



SUSTAINABILITY ACCOUNTING CHALLENGES AND SOLUTIONS

Digitizing Measurement, Reporting and Verification of Climate and Sustainability Activities for Trust, Efficiency and Utility

Introduction

Digital MRV solution for carbon accounting implemented at state-of-the-art waste-to-energy facilities to support climate finance, carbon markets, and NDCs

Outline:

1. Why we need DigitalMRV
2. What is DigitalMRV
3. Intro to DigitalMRV Pilot
4. Stacking DigitalMRV with other solutions

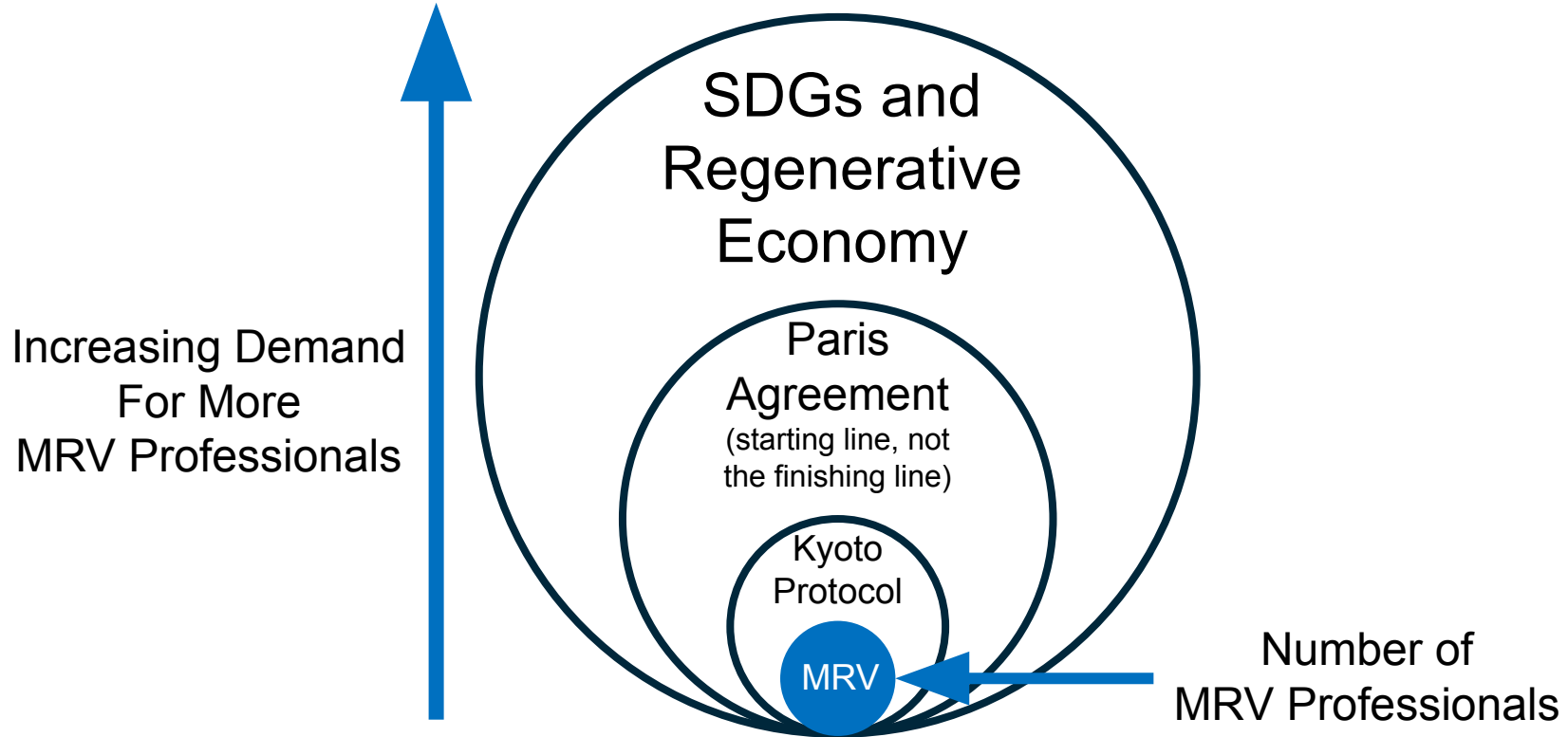
1. Why we need DMRV

Challenges

1. Not enough trained professionals to do the MRV
2. Crazy huge errors in collected and reported Data
3. Lack of credible Standardization
4. Finance and policies lack major Credibility

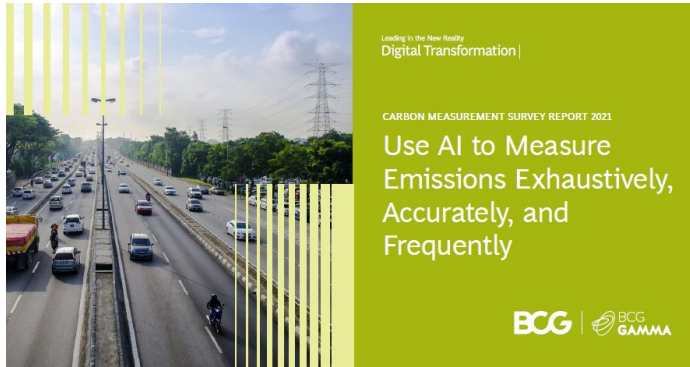
These challenges are focused on “carbon accounting”, which is so much easier than adaptation to climate impacts or other sustainability issues

Challenge 1: Not Enough MRV Professionals



Challenge 2: Crazy Huge Errors

BCG GAMMA Report, 2021



- 85% of organizations are concerned about reducing their emissions
- But only 9% are able to measure their emissions comprehensively
- And only 11% have reduced their emissions in line with their ambitions in the past five years
- Overall, respondents estimate a **30% to 40% average error** rate in their emissions measurements”

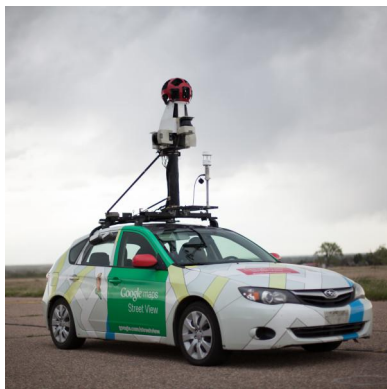
Nature Climate Change, 2021



“A **mismatch of ~5.5 Gt CO₂ yr⁻¹** exists between the global land-use fluxes estimated with IAMs and from countries’ GHG inventories [**12% error**]. Here we present a ‘Rosetta stone’ adjustment to translate IAMs’ land-use mitigation pathways to estimates more comparable with GHG inventories.”

Challenge 3: 100% error = crazy. 100x error!?

Environmental Defense Fund & Google, 2019



*“The team discovered that fertilizer plants emitted... total annual methane emissions of **29,000 metric tons** — **more than 100 times higher** than the fertilizer industry’s **self-reported estimate of 200 metric tons**.*

This figure also far exceeds the EPA's estimate for the entire U.S. industrial sector of 8,000 metric tons of methane emissions per year.”

Environmental Science & Technology, 2020

ENVIRONMENTAL
Science & Technology

*“Eight-Year Estimates of Methane Emissions from Oil and Gas Operations in Western Canada Are **Nearly Twice** Those Reported in Inventories”*

We need to redefine the standards

Challenge 4: Finance Greenwashing

The Economist, 2021



“Hot air

*Sustainable finance is rife with greenwash. **Time for more disclosure***

Supposedly green and cuddly funds are stuffed full of polluters and sin stocks.”

