAT,AR3020-1,1HI BUMPER,DRUM	11/1/2021 0:00	11/30/2021 0:00	130.832	1	130.832	1000214	42:26.0
1266891	PAINT BASECOAT WATERBORNE 1J9 BUMPER PAINT 50 GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	35.4465	1	35.4465	1000214	42:25.2
1266891	PAINT BASECOAT WATERBORNE 1J9 BUMPER PAINT 50 GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	200.8635	1	200.8635	1000214	42:25.1
1266639	PAINT BASECOAT WATERBORNE 040 BUMPER PAINT 50GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	24.1245	1	24.1245	1000214	42:24.4
1266639	PAINT BASECOAT WATERBORNE 040 BUMPER PAINT 50GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	136.7055	1	136.7055	1000214	42:24.4
1272987	PAINT PRIMER WATERBORNE BUMPER PAINT WB1310 PHASE 2 55 GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	19.641	1	19.641	1000214	42:23.2
1272987	PAINT PRIMER WATERBORNE BUMPER PAINT WB1310 PHASE 2 55 GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	111.299	1	111.299	1000214	42:23.2
1266631	PAINT PRIMER WATERBORNE BUMPER PAINT 50GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	6.045	1	6.045	1000214	42:22.6
1266631	PAINT PRIMER WATERBORNE BUMPER PAINT 50GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	3.4255	1	3.4255	1000214	42:22.5
1277700	3T3 WB Red Base 2 (Mica)	11/1/2021 0:00	11/30/2021 0:00	2.3415	1	2.3415	1000214	42:21.8
1277700	3T3 WB Red Base 2 (Mica)	11/1/2021 0:00	11/30/2021 0:00	13.2685	1	13.2685	1000214	42:21.7
1277702	3T3 WB Red Base 1	11/1/2021 0:00	11/30/2021 0:00	3.408	1	3.408	1000214	42:21.1
1277702	3T3 WB Red Base 1	11/1/2021 0:00	11/30/2021 0:00	19.312	1	19.312	1000214	42:21.0
1282250	PAINT,PRIMER,JVPT70DGM,PCR,BUMPER PAIL	11/1/2021 0:00	11/30/2021 0:00	30.7395	1	30.7395	1000214	42:20.3
1282250	PAINT,PRIMER,JVPT70DGM,PCR,BUMPER PAIL	11/1/2021 0:00	11/30/2021 0:00	174.1905	1	174.1905	1000214	42:20.2
1270882	PAINT CLEARCOAT R2550-2 MODIFIED UNICLEAR RESIN GAL 50 GALLON DRUM	11/1/2021 0:00	11/30/2021 0:00	80.5695	1	80.5695	1000214	42:19.4
1270882	PAINT CLEARCOAT R2550-2 MODIFIED UNICLEAR RESIN GAL 50 GALLON DRUM	11/1/2021 0:00	11/30/2021 0:00	456.5605	1	456.5605	1000214	42:19.3
1273754	SOLVENT PAINT 2K ANTI-HARDENER FLUSH 31918 PAIL 5 GAL(L)	11/1/2021 0:00	11/30/2021 0:00	2.7375	1	2.7375	1000214	42:18.7
1273754	SOLVENT PAINT 2K ANTI-HARDENER FLUSH 31918 PAIL 5 GAL(L)	11/1/2021 0:00	11/30/2021 0:00	15.5125	1	15.5125	1000214	42:18.6
1266629	PAINT CLEARCOAT H-2550 UNICLEAR HARDENER BUMPER PAINT 50 GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	32.6115	1	32.6115	1000214	42:17.7
1266629	PAINT CLEARCOAT H-2550 UNICLEAR HARDENER BUMPER PAINT 50 GAL DRUM GAL(L)	11/1/2021 0:00	11/30/2021 0:00	184.7985	1	184.7985	1000214	42:17.6
1270787	PAINT BASECOAT WATERBORNE 221 BUMPER PAINT 50 GAL	11/1/2021 0:00	11/30/2021 0:00	0	1	0	1000214	42:16.9
1270787	PAINT BASECOAT WATERBORNE 221 BUMPER PAINT 50 GAL	11/1/2021 0:00	11/30/2021 0:00	0	1	0	1000214	42:16.8
1275147	3U5 RED SOLID B2 FOR 602B	11/1/2021 0:00	11/30/2021 0:00	2.6145	1	2.6145	1000214	42:15.9
1275147	3U5 RED SOLID B2 FOR 602B	11/1/2021 0:00	11/30/2021 0:00	14.8155	1	14.8155	1000214	42:15.9
1275143	PAINT BASECOAT WBC717T JWBE 3U5 BASE 1 PAIL	11/1/2021 0:00	11/30/2021 0:00	4.6875	1	4.6875	1000214	42:15.1
1275143	PAINT BASECOAT WBC717T JWBE 3U5 BASE 1 PAIL	11/1/2021 0:00	11/30/2021 0:00	26.5625	1	26.5625	1000214	42:15.1
1275447	ASX 2880 MID GRAY ADHESION PROMOTER	11/1/2021 0:00	11/30/2021 0:00	2.607	1	2.607	1000214	42:14.1
1275447	ASX 2880 MID GRAY ADHESION PROMOTER	11/1/2021 0:00	11/30/2021 0:00	14.773	1	14.773	1000214	42:14.0
1273809	PAINT BASECOAT WATERBORNE 4X9 AMBER BASECOAT PAIL	11/1/2021 0:00	11/30/2021 0:00	0.3315	1	0.3315	1000214	42:13.2
1273809	PAINT BASECOAT WATERBORNE 4X9 AMBER BASECOAT PAIL	11/1/2021 0:00	11/30/2021 0:00	1.8785	1	1.8785	1000214	42:13.7
1270786	PAINT BASECOAT WATERBORNE 089 BASE BUMPER PAINT 50 GAL	11/1/2021 0:00	11/30/2021 0:00	12.507	1	12.507	1000214	42:1

TMMK Reports Generated from ERA



TRI

Tier II

MACT / NESHP

NSPS

Emission Inventory

Waste Management

...

Cost of Data Inaccuracies

TIME & MONEY



**TIME TO DETECT / IDENTIFY
DATA ANOMALIES**



**TIME TO REVIEW
REGENERATED REPORTS**



**TIME TO CORRECT THE DATA
ANOMALIES IN YOUR DATASET**



VIOLATION FEES



**TIME TO REGENERATE
REPORTS**



DAMAGE TO BRAND

Impact of Data Inaccuracies on TRI



The U. S. Environmental Protection Agency (EPA) has initiated enforcement actions against hundreds of facilities that reported inaccurately to the Toxics Release Inventory (TRI). Reporters who violate the Emergency Planning and Community Right-to-Know Act (EPCRA) could face penalties up to **\$27,500** per violation, per day per reportable chemical.

Toyota Philosophy

Do it right in the beginning



Rework = Waste



Cost of rework



ERA Bridging the Gap on Data Anomaly Detection



**ERA
Environmental**

**Concordia
University**

**Toyota Motor
Manufacturing Kentucky**



Introducing AI Data Anomaly Detection for Big Data



Presenter: Dong Jae Kim,

PhD Candidate (Concordia University)



SUPPLIERS PARTNERSHIP
FOR THE ENVIRONMENT



| Monitor All Your Data

ERA stores millions of user-provided records



Checking your data quality is crucial

Product	Start Date	End Date	Amount (gal)
X	2/1/2020	2/29/2020	1000
X	3/1/2020	3/29/2020	1
X	4/1/2020	4/29/2020	1



Manual monitoring is impossible.
AI can help.

AI-powered systems are everywhere



Self-Driving Car



Social Media

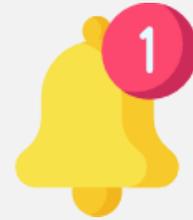
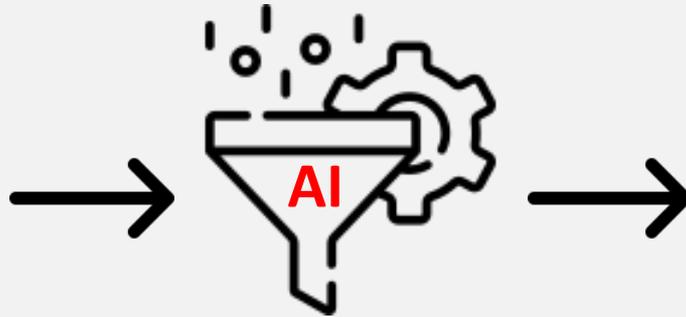


Health Care



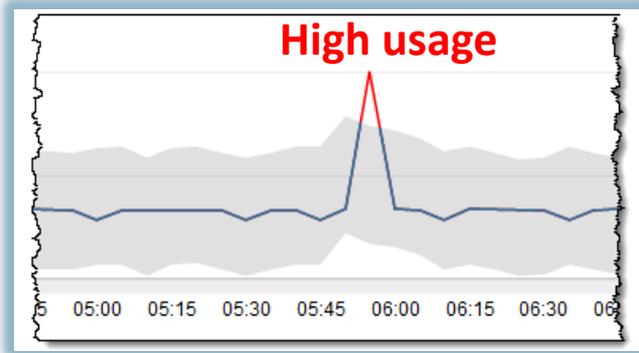
Finance

AI can harness existing data to make recommendations

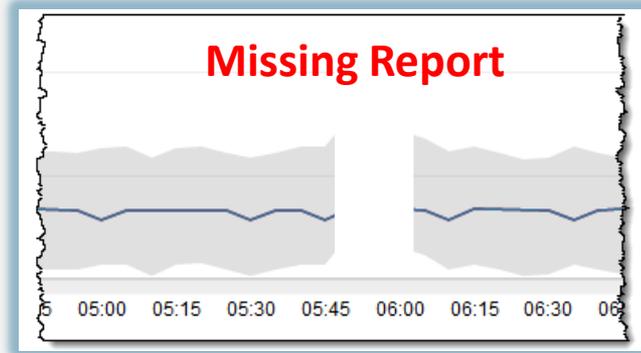


**Automatic
Recommendation**

We discuss two types of anomalies in user reports



Anomalous amount usage

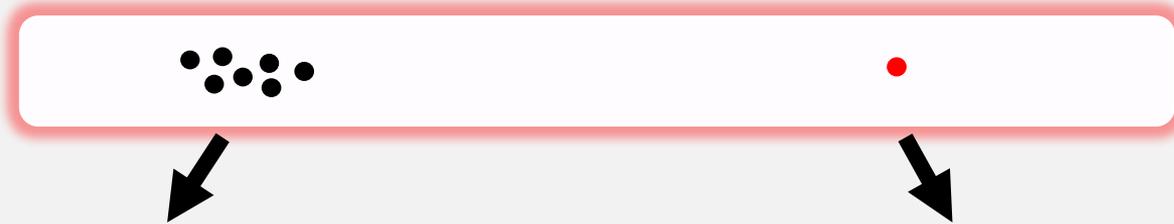


Anomalous report frequency

ERA employed the isolation forest model

INTUITION:

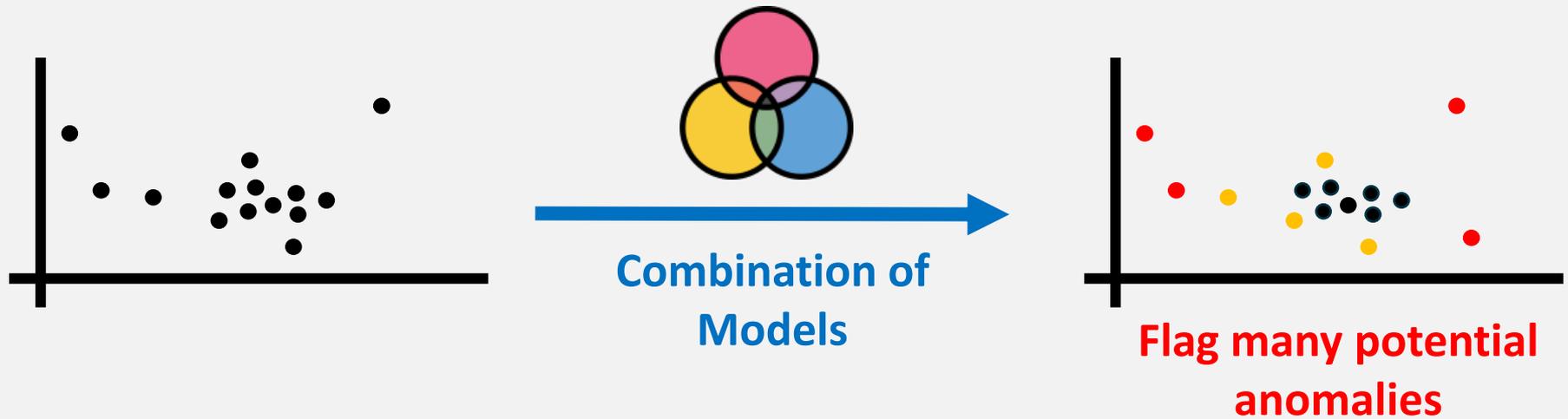
- “How many splits does it take to isolate a single data point?”



***Inlier requires many splits
for isolation***

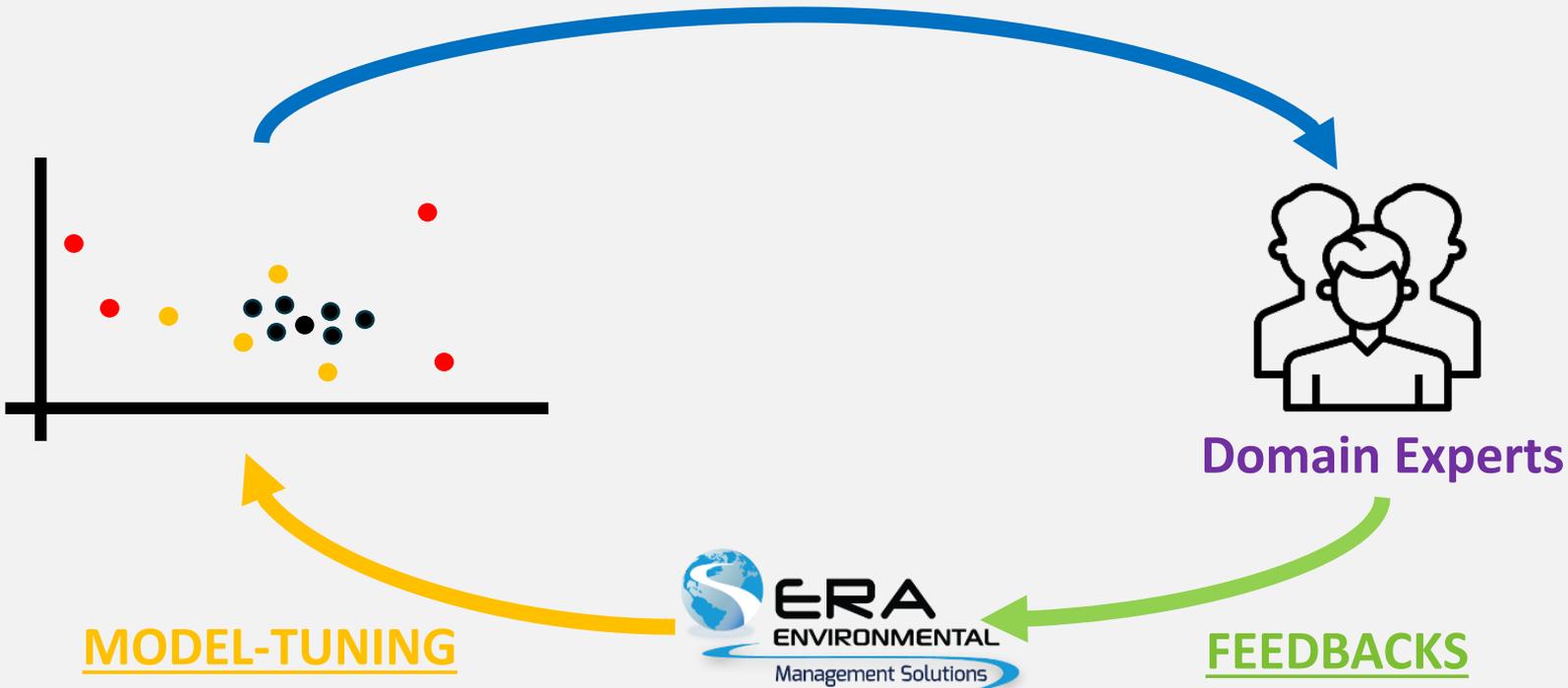
***Outliers require one split for
isolation***

We also used an ensemble of models for outlier detection



Validation Challenges – What is an ‘anomaly’?

REASONS FOR FLAGGING



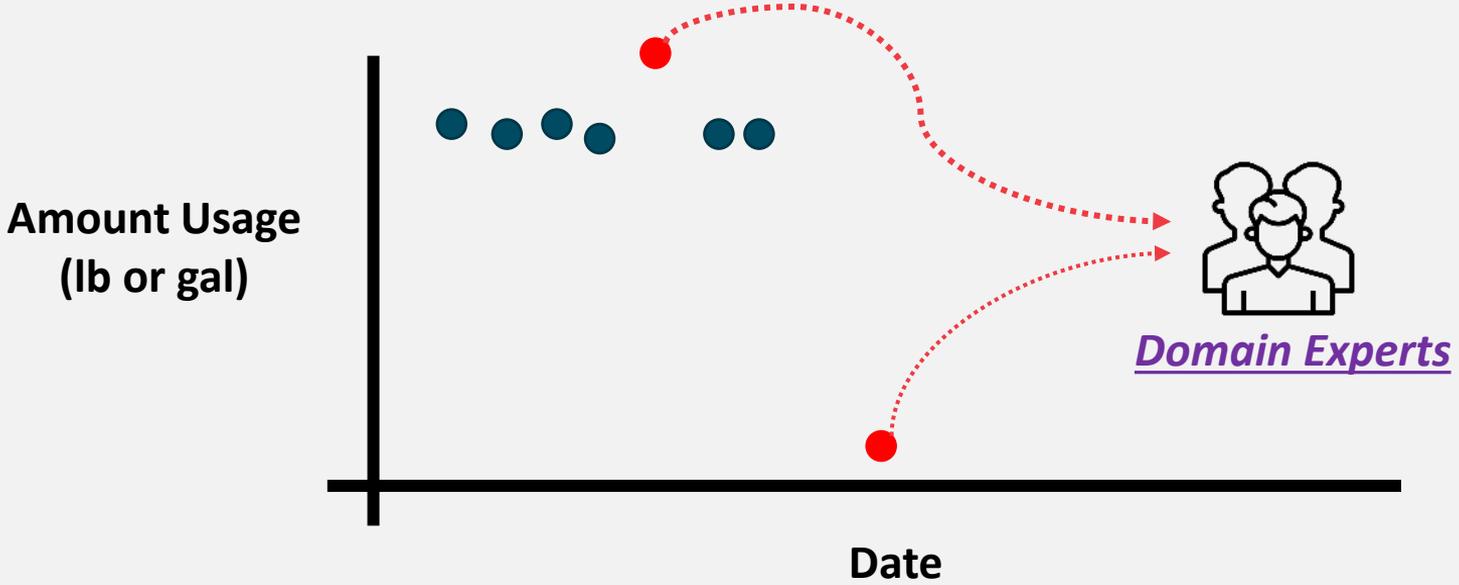
MODEL-TUNING



FEEDBACKS

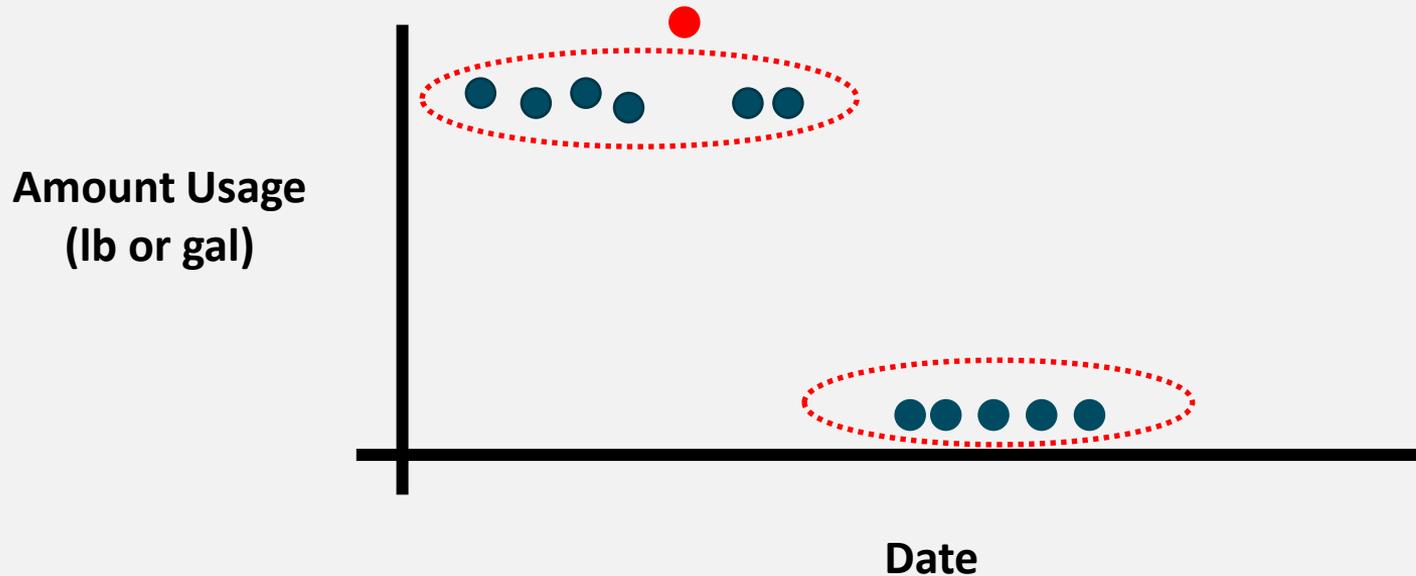
Application of our anomaly detection model on product usage