Bloomberg, 2021 and 2022



*“Regulators Intensify ESG Scrutiny as Greenwashing Explodes. The Global Sustainable Investment Alliance **erased \$2 trillion** from the European market for sustainable investments after anti-greenwashing rules were introduced in March by the European Union.” (2021)*

*“...about **30% of those companies**—across various industries—had **mismatched data** in at least one of the categories in a given year.” (2022)*

Challenges = Greenwashing Data & Metrics

“Garbage in = Garbage out”

Bad data (low quality, out of date, incomplete, not relevant) = **Bad results**
(rather than data as *“the new oil”* ... bad data can be damaging like *“plutonium”*)

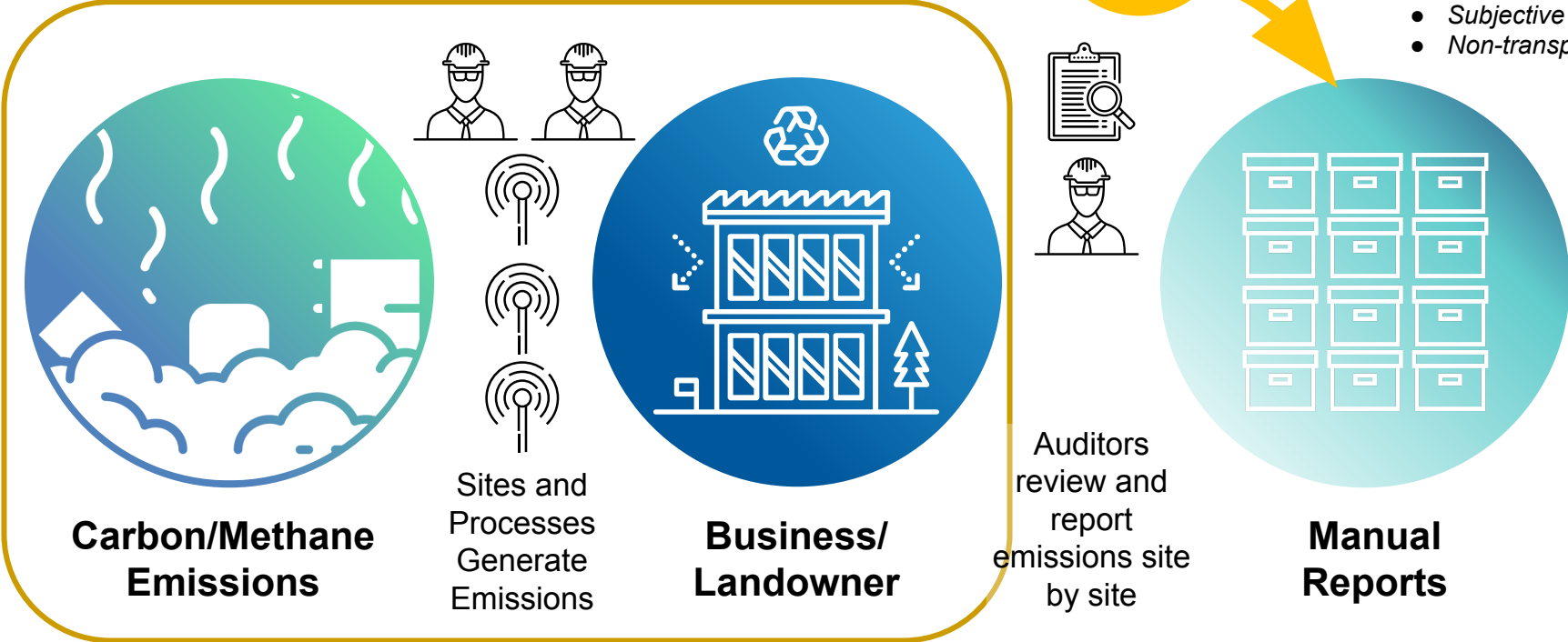
is a different problem than

Good data in + using bad standards = Garbage out

Good data (IoT digital sensors, into a DLT) + **bad standards** = **Bad results**
(mismatch of current *“manual”* standards processes relative to digital solutions that can turbo-boost greenwashing like going from *“green lipstick on a pig”* to ... I’m sure you can imagine)

Too Many Opportunities for Misrepresentation

With **Manual MRV**, it's almost impossible to accurately know if the reductions **actually** occurred



2. What is DMRV

Digitizing

Measurement:

Obtaining the data necessary to quantify anything, but in this use case the carbon footprint.

Reporting:

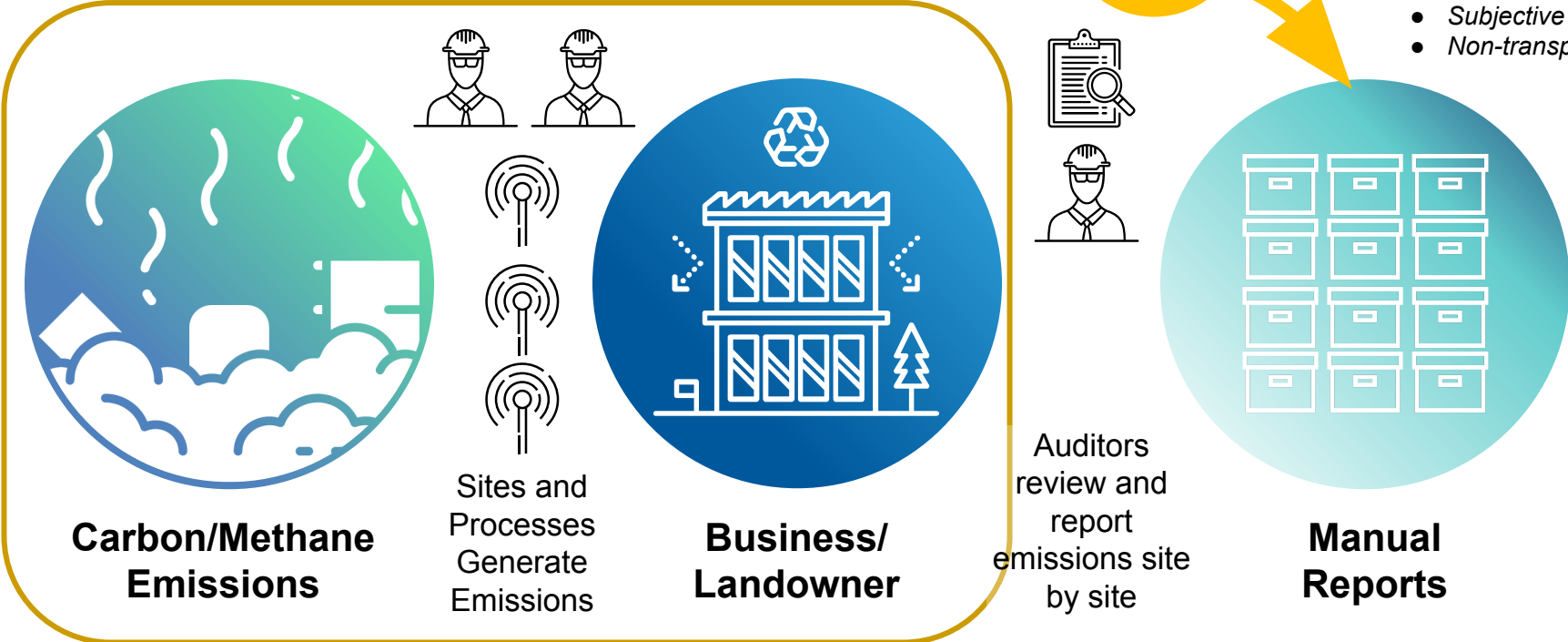
Sharing the results of the measurements in a standardized fashion

Verification:

- 1st party - Quality Assurance/Control
- 3rd party - assurance of “truthfulness” of carbon footprint reporting

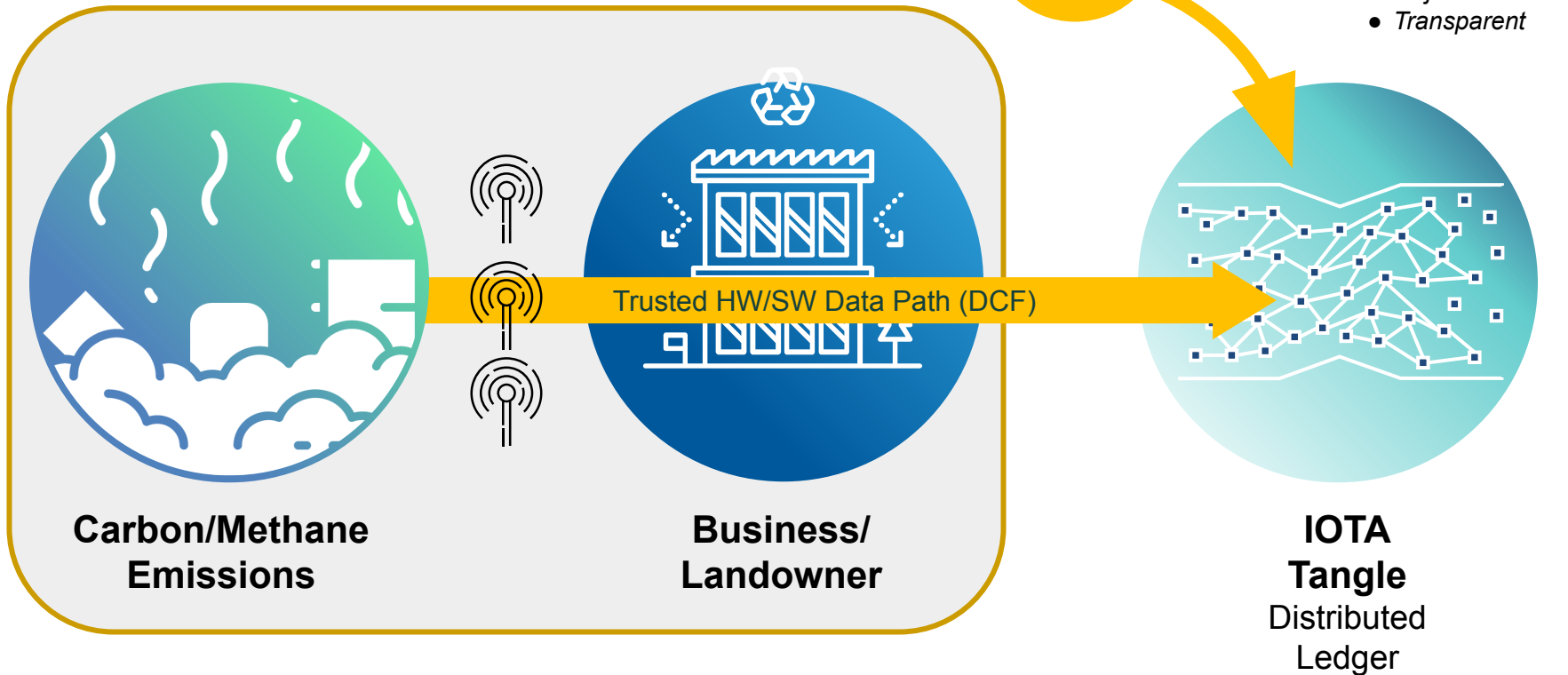
Opportunities for Misrepresentation

With **Manual MRV**, it's difficult to know if the reductions **actually** occurred



Security + Transparency

With **Digital MRV**, the granular nature provides trust in the reporting and real time insights **proving** what happened



3. Intro to DMRV Pilot

Outline

1. The Project
2. The Underlying Technology
3. Alvarium and Establishing Data Confidence
4. The DMRV Platform

DMRV has scaled 2 pilots on the GHG emissions reporting space and is moving towards scaling out as a full platform as a service across the sustainability auditing and accounting space

Chile – Canada Project Context



- Chile-Canada Bilateral Agreement on Environmental Cooperation, part of the Free Trade Agreement
- \$7M CAD financial by Environment and Climate Change Canada to support implementation of Chile's NDC
- Canada-Chile Reciclo Orgánicos Program, 2017 – 2022
 - Landfill gas to clean energy production
 - Composting and organic waste management
 - Anaerobic digestion (biodigester)
 - MRV innovations (methodologies and digitization)

This project was undertaken with the financial support of:
Ce projet a été réalisé avec l'appui financier de :



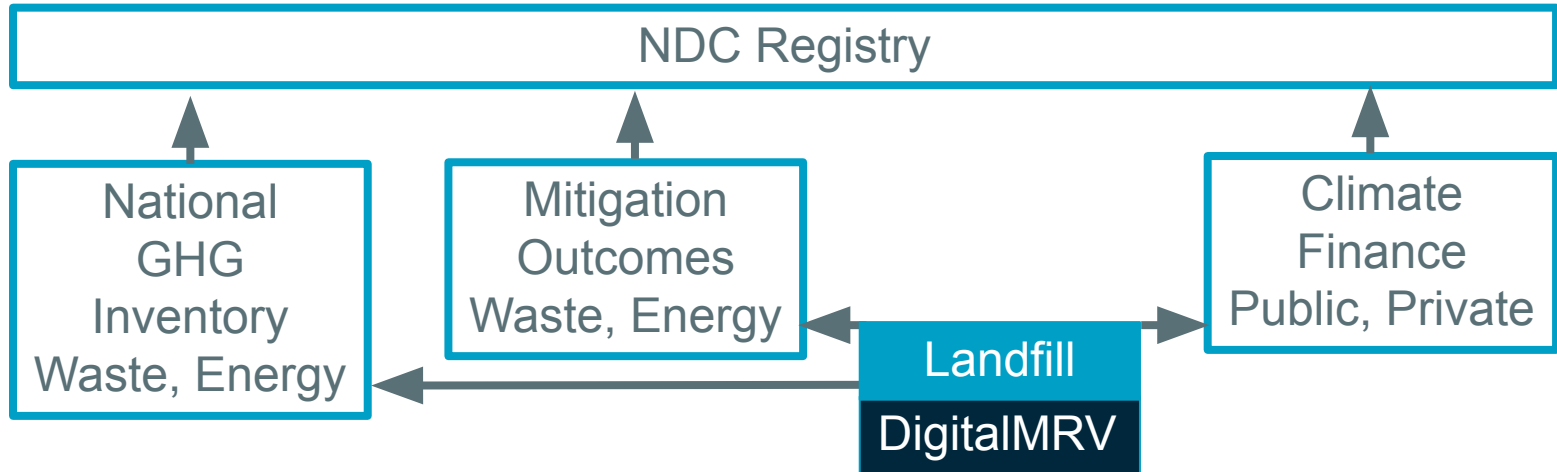
Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Chile DigitalMRV Pilot Project



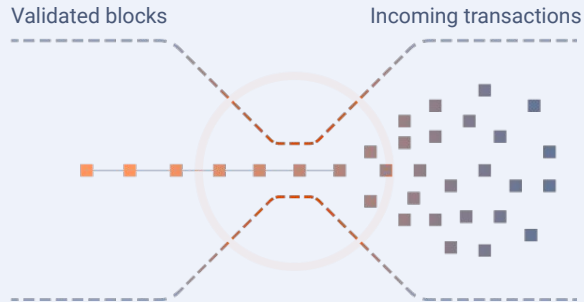
1. Proven, mature technologies (low scientific risk)
2. New build site, modern equipment
3. Digital sensors and data management system enable quick connect for DigitalMRV
4. Chile landfill project MRV methodology
5. Site is relevant to different stakeholders (mitigation, inventories, finance)



The IOTA Tangle is a next generation distributed ledger - a better blockchain without blocks, chains, miners or fees

Blockchains

Bottleneck by design

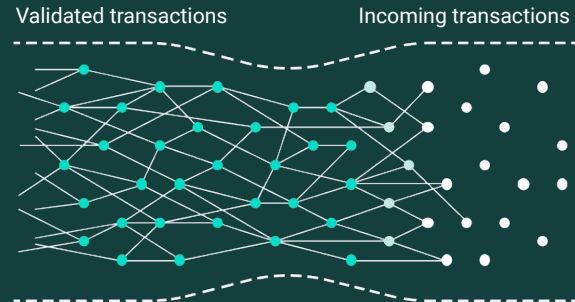


A chain of blocks containing a **limited number of transactions** each

Miners validate new transactions & package them into new blocks, extracting fees

IOTA

Scalability by design



A directed acyclic graph (DAG) of **individual interlinked transactions**

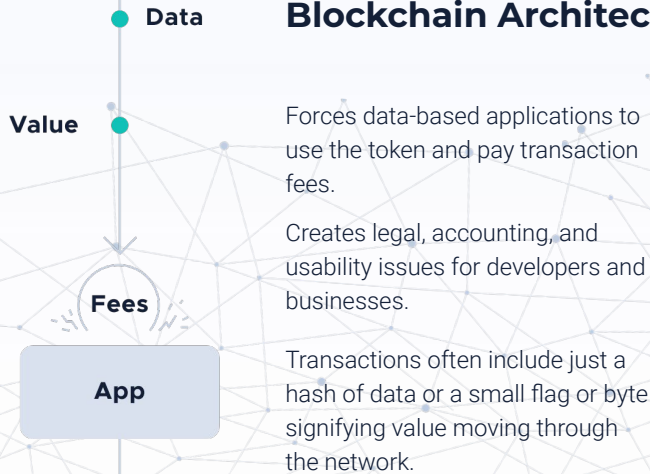
Incoming transactions validate and attach to previous ones, **without transaction fees**