Q1 REPORT – product X:



Application of our anomaly detection model on product usage

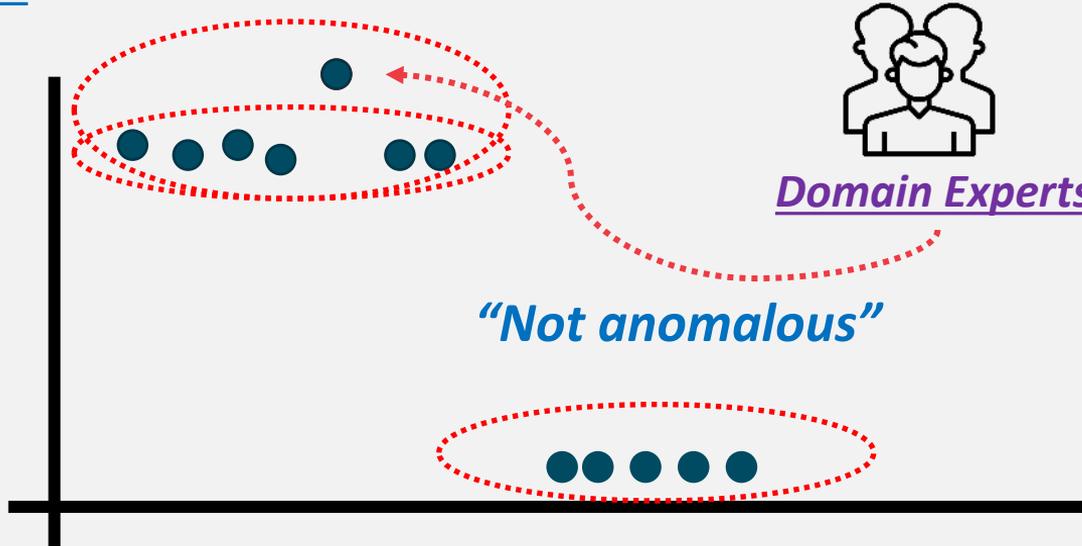
Q2 REPORT – product X:



Application of our anomaly detection model on product usage

Q2 REPORT – product X:

Amount Usage
(lb or gal)

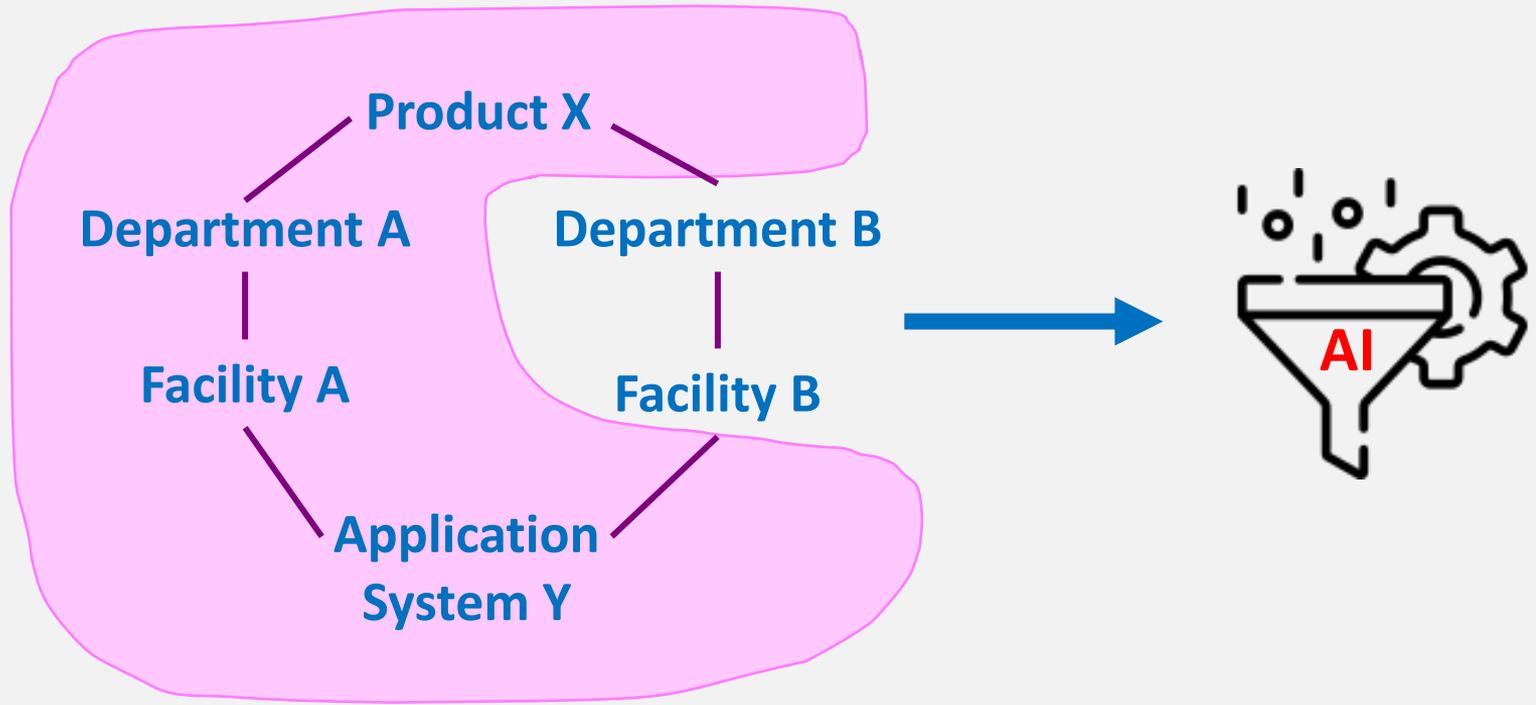


Domain Experts

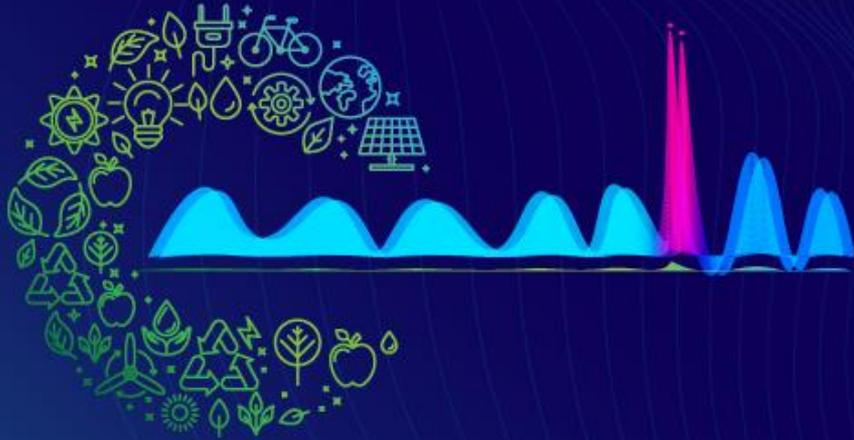
“Not anomalous”

Date

Users can parameterize different model configurations



Case Study: Toyota Kentucky Facility Data Anomalies & Analysis



SUPPLIERS PARTNERSHIP
FOR THE ENVIRONMENT

Why is it important to detect data anomalies?

Data Accuracy Matters:

- When dealing with emissions of CO₂, PM, VOC, Xylene, ...
- Data Entry Accuracy matters:
 - Example: of a product Containing 20% of any single of the chemicals above.

Accidentally adding a decimal point instead of comma, makes a big impact on calculated results!!

Erroneous record: $190.020 \times 20\% = 38.004$ lbs. of emission

• Correct record: $190,020 \times 20\% = 38,040$ lbs. of emission

Types of data anomalies Detected



Client Raw Data.xlsx



sample_amount_yearly.xlsx



sample_gap.xlsx



sample_Monthly_amount_record.xlsx



sample_period.xlsx

Anomalies Analysis of Monthly Records

Looking Anomalies in Monthly recordkeeping data:

Example of Data Anomaly:
9/1/2021 – 9/30/2021 in amount of 11,222 -- flagged as Outlier

ApplicationSystemID	Unique_ID	Amount	StartDate	EndDate	Iso_forest	local	z_score (STD Deviation)	Scores	Outliers
Filling Operatio	11	155,222	1/1/2021	1/31/2021	0	0	0.5711	0.3928	Normal
Filling Operatio	11	138,516	2/1/2021	2/28/2021	0	0	0.2530	0.3132	Normal
Filling Operatio	11	111,589	3/1/2021	3/31/2021	0	0	0.2598	0.3150	Normal
Filling Operatio	11	153,804	4/1/2021	4/30/2021	0	0	0.5441	0.3860	Normal
Filling Operatio	11	162,876	5/1/2021	5/31/2021	0	0	0.7169	0.4292	Normal
Filling Operatio	11	76,328	6/1/2021	6/30/2021	1	0	0.9313	0.7328	Normal
Fluid Filling Operatio	11	68,151	7/1/2021	7/31/2021	0	0	1.0871	0.5218	Normal
A05-07- Fluid Filling Operatio	11	65,512	8/1/2021	8/31/2021	0	0	1.1373	0.5343	Normal
A05-07- Fluid Filling Operatio	11	11,222	9/1/2021	9/30/2021	1	0	2.1713	1.0428	Outlier
A05-07- Fluid Filling Operatio	11	60,175	10/1/2021	10/31/2021	0	0	1.2390	0.5597	Normal
A05-07- Fluid Filling Operatio	11	58,042	11/1/2021	11/30/2021	0	0	1.2796	0.5699	Normal
A05-07- Fluid Filling Operatio	11	57,576	12/1/2021	12/31/2021	0	0	1.2885	0.5721	Normal