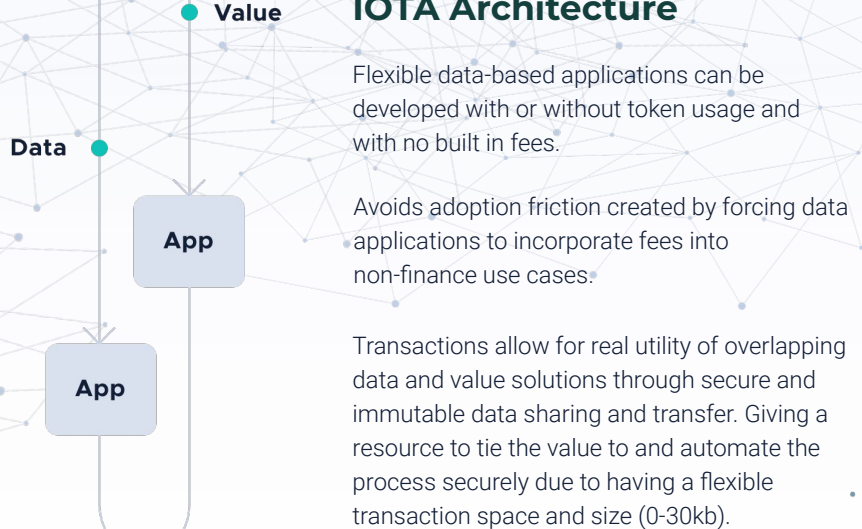
IOTA's Parallel Architecture

By separating data and value, IOTA enables complex networks of stakeholders to cooperate on Climate Action and Sustainability over a permissionless network, without requiring fees.

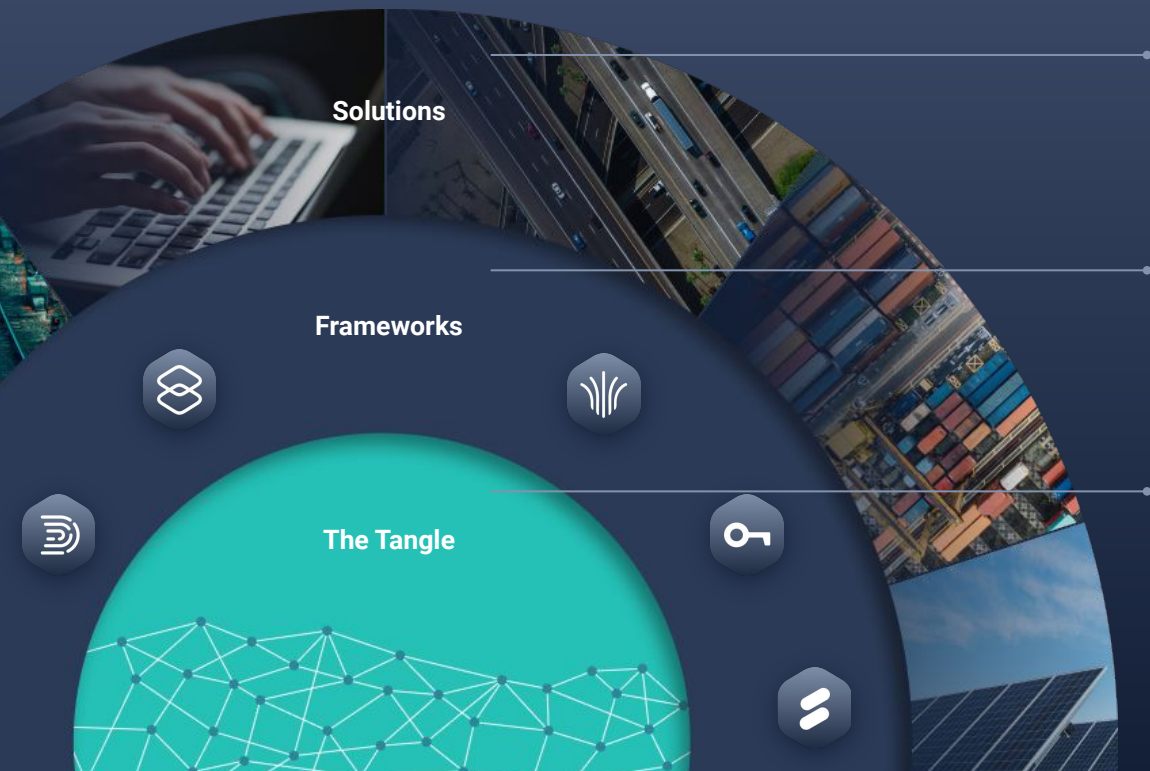
Blockchain Architecture



IOTA Architecture



IOTA enables you to build solutions through its open-source tech stack



Products and solutions

Solve specific industry problems and offer a broad range of functionalities to users

Frameworks

Extend the core protocol using freely available building blocks that you can tailor to your needs

Core protocol

The Tangle provides the basic functionality and security of the IOTA protocol and defines its key characteristics



Biodigester pilot project (Molina, Chile)



Organic Feedstock

(Used grapes and crop waste, animal waste)
Significant carbon & methane emissions



Fertilizer and Emissions Capture

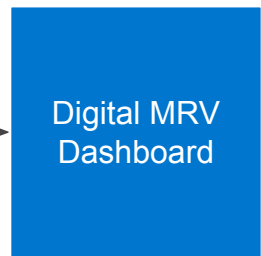
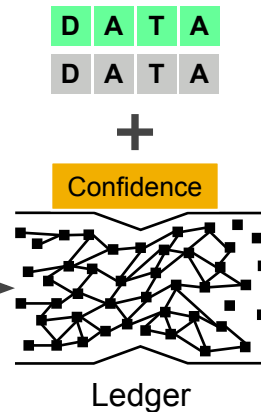
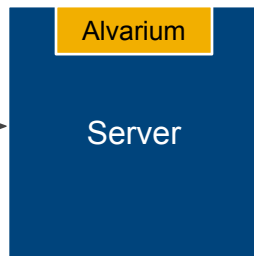
Liquid and Physical Fertilizer is created and sold. Emissions are captured and use to produce energy for the facility

Digital MRV/DCF solution overview

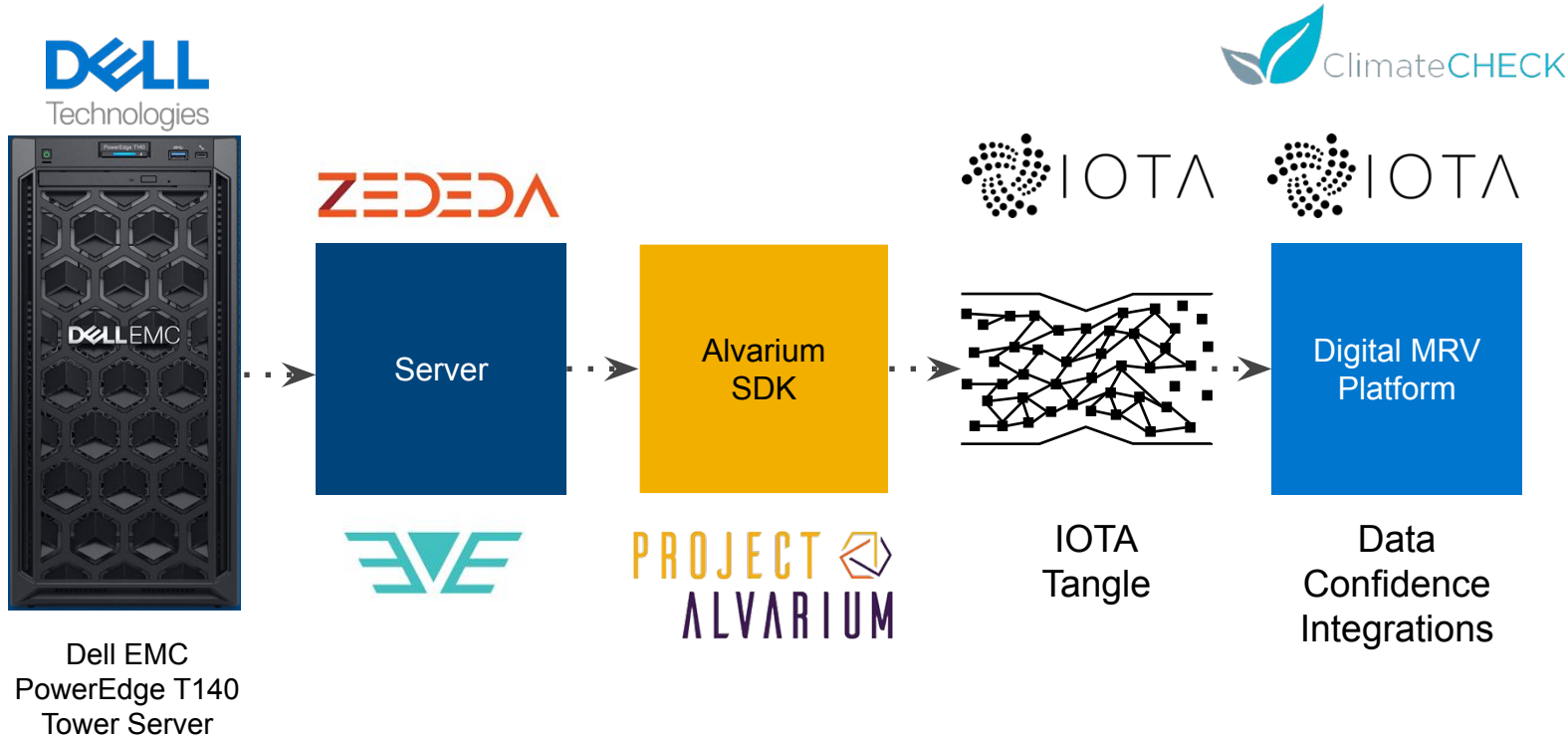
- Gas Flow Sensor
- Gas Composition
- Electricity Generation
- Flare
- Temperature
- Flow Meter
- Feedstock Weight
- Truck Mileage
- Material
- Diesel
- Photos and Misc.



D	A	T	A
D	A	T	A
D	A	T	A
D	A	T	A
D	A	T	A
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Solution partners



Alvarium SDK operation

Sensor Based Data

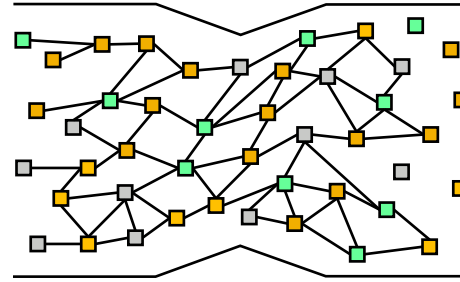


D A T A

Manually Entered Data

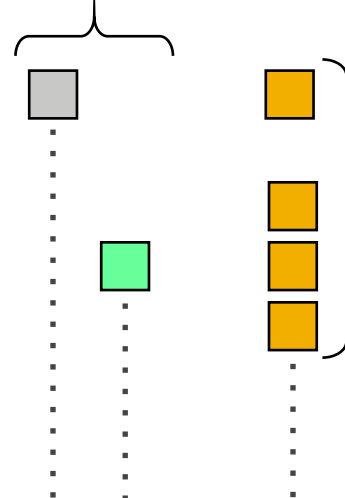


D A T A



```
SDK.Create {  
  TPM.Annotate(data);  
  PKI.Annotate(data);  
  TLS.Annotate(data);  
}  
  
SDK.Create {  
  TPM.Annotate(data);  
}
```