Monthly Record Amount Anomalies Analysis

ApplicationSystemID	Unique_ID	Amount	StartDate	EndDate	Iso_forest	local	z_score (STD Deviation)	Scores	Outliers
A05-07- Fluid Filling Operations	11	152,729	8/1/2018	8/31/2018	0	0	0.5237	0.3809	Normal
A05-07- Fluid Filling Operations	11	143,951	9/1/2018	9/30/2018	0	0	0.3565	0.3391	Normal
A05-07- Fluid Filling Operations	11	155,790	11/1/2019	11/30/2019	0	0	0.5819	0.3955	Normal
A05-07- Fluid Filling Operations	11	113,105	12/1/2019	12/31/2019	0	0	0.2310	0.3077	Normal
A05-07- Fluid Filling Operations	11	164,285	1/1/2020	1/31/2020	0	0	0.7437	0.4359	Normal
A05-07- Fluid Filling Operations	11	148,165	2/1/2020	2/29/2020	0	0	0.4367	0.3592	Normal
A05-07- Fluid Filling Operations	11	102,589	3/1/2020	3/31/2020	1	0	0.4312	0.6078	Normal
A05-07- Fluid Filling Operations	11	34,027	5/1/2020	5/31/2020	1	0	1.7370	0.9342	Outlier
A05-07- Fluid Filling Operations	11	161,815	6/1/2020	6/30/2020	0	0	0.6967	0.4242	Normal
A05-07- Fluid Filling Operations	11	160,908	7/1/2020	7/31/2020	0	0	0.6794	0.4199	Normal
A05-07- Fluid Filling Operations	11	186,351	8/1/2020	8/31/2020	1	0	1.1640	0.7910	Normal
A05-07- Fluid Filling Operations	11	213,180	9/1/2020	9/30/2020	1	1	1.6749	1.1687	Outlier
A05-07- Fluid Filling Operations	11	198,086	10/1/2020	10/31/2020	1	1	1.3874	1.0969	Outlier
A05-07- Fluid Filling Operations	11	164,019	11/1/2020	11/30/2020	0	0	0.7387	0.4347	Normal
A05-07- Fluid Filling Operations	11	163,267	12/1/2020	12/31/2020	0	0	0.7243	0.4311	Normal
A05-07- Fluid Filling Operations	11	155,222	1/1/2021	1/31/2021	0	0	0.5711	0.3928	Normal
A05-07- Fluid Filling Operations	11	138,516	2/1/2021	2/28/2021	0	0	0.2530	0.3132	Normal
A05-07- Fluid Filling Operations	11	111,589	3/1/2021	3/31/2021	0	0	0.2598	0.3150	Normal
A05-07- Fluid Filling Operations	11	153,804	4/1/2021	4/30/2021	0	0	0.5441	0.3860	Normal
A05-07- Fluid Filling Operations	11	162,876	5/1/2021	5/31/2021	0	0	0.7169	0.4292	Normal
A05-07- Fluid Filling Operations	11	76,328	6/1/2021	6/30/2021	1	0	0.9313	0.7328	Normal
A05-07- Fluid Filling Operations	11	68,151	7/1/2021	7/31/2021	0	0	1.0871	0.5218	Normal
A05-07- Fluid Filling Operations	11	65,512	8/1/2021	8/31/2021	0	0	1.1373	0.5343	Normal
A05-07- Fluid Filling Operations	11	11,222	9/1/2021	9/30/2021	1	0	2.1713	1.0428	Outlier
A05-07- Fluid Filling Operations	11	60,175	10/1/2021	10/31/2021	0	0	1.2390	0.5597	Normal
A05-07- Fluid Filling Operations	11	58,042	11/1/2021	11/30/2021	0	0	1.2796	0.5699	Normal
A05-07- Fluid Filling Operations	11	57,576	12/1/2021	12/31/2021	0	0	1.2885	0.5721	Normal

Unique_ID	Amount	Year
11262	126,419	2017
11262	1,415,535	2018
11262	625,965	2019
11262	40,646	2020

Records Yearly Amount Anomalies Analysis

- Looking for Yearly Amount Anomalies in Summary data:
 - Yearly Amount Anomalies in
 - Example:
 - Year 2018-- flagged as Outlier

Yearly
Record
Amount
Anomalies
Analysis

Unique_ID	Amount	Year	Iso_forest	local	z_score (STD Deviation)	Scores	Outliers
11204	570	2018	0	0	0.8783	0.4696	Normal
11204	1,140	2019	0	0	0.6831	0.4208	Normal
11204	2,850	2020	0	1	0.0976	0.5244	Normal
11204	7,980	2021	1	0	1.6590	0.9148	Outlier
11262	126,419	2017	0	0	0.7793	0.4448	Normal
11262	1,415,535	2018	1	0	1.5804	0.8951	Outlier
11262	625,965	2019	0	1	0.1351	0.5338	Normal
11262	40,646	2020	0	0	0.9363	0.4841	Normal
11525	57,131	2017	0	0	0.2859	0.3215	Normal
11525	62,689	2018	0	0	0.2257	0.3064	Normal
11525	55,082	2019	0	0	0.3081	0.3270	Normal
11525	325,772	2020	1	1	2.6240	1.4060	Outlier
12766	20,000	2019	0	-1	1.3371	0.3343	Outlier
12766	1,469,814	2020	0	-1	0.2698	0.0674	Normal
12766	2,189,400	2021	0	-1	1.0674	0.2668	Normal

Records Days Gap Anomalies Analysis

- Looking for Days gap in data entry:
 - Days gap between last entry to next entry
 - Example:
 - 8/1/2021 - 8/31/2021
 - 10/1/2021 – 10/31/2021-- **flagged as Outlier**
 - Data Gap:
 - Missing 9/1/2021 - 9/30/2021
 - **Period- Delta is 30 days**
- **Note 32 represents normal date interval**

Sample Records Days Gap Anomalies Analysis

ApplicationSystemID	Unique_ID	Amount	Period_Delta	StartDate	EndDate	iso_forest	local	Z_score (STD Deviation)	Scores	Outliers
A03-03- Glass Installation- W	8	3,672		8/1/2018	8/31/2018	-1	-1	-1	-1	-1
A03-03- Glass Installation- W	8	3,456	1	9/1/2018	9/30/2018	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	2,592	397	11/1/2019	11/30/2019	1	1	4.97243736	1.99311	Outlier
A03-03- Glass Installation- W	8	3,240	1	12/1/2019	12/31/2019	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,888	1	1/1/2020	1/31/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,240	1	2/1/2020	2/29/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	2,592	1	3/1/2020	3/31/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	648	31	5/1/2020	5/31/2020	1	0	0.163726596	0.29093	Outlier
A03-03- Glass Installation- W	8	2,592	1	6/1/2020	6/30/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	2,808	1	7/1/2020	7/31/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	4,104	1	8/1/2020	8/31/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,456	1	9/1/2020	9/30/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	4,104	1	10/1/2020	10/31/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,456	1	11/1/2020	11/30/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	2,808	1	12/1/2020	12/31/2020	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,024	1	1/1/2021	1/31/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	4,104	1	2/1/2021	2/28/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	2,160	1	3/1/2021	3/31/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,024	1	4/1/2021	4/30/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,672	1	5/1/2021	5/31/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	4,320	1	6/1/2021	6/30/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	4,536	1	7/1/2021	7/31/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,456	1	8/1/2021	8/31/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	1,944	31	10/1/2021	10/31/2021	1	0	0.163726596	0.29093	Outlier
A03-03- Glass Installation- W	8	2,376	1	11/1/2021	11/30/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	3,024	1	12/1/2021	12/31/2021	0	0	0.230430024	0.05761	Normal
A03-03- Glass Installation- W	8	216	1	12/1/2021	12/31/2021	0	0	0.230430024	0.05761	Normal

Records Period Anomalies Analysis

- Looking for Data entry Period Anomalies:
 - Detecting Data Anomalies regarding Start and End date data entry pattern.
 - Example:
 - 6/1/2019 - 6/30/2019 -- Normal
 - **8/1/2019 – 8/30/2019-- flagged as Outlier**
 - Data Gap:
 - Normal Expected entry is 8/1/2019 – 8/31/2019
 - **Period- is 30 days**
- **Note 32 represents normal date interval**

Records Period Anomalies Analysis

ApplicationSystemID	Unique_ID	Amount	Period	StartDate	EndDate	Iso_forest	local	z_score (STD Deviation)	Scores	Outliers
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	8.818488	32	1/1/2019	1/31/2019	0	0	0.37796	0.09449	Normal
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	4.409244	32	2/1/2019	2/28/2019	0	0	0.37796	0.09449	Normal
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	6.613866	32	4/1/2019	4/30/2019	0	0	0.37796	0.09449	Normal
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	6.613866	32	5/1/2019	5/31/2019	0	0	0.37796	0.09449	Normal
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	13.227732	32	6/1/2019	6/30/2019	0	0	0.37796	0.09449	Normal
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	6.613866	29	8/1/2019	8/30/2019	1	1	2.64575	1.16144	Outlier
GA400 / ATRIV- TRIVIAL ACTIVITIE	270	4.409244	32	10/1/2019	10/31/2019	0	0	0.37796	0.09449	Normal

AI Data Anomaly Detection for Big Data



Thank you!!
Questions??

SUSTAINABILITY TRACKING

THE IMPORTANCE OF SUSTAINABILITY TRACKING & REPORTING



Measure progress and track goals



Demonstrating effectiveness and impact



Decision-making process is more efficient



Identifies operations and practices that need to be improved



Reduced risk across your supply chain



Improved corporate reputation and consumer confidence



Mitigate negative environmental, social, and governance impacts

Scope 1 - Direct Emissions

Stationary Combustion

e.g., boilers, heaters, furnaces, kilns, ovens, flares, thermal oxidizers, dryers and other equipment

Mobile Combustion

e.g., heavy-duty vehicles, pickup trucks, construction equipment, ships, freight trains, commercial aircraft

Fugitive Emissions

e.g., leaks from refrigeration and air conditioning systems, fire suppression systems

Process Emissions

e.g. production of CO₂ during manufacturing, factory fumes

SCOPE 2- DEFINITION/METRICS

- Scope 2 Emissions are indirect emissions that result from an organizations activities but are emitted from sources owned by other parties.



Location Based:

- Direct Line.
- Region/Sub-Region.
- Nation based.



Calculation: Total Emissions (CO₂, CH₄, N₂O) = Activity (energy consumed, heat/steam/cooling used) * Emission Factor

THIRD-PARTY PARTNERSHIP WITH **urjanet**

UNLOCK THE POWER OF UTILITY DATA

Submitter's Name	<input type="text" value="Joel Smith"/>
Submitter's Phone Number	<input type="text" value="450 438 4585"/>
Email Address	<input type="text" value="Joel.Smith@abc.com"/>
Utility Provider	<div style="border: 1px solid #ccc; padding: 5px;"><p>Please Choose:</p><input type="text" value="Looking for"/><p>4-County Electric Power Association, Mississippi</p><p>4D Sanitation & Recycling</p><p>A & A Waste Management Inc.</p><p>A & S Sanitation Services, New Jersey</p><p>A A A Septic Tank Cleaning, West Virginia</p></div>
Utility Account Username	<input type="text"/>
Utility Account Password	<input type="password"/>



Utility data aggregator



Connects with electricity, natural gas, waste, water, and telecom providers



Data automatically fed into ERA's system within 24 hours



For Small, medium to large enterprises: locate your facilities and measure their sustainability metrics without effort



Closely monitor progress toward sustainability initiatives with utility bill and interval data

WATER EMISSION FACTORS

Calculate water emission factors based on water usage data provided:

Emission factors are calculated as per the water consumption used in cooling, treatment, transportation, etc.

Emission factors are typically calculated as
EF x Usage = Emissions



WASTE EMISSION FACTORS

Are sorted per:

The type of waste material
landfilled, recycled, combusted,
composted, etc.

How the waste is processed
aluminum cans, drywall, copper
wire, concrete, etc.

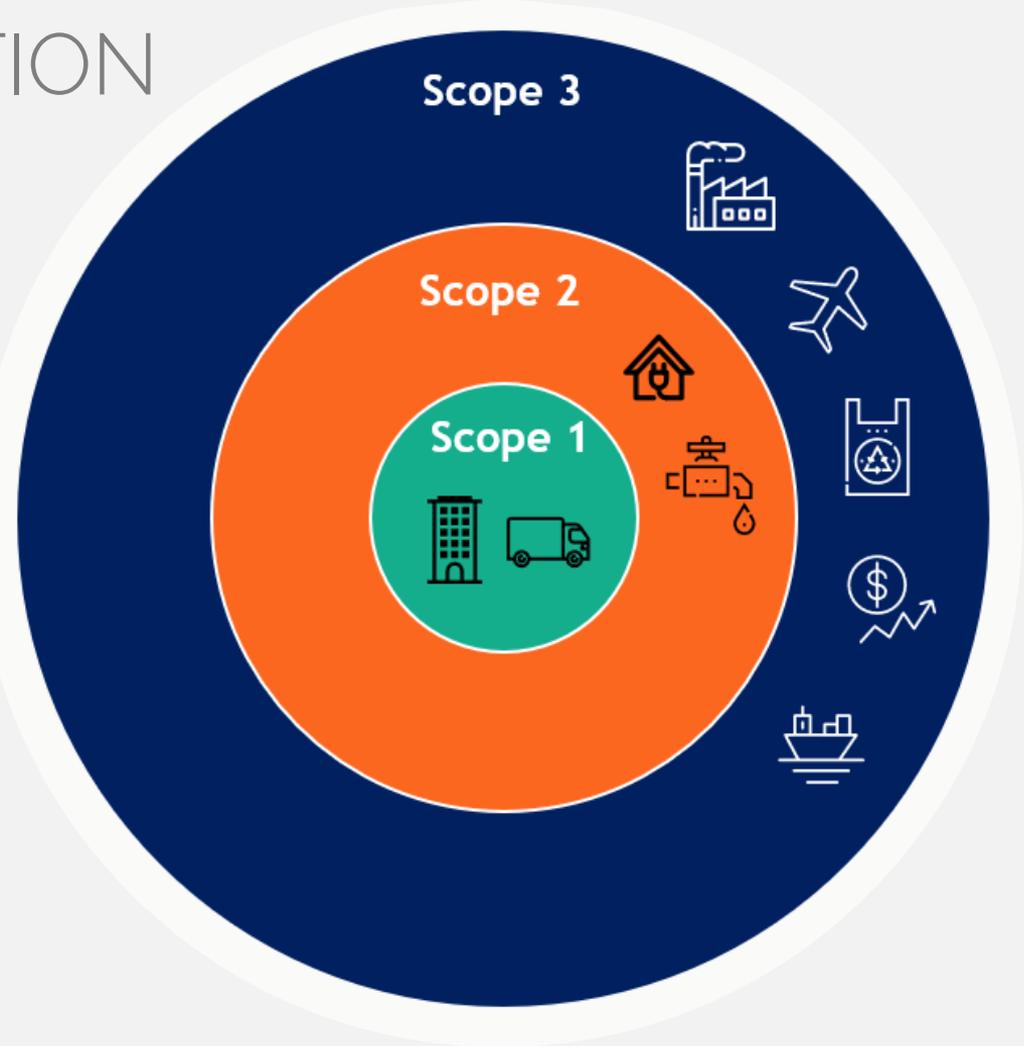
PLEASE  RECYCLE

ORGANIC PAPER PLASTIC GLASS METAL E-WASTE MIXED



SCOPE 3 - DEFINITION

Scope 3: Supply chain emissions are the emissions which occur from **other sources** owned or controlled by other entities within an organization.



Scope 3 emissions are divided in 15 different categories.

Upstream or downstream

Upstream scope 3 emissions

Downstream scope 3 emissions

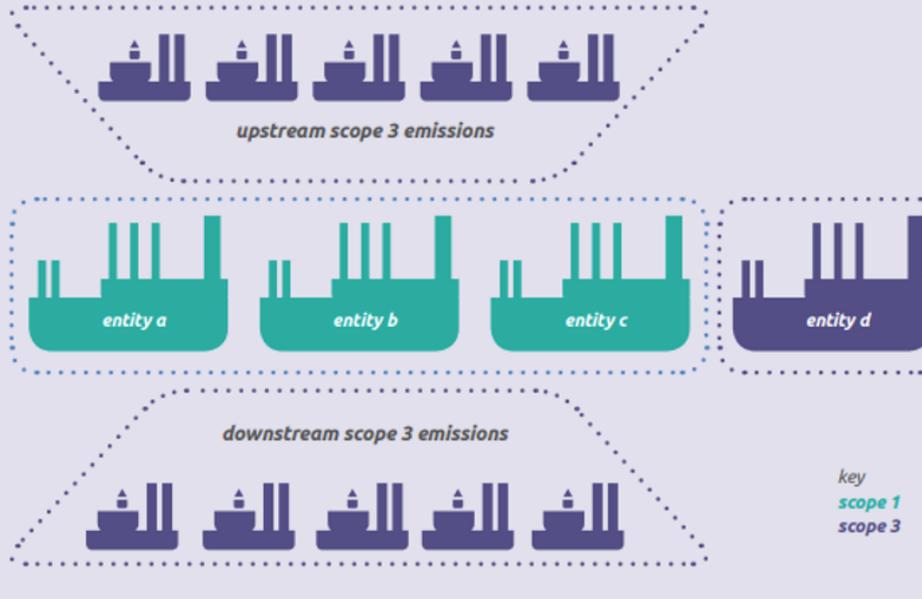
Scope 3 category

1. Purchased goods and services
2. Capital goods
3. Fuel- and energy-related activities (not included in scope 1 or scope 2)
4. Upstream transportation and distribution
5. Waste generated in operations
6. Business travel
7. Employee commuting
8. Upstream leased assets
9. Downstream transportation and distribution
10. Processing of sold products
11. Use of sold products
12. End-of-life treatment of sold products
13. Downstream leased assets
14. Franchises
15. Investments

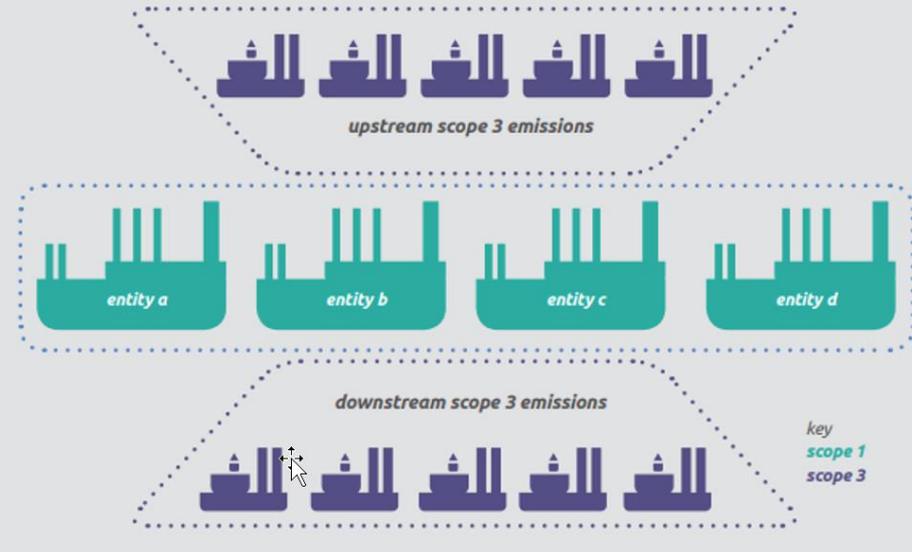
SCOPE 3 – OPTIONS OF organization's boundary