Emissions Data

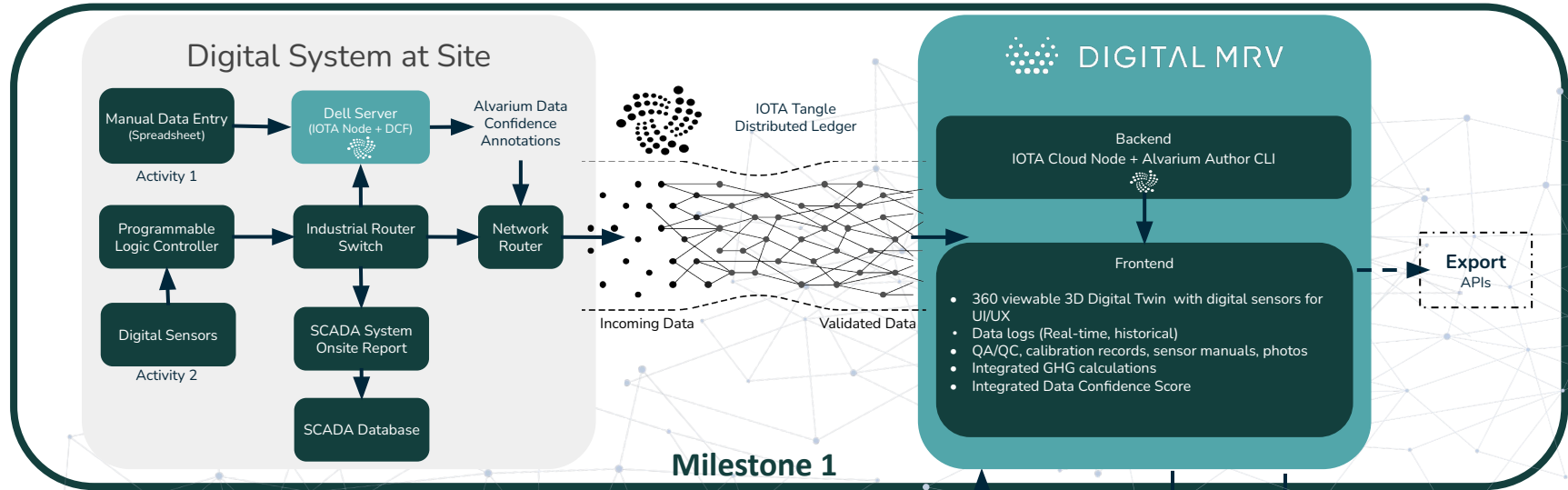


GHG Emissions Savings

Data Confidence Score

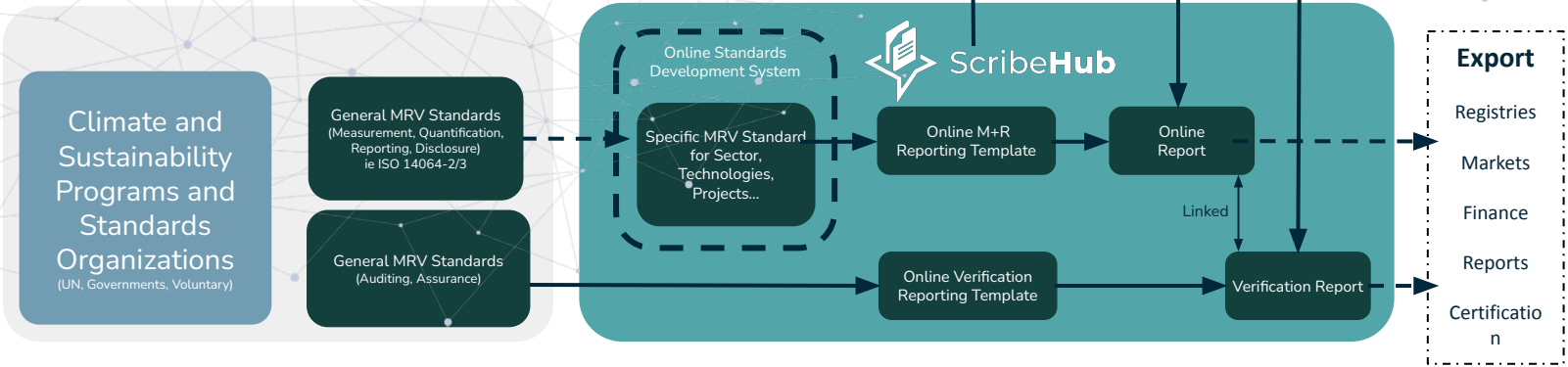
Dashboard

Integration Process

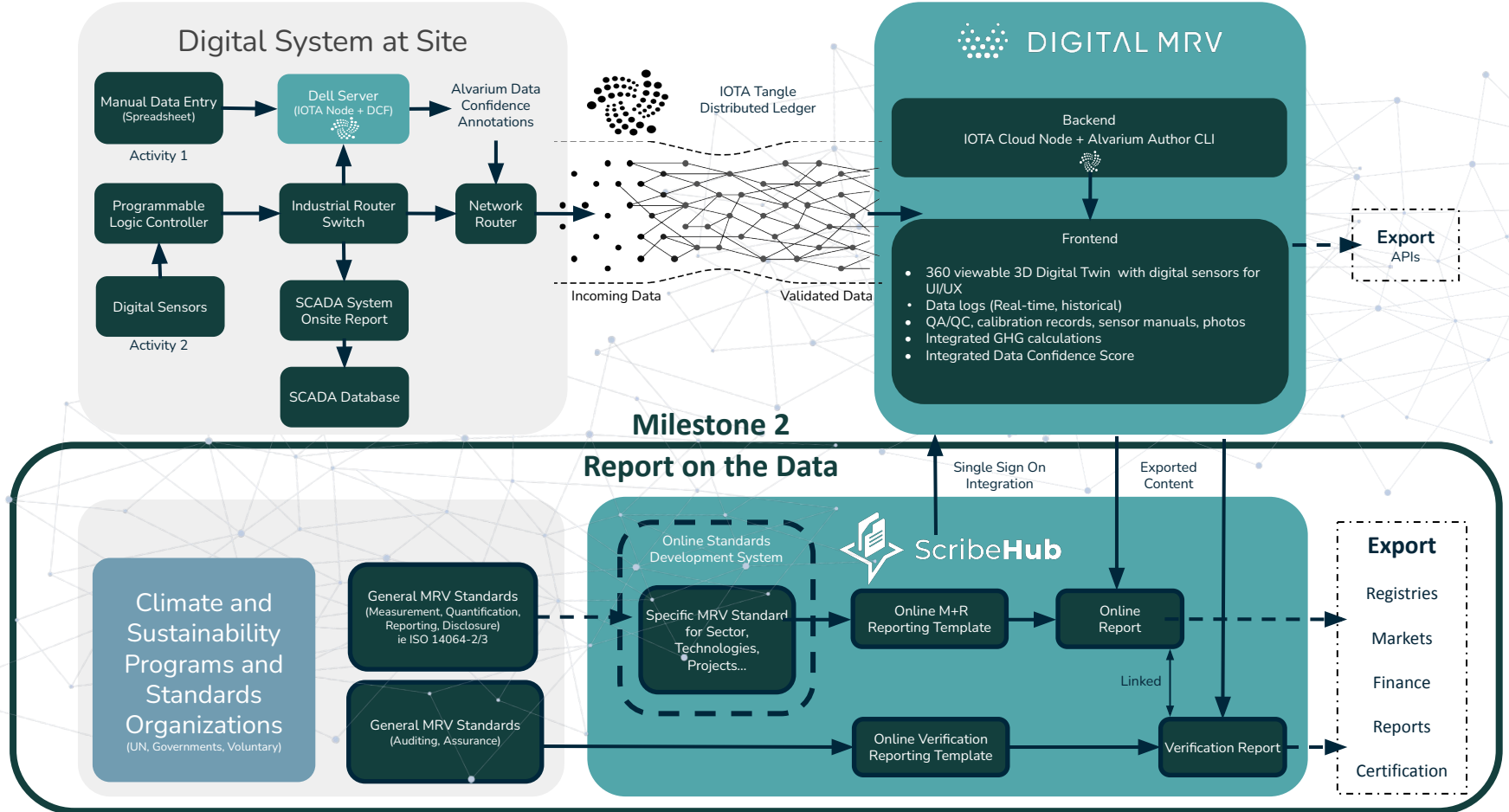


Milestone 1

Gather the Data



Integration Process

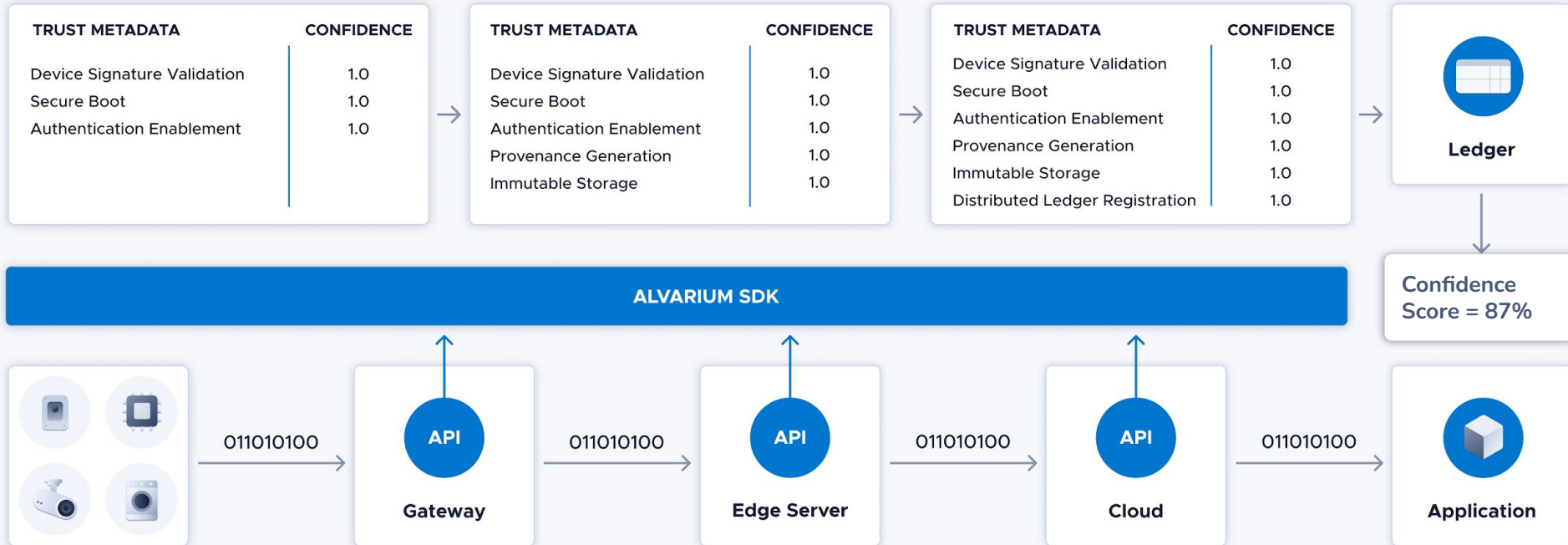


Establishing Data Confidence

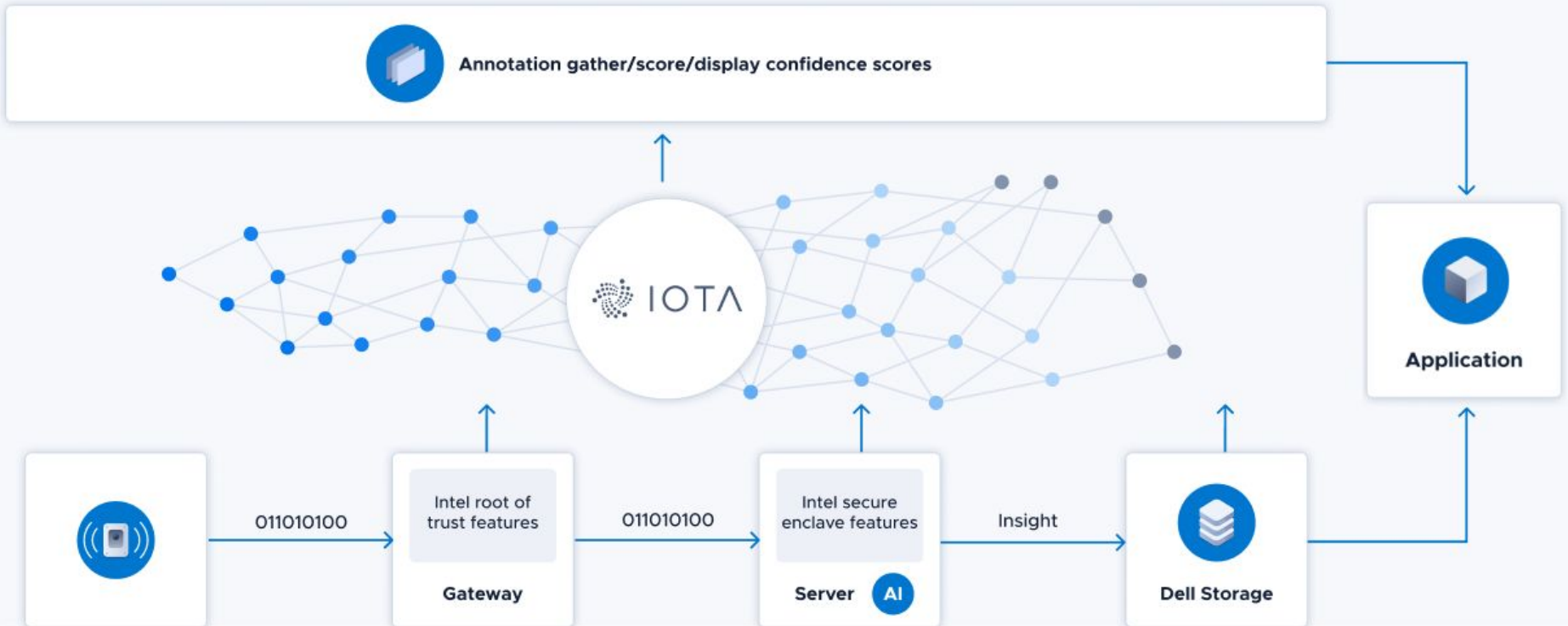


PROJECT ALVARIUM

The Alvarium code base is a lightweight SDK that annotates data streams (e.g., sensor data) with trust metadata and confidence scores, forming a Data Confidence Fabric (DCF)