Example of how the consolidation approach affects the scope 3 inventory

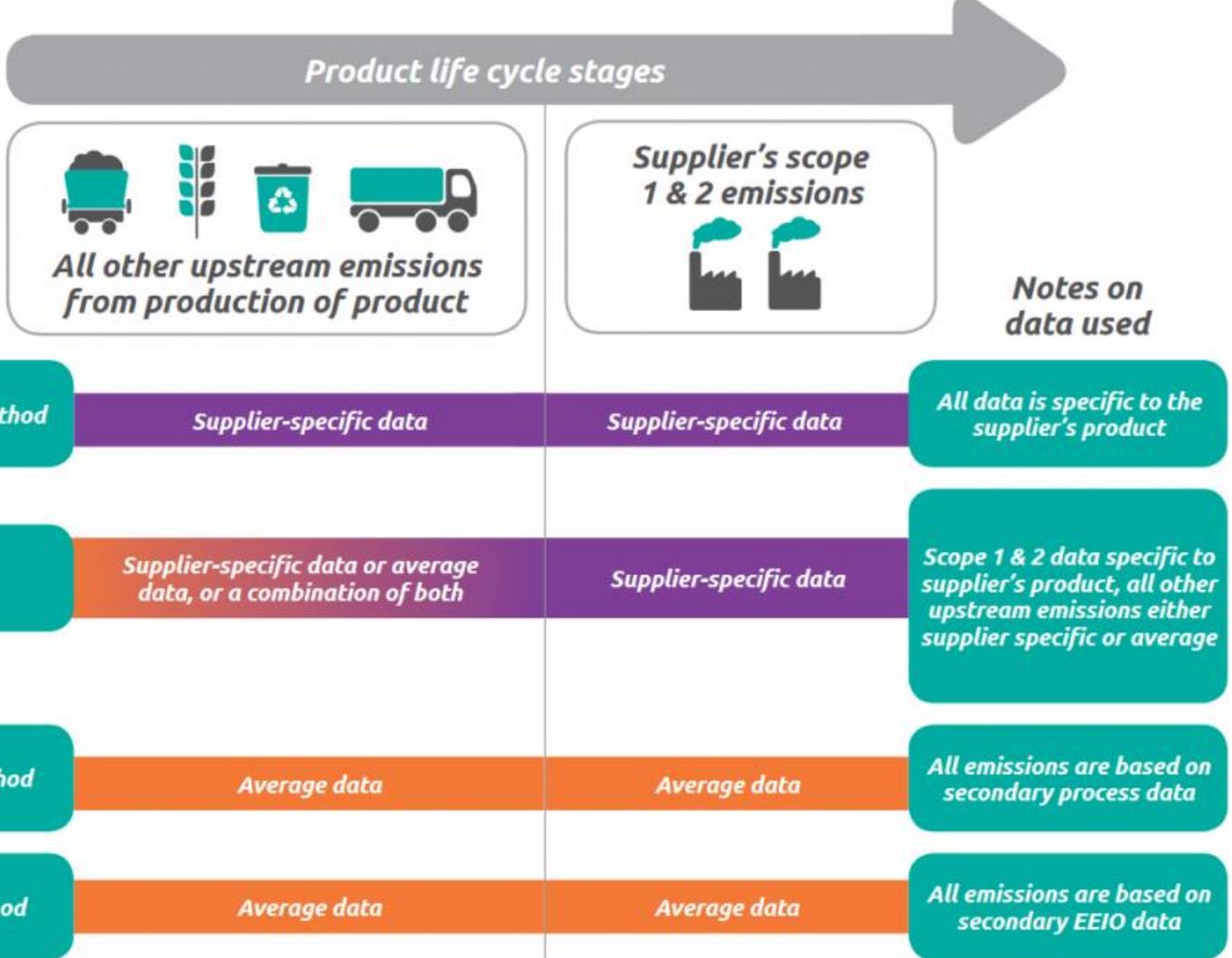
using the operational control approach



using the equity share approach



SCOPE 3 - CALCULATIONS



SCOPE 3 - METRICS



Department for
Business, Energy
& Industrial Strategy



Department
for Environment
Food & Rural Affairs

CARBON CREDIT TYPES –

CARBON OFFSET



Certificates sold to 3rd party companies that want to balance their CO₂ emissions



One certificate represents the reduction of 1 metric ton of CO₂ or CO₂-e emission



Companies can claim to have reduced or avoided GHG emissions outside of the organization's operations



Emission reduction projects reduce GHGs by –

- capturing and destroying a greenhouse
- producing energy using clean, renewable resources
- Sequestering GHGs



Offsets can be used to reduce an organization's scope 1, 2 or 3 emissions

(REC)



1 REC = one megawatt-hour (MWh) of electricity produced by renewable energy source



RECs can be generated when companies

- produce renewable energy on-site
- purchase a green power product from an electricity service provider
- sign a Power Purchase Agreement (PPA) with a renewable energy producer, etc.



There is no way to differentiate between renewable and non-renewable electricity once it goes onto the grid.



RECs are generally used to reduce Scope 2 emissions; Companies can claim to have used renewable electricity from a low or zero emissions source

SCOPE 1 -CHALLENGES

- For On-Road Vehicles, distance should be tracked in units of vehicle-miles or vehicle-kilometers, as opposed to passenger-miles or passenger-kilometers, which are often used for scope 3 mobile source emissions.



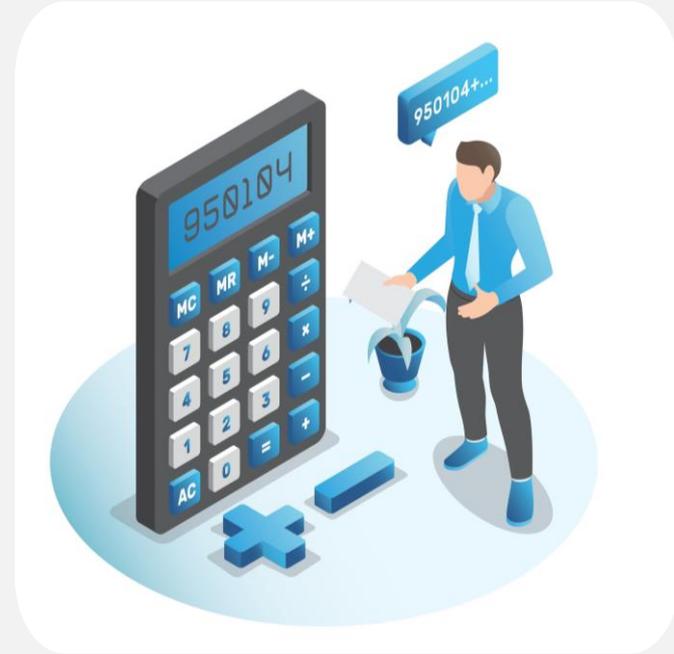
SCOPE 2 -CHALLENGES

- Large Companies must be sure that they have accounted for all energy providers as bigger companies often purchase energy from multiple sources/location.



SCOPE 3 CHALLENGES

- Obtaining data for all Scope 3 metrics can be challenging as they are provided from many different sources which are not always 100% accurate. Most of the metrics for Scope 3 are calculated as an average and the data quality as a result can be relatively poor.



AUTOMATION CAPABILITIES

AUTOMATICALLY POPULATE YOUR SUSTAINABILITY REPORTS



**CARBON
DISCLOSURE
PROJECT**

ECOVADIS

**GLOBAL
REPORTING
INITIATIVE**

Similarities Between Standards

GRI

CDP

SASB

GRI 102-50

Reporting period

C0.2

State the start and end date of the year for which you are reporting data

GRI 302-1

Energy consumption within the organization

State how much fuel in MWh your organization has consumed

HC0201-08

Total annual energy consumed (gigajoules)

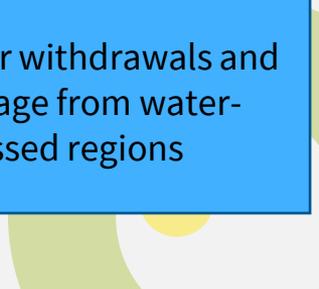
GRI 303-2

Water sources significantly affected by withdrawal of water

C8.2C

HC0201-09

Total water withdrawals and percentage from water-stressed regions





ERA Sustainability Module Demonstration

Presenter: Chelsea Scalia,
Sustainability Specialist & Project
Manager (ERA)



ERA'S SUSTAINABILITY MODULE

BENEFIT FROM A COMPREHENSIVE SUSTAINABILITY TOOL



**BUSINESS
CONTINUITY**



AUDITABILITY



**DATA
RETENTION**



**STREAMLINE
TRAINING**

ERA'S SUSTAINABILITY SOFTWARE

Standardization

- Dedicated portal with guided sustainability fields to standardize data collection process
- Built-in standardization capabilities
 - Converts and standardizes data discrepancies, units, etc.
 - Data normalization



MASTER METRICS & EMISSION FACTOR FORM

- Fully configurable to meet your corporate and site-specific goals
- Only track metrics relevant to your organization
- Assign to each site ONLY metrics that it should be tracking
- Master library of Sustainability Metrics & Emission Factors



Fuels

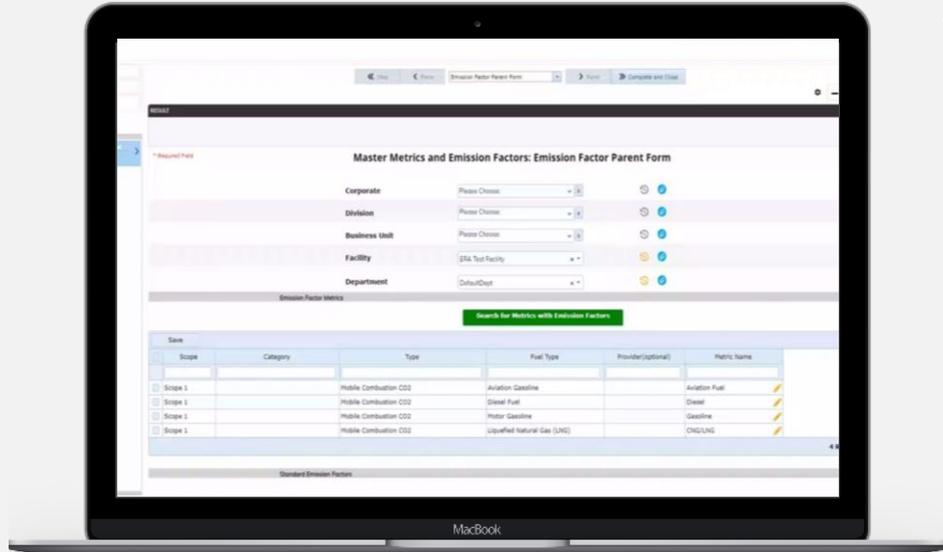
Waste

Electricity

**Non-Emission
Factor Metrics**

MASTER METRICS & EMISSION FACTOR FORM

ERA'S MASTER EMISSION FACTOR LIBRARY



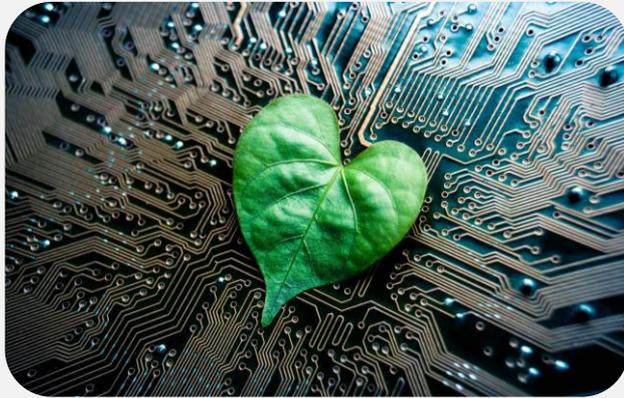
Sources include:

- ✓ U.S. Environmental Protection Agency
- ✓ European Environment Agency
- ✓ Environment and Climate Change Canada
- ✓ Environment Canada
- ✓ Intergovernmental Panel on Climate Change

Master Metrics & Emission Factor Form

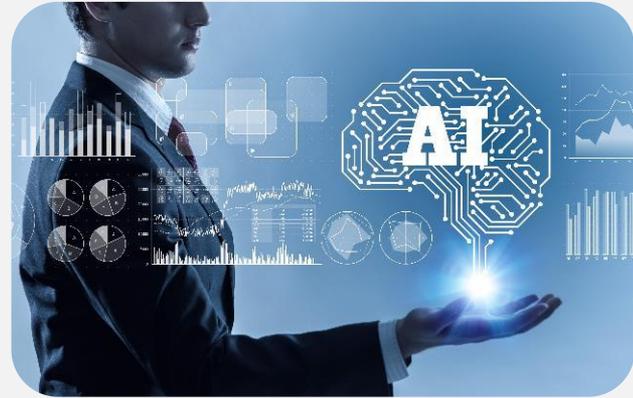
SUSTAINABILITY DATA ENTRY

STREAMLINE THE DATA ENTRY PROCESS



Manual Data Entry

Manually enter sustainability usage data directly into ERA's easy-to-use Sustainability Data Entry



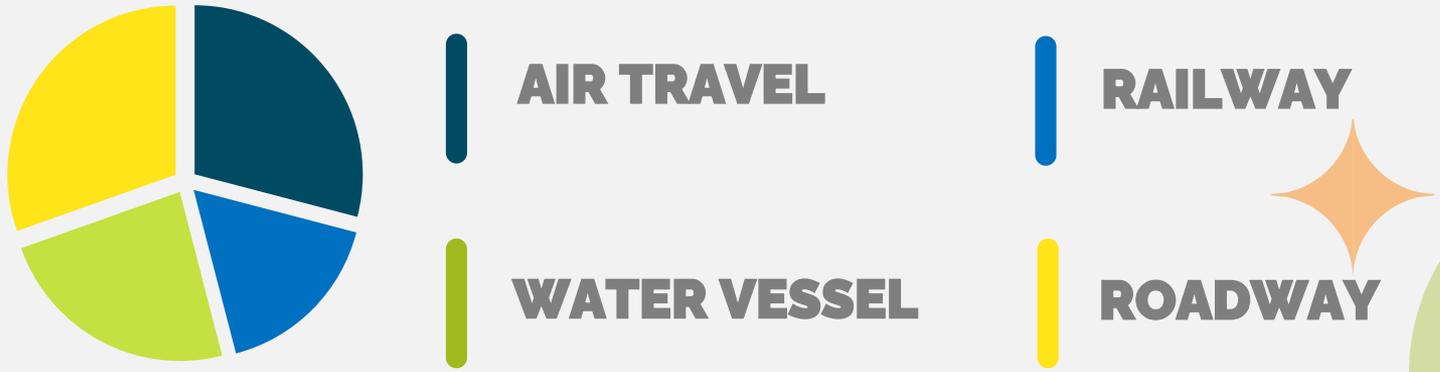
Mass-Import Data

Import large amounts of data (ex. historical data) into the system from an Excel spreadsheet

Sustainability Data Entry Form

BUSINESS TRAVEL DATA COLLECTION WORKFLOW

- Easily track Scope 3 metrics & calculate emissions
- Streamline the data collection process using ERA's smart forms
- Your employees can manually enter details about their daily commutes and other business-related travel



Business Travel Data Collection Workflow

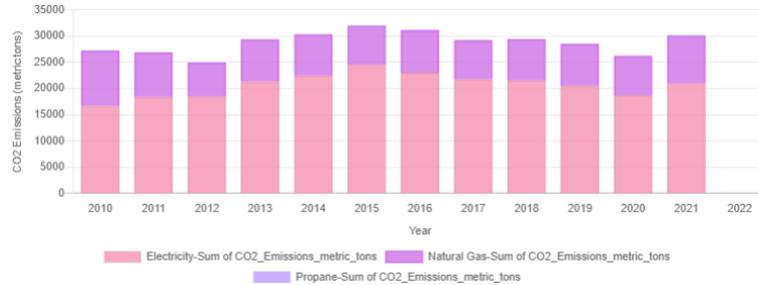
ERA HOME PAGE & DASHBOARD

☰ Scope-2 Sustainability Dashboard - Clone ▾

CO2 Emissions By Year

📊 Graphs

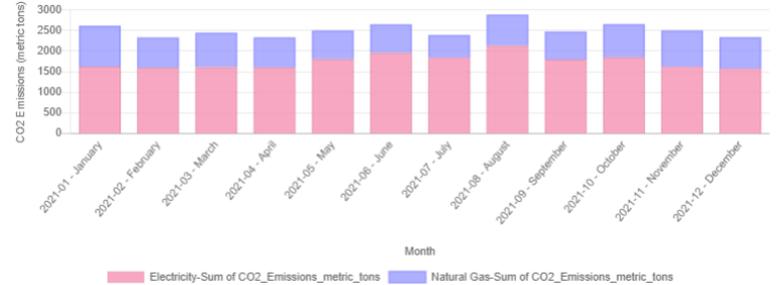
📄 Data Table



CO2 Emissions By Month

📊 Graphs

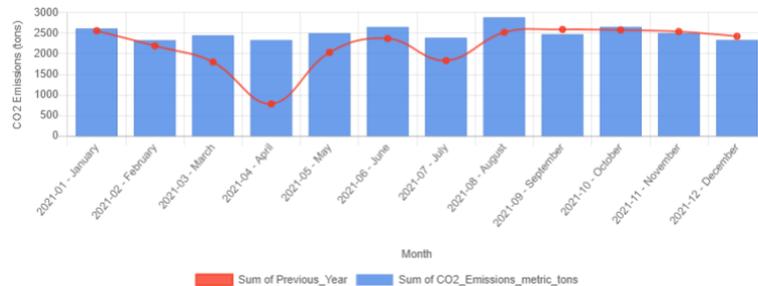
📄 Data Table



CO2 Emissions

📊 Graphs

📄 Data Table

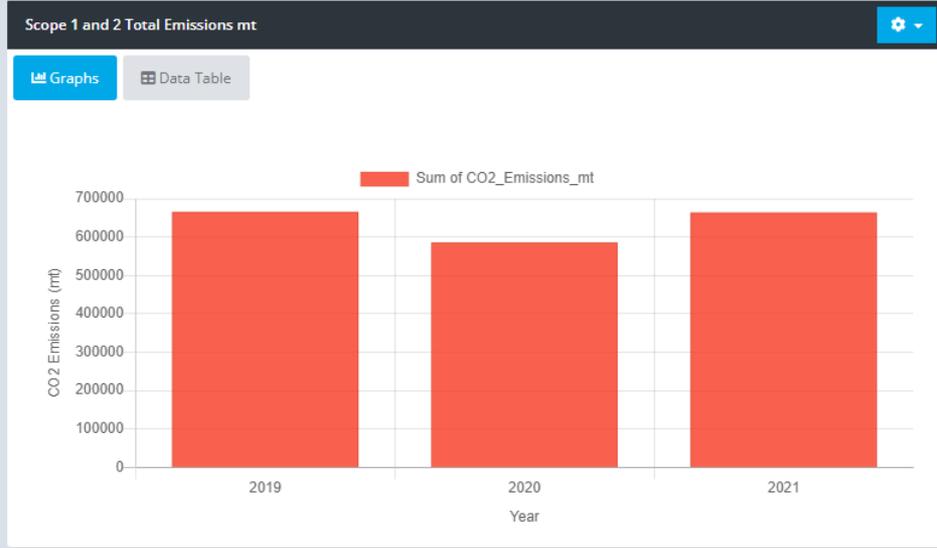
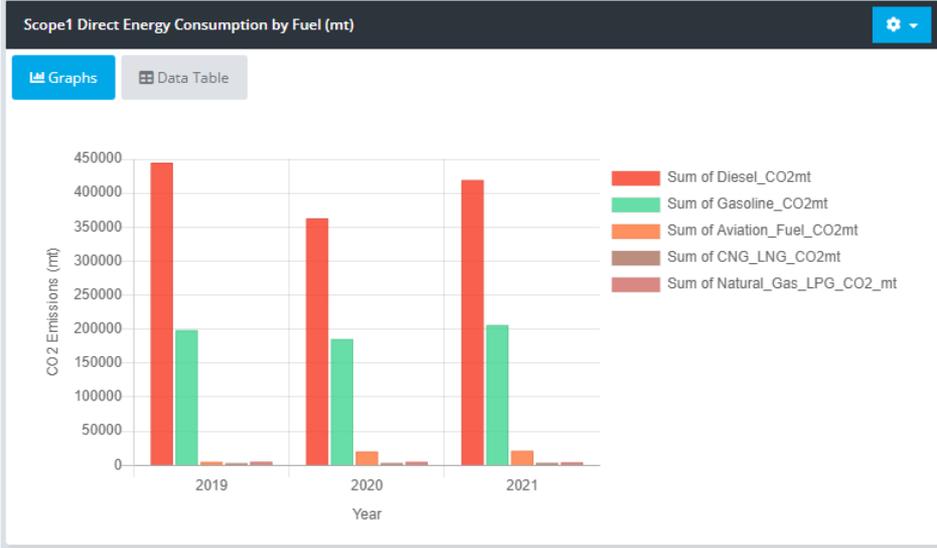


Quick Links

- Modules
 - Environmental
 - Air Emissions
 - Finishing & Chemical Coatings
 - Records
 - Product Usage
 - Materials
 - Product Specifications
 - Vendor Import Product
 - Combustion
 - Records
 - Fuel Usage
 - Miscellaneous
 - Records
 - Miscellaneous Usage
 - Tanks
 - Records

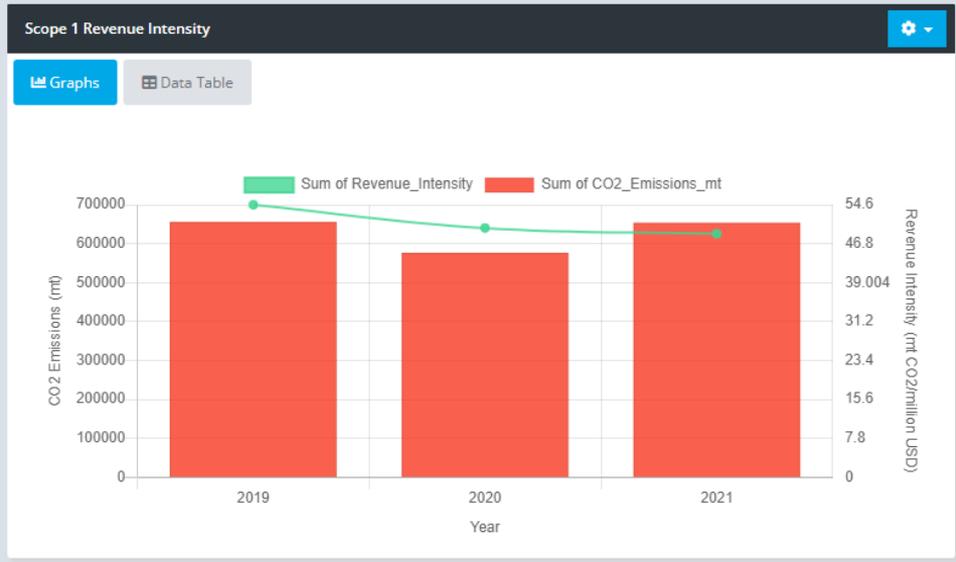
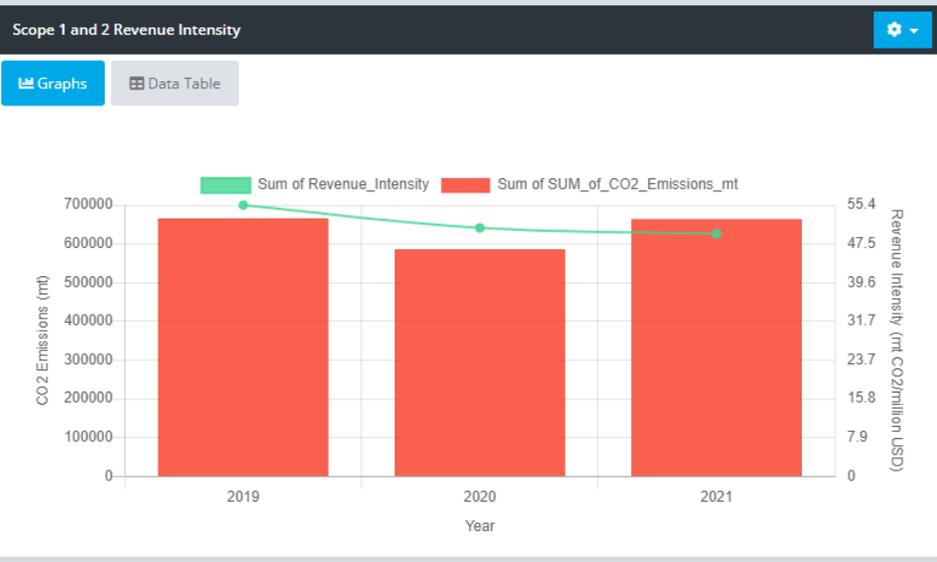
TOTAL EMISSIONS

ERA STANDARD SUSTAINABILITY KPIS



NORMALIZATION & INTENSITY

ERA STANDARD SUSTAINABILITY KPIS



CONSUMPTION & USAGE

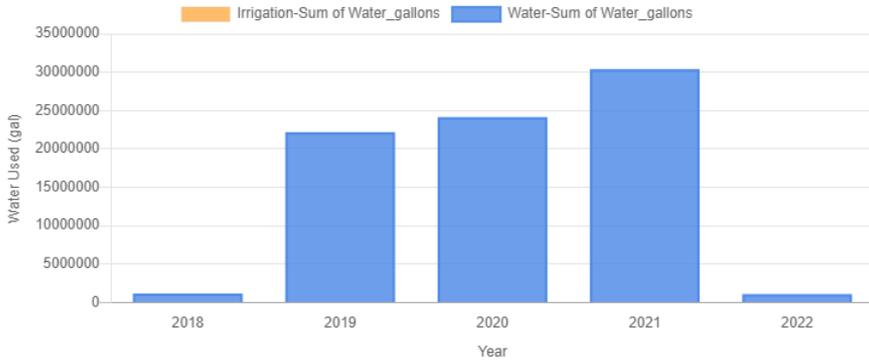
ERA STANDARD SUSTAINABILITY KPIS

Total Water Intake - All Sites



Graphs

Data Table

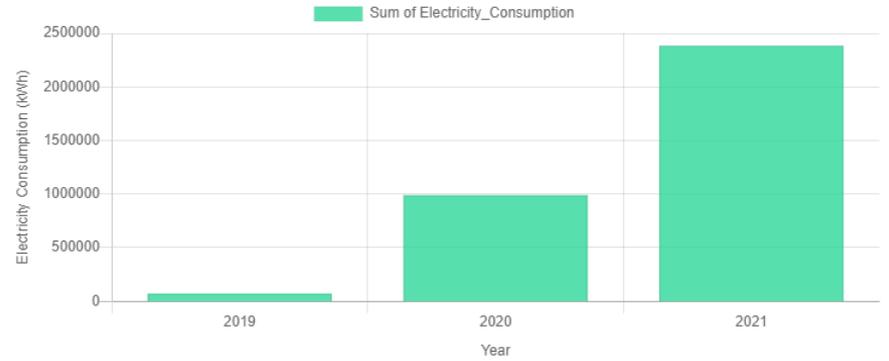


Electricity Consumption By Year



Graphs

Data Table



Year	Metric		
Month	Electricity	Natural Gas	Total Sum of CO2_Emissions_metric_tons
2021	21 014.9973	9 110.85789	30 125.85519
01 - January	1 623.69541	991.10109	2 614.7965
02 - February	1 597.57858	733.59986	2 331.17844
03 - March	1 612.77646	836.29734	2 449.0738
04 - April	1 603.61486	731.2732	2 334.88806
05 - May	1 804.08241	697.185	2 501.26741
06 - June	1 957.5542	693.07277	2 650.62697

Axis Labels

X Axis Title:

Left Y Axis Title:

Right Y Axis Title:

Target Line Value:

Labels

Chart Title:

Legend Position:

Legend Detail Labels:

Data Labels:

Count of Decimal Places:

Series

Electricity-Sum of CO2_Emissions_metric_tons Right Axis

Natural Gas-Sum of CO2_Emissions_metric_tons Right Axis

Propane-Sum of CO2_Emissions_metric_tons Right Axis

Axis Labels

X Axis Title:

Right Y Axis Title:

Target Line Value:

Color selection palette with a mouse cursor pointing to a pink color swatch.

KEY PERFORMANCE INDICATORS

- INTUITIVE UI
- CONFIGURABLE FROM THE DASHBOARD
- EDIT DISPLAY SETTINGS
- ACCESS KPI DATA TABLE
- ADD TARGET LINE
- EXPORT TO EXCEL

BENEFITS & KEY FEATURES

A COMPLETE ESG SOFTWARE SOLUTION



PLUG & PLAY MODULE



SIMPLE USER DASHBOARD



MASS IMPORT
CAPABILITY



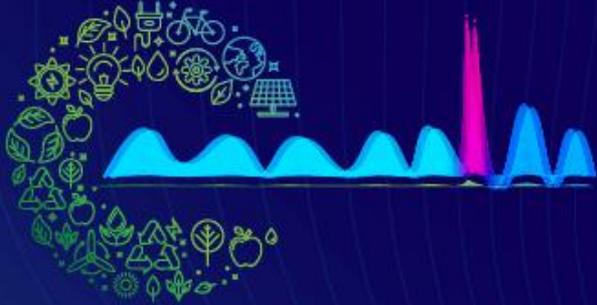
MEANINGFUL KPIs



STANDARDIZATION



FLEXIBLE GROWTH
MODEL



Would you like to learn more
about ERA software?

Erin Manitou

Managing Partner | Business
Development & Marketing Manager

Tel: 438-799-6219

E-mail: erin.manitou@era-ehs.com

Web site: www.era-environmental.com

Thank you!!
Questions??



SUPPLIERS  PARTNERSHIP
FOR THE ENVIRONMENT

References

1. [Scope 3 Inventory Guidance | US EPA](#)
2. [Corporate Value Chain \(Scope 3\) Standard | Greenhouse Gas Protocol \(ghgprotocol.org\)](#)
3. [Scope 2 Guidance | Greenhouse Gas Protocol \(ghgprotocol.org\)](#)
4. [Greenhouse Gas Inventory Guidance: Indirect Emissions from Purchased Electricity \(EPA\)](#)
5. [Calculation Tools | Greenhouse Gas Protocol \(ghgprotocol.org\)](#)
6. [Scope3 Calculation Guidance 0.pdf \(ghgprotocol.org\)](#)
7. [Emission Factors for Greenhouse Gas Inventories \(epa.gov\)](#)
8. [Greenhouse gas reporting: conversion factors 2022 - GOV.UK \(www.gov.uk\)](#)
9. [Greenhouse Gas Inventory Guidance: Direct Emissions from Stationary Combustion Sources \(epa.gov\)](#)
10. [Amazon.ca : freon r410a](#)
11. [Greenhouse Gas Inventory Guidance: Direct Fugitive Emissions from Refrigeration, Air Conditioning, Fire Suppression, and Industrial Gases \(epa.gov\)](#)
12. [Greenhouse Gas Inventory Guidance: Direct Emissions from Mobile Combustion Source \(epa.gov\)](#)
13. [Carbon emissions set to drop this year by biggest amount since World War II \(freshdaily.ca\)](#)