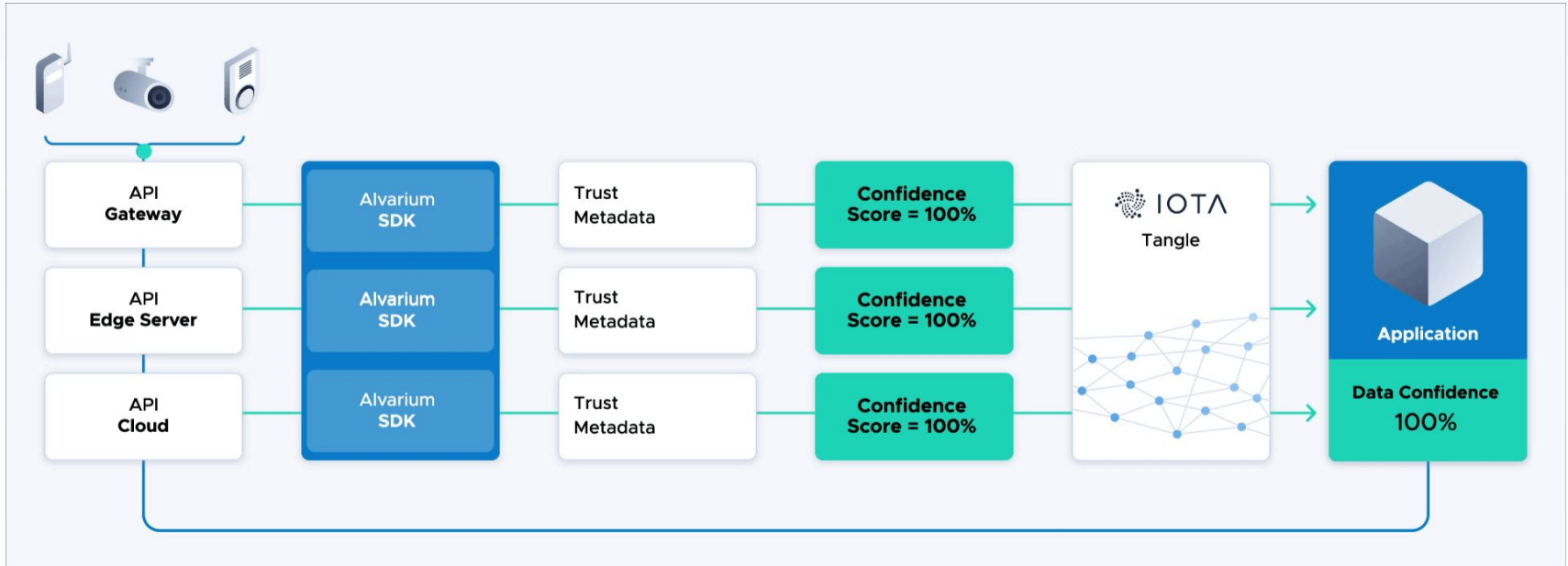
Securing Data Confidence



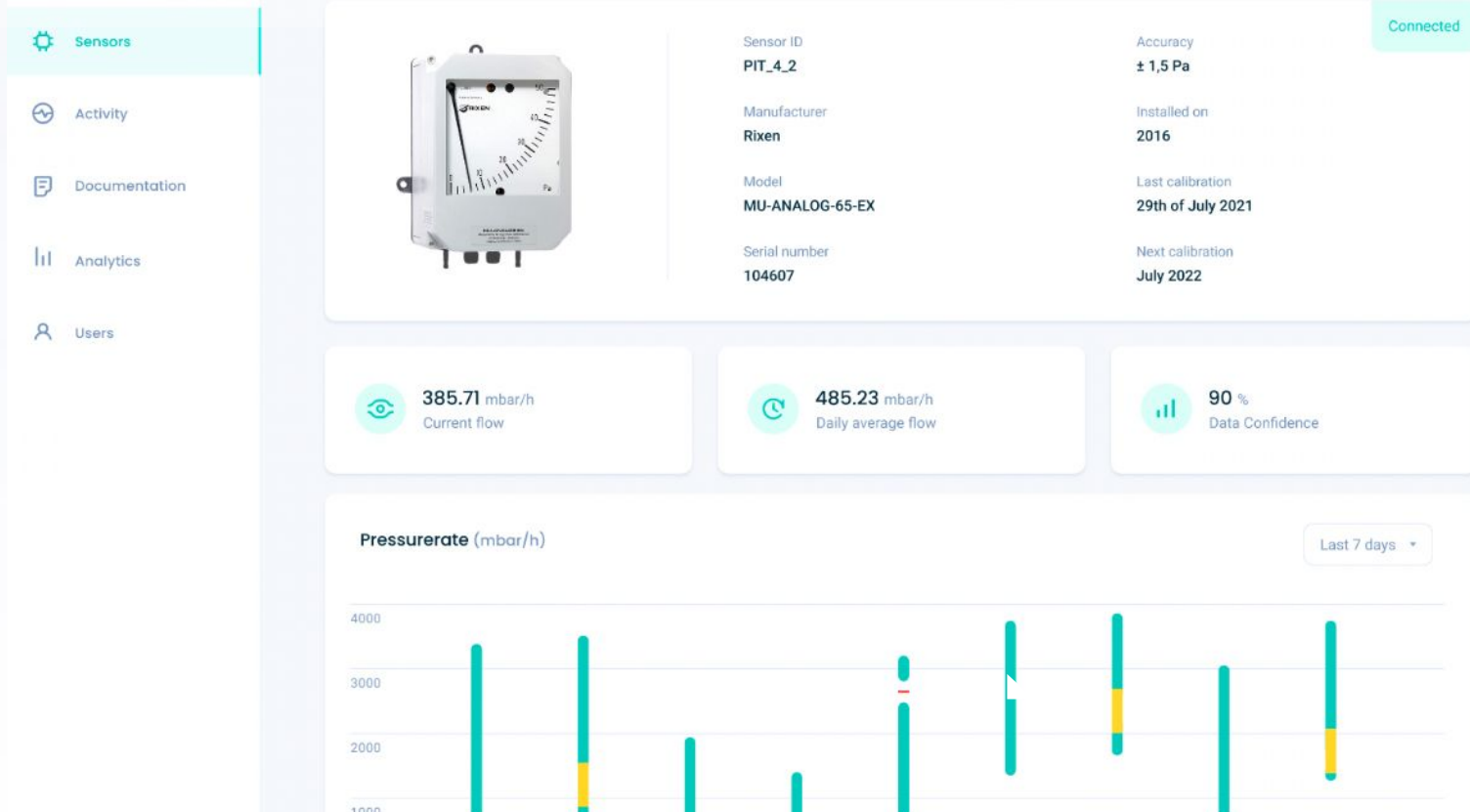
Resilient, Sustainable Infrastructure

Putting secure data and scalability first.

IOTA enables drastic levels of security improvements and new degrees of oversight, while ensuring that data remains private - with its contribution to Project Alvarium, IOTA even enables graded trust scores based on the full journey of data from source to application. [Learn More](#)

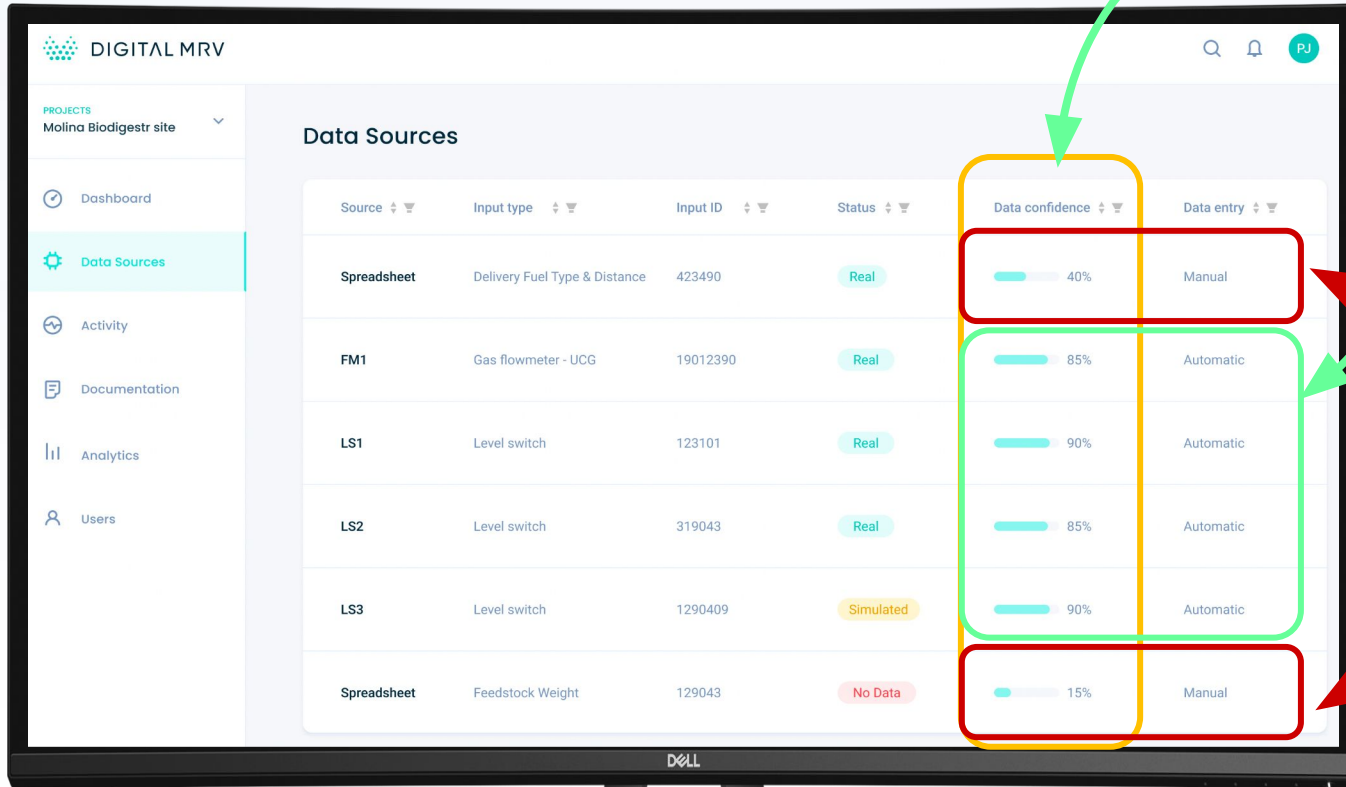


The Next Generation of Climate MRV



A clear user interface makes DigitalMRV feel seamless and intuitive...

Data Confidence Quantified



Data
Confidence
Scores

Autonomous data
has higher
confidence

Manually entered
data has lower
confidence



4. Stacking DMRV

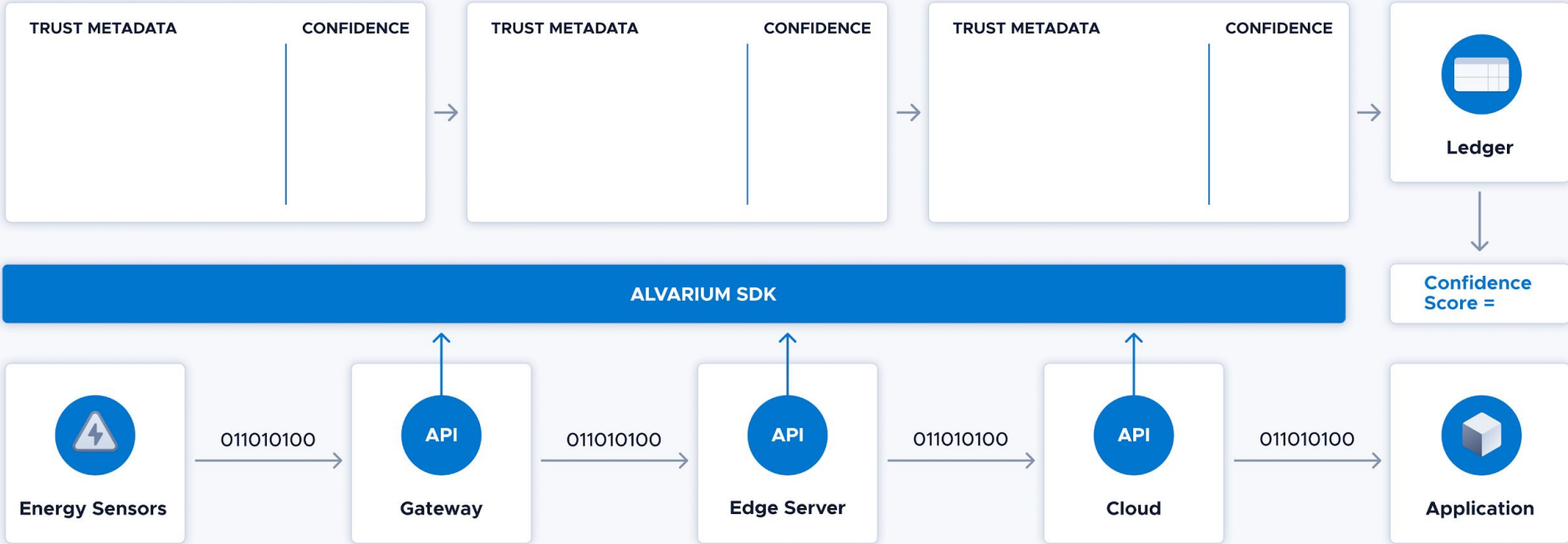
Digital MRV and Alvarium allow granular reporting to be integrated across all industries. Once a methodology has been defined for reporting required information, DMRV can integrate Alvarium to quantify the confidence in the reporting process, and incentivize new investments with heightened trust and transparency for the industry.

Stacking Digital MRV



PROJECT ALVARIUM

The Alvarium code base is a lightweight SDK that annotates data streams (e.g., sensor data) with trust metadata and confidence scores, forming a Data Confidence Fabric (DCF)



Future DCF environmental use cases



Infrastructure
Carbon Credits



Smart City
Renewable Energy
Certificates



Transportation
SDG Progress
Reporting

We're Digitizing the ESG Information Chain

Securing Data from the Source

IoT and Edge Data is the life blood of the 21st century. DigitalMRV gives you the highest levels of assurance and periodicity to guarantee the trust in your data is up to the highest standards - independent of use-case and industry.

Acting on Knowledge

Knowing and trusting machine-generated data is just the beginning. Digital Twins, Certificates and Tokenized Assets can easily be integrated with legacy systems and ensure cohesiveness of registries and ratings in a seamless fashion.

Transitioning from Data to Value

DigitalMRV empowers you to realize the value of data across domains - No matter if compliance, finance, or recognition of verifiable climate action or engaging with consumers and differentiating products, DigitalMRV allows you to structure, share and monetize data seamlessly, impacting how we progress on scope 1, 2 AND 3 emissions.

Scaling with Smart Standards & Open Collaboration

Innovation should not happen in isolation. Based on the data-sharing and incentive mechanism built into the DigitalMRV platform, you can start to innovate, experiment and start taking more-evidence based decision and business across your partner ecosystem.

This enables DigitalMRV to provide value not just in facilities, but holistically, across multiple implementations and environments at scale, feeding ESG investment into what creates the most impact and enabling true climate action.





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Head of Sustainability
IOTA Foundation

Learn more and get involved!

www.alvarium.org