Climate Warehouse

Climate Action Data Trust
Climate Warehouse Digital Ecosystem

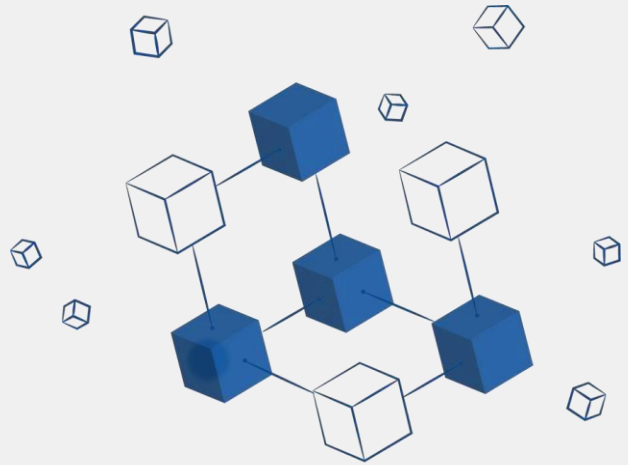
# **Climate Action Data Trust**: A global public metadata layer for the carbon markets

*WB Climate Warehouse Simulation III*

*August 2022*

# Agenda

## September 2022



- **Overview of CADT**
  - Context-setting
  - Value Proposition and Ecosystem
  - Public Good Data Layer
  - Testing and Simulation Activities
  - Prototype Architecture
- **Testing Scope and Process**
  - Objectives
  - Scope of Work & Testing Strategy
  - IT and Time Requirements
  - Feedback & Next Steps
  - Lessons Learned
- **Governance and Timeline**
  - Consultations Process and Results
  - Interim Structure and Model
  - Next Steps

**Annex:** Prototype at a glance

# Climate Action Data (CAD) Trust Overview

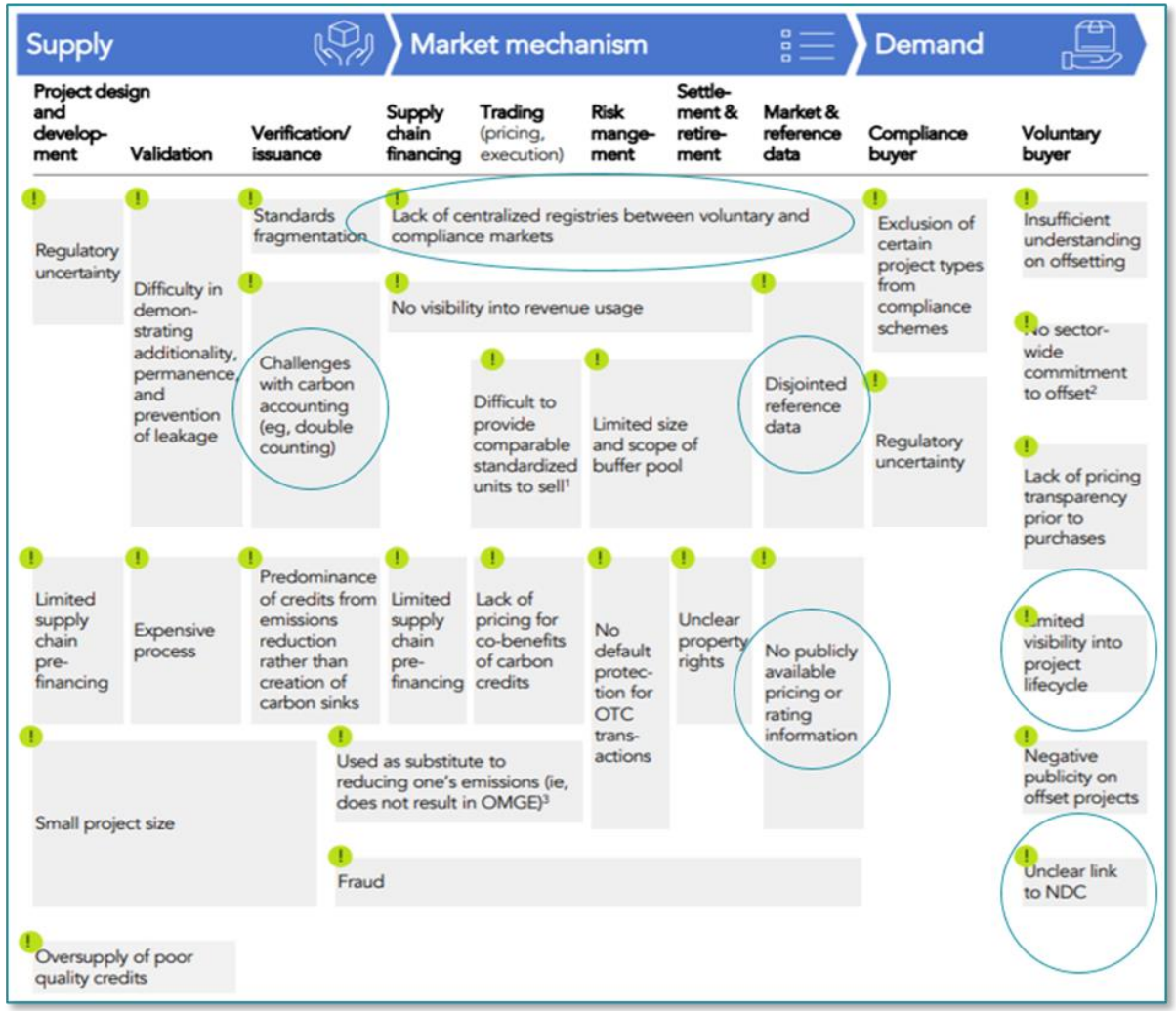
# Challenges in the Scale-up of Voluntary Carbon Markets

- **Post-2020 markets under the Paris Agreement will be built through a bottom-up approach**, as each party to the Agreement is required to track the greenhouse gas (GHG) emission reductions (or removals) achieved—and has considerable leeway to determine how this will be done.

- **The bottom-up nature of future carbon markets comes with increased complexity and diversity of reporting and verification approaches** for GHG emissions inventories and mitigation outcomes**:**
  - Limited transparency
  - Limited liquidity
  - Market fragmentation and inaccessibility
  - Quality variability
  - Lagging methodologies

- **Climate Action Data Trust**: a decentralized IT approach to underpin and streamline the functioning of post-2020 carbon markets.

Report by Taskforce on Scaling Voluntary Carbon Markets (TSVCM)




***Source:*** *Adams, Tim. Winters, Bill. Nazareth, Annette and Mark Carney Taskforce on Scaling Voluntary Carbon Markets Phase 1 Final Report: January 2021, TSVCM, pg. 45*

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# What is the Value Proposition?

## Climate Action Data Trust

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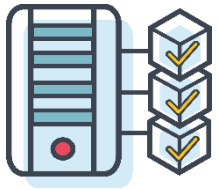
*An open-shared infrastructure*

**Global public good that aims to empower a new global carbon market infrastructure.**
Metadata platform that aims to link, aggregate and harmonize underlying registry data to enable transparent accounting as per Article 6.

**Designed as an open shared infrastructure** with a common taxonomy of data that facilitates connection and communication between entities enabled by blockchain technology.



**Registry service providers** and **countries** share data to the platform and **public and private sector market players** can host a node and build out the service layer.

**Provide visibility into corresponding adjustment procedures and the lifecycle of carbon offsets** from issuances to retirement, which will safeguard against double counting and ease reporting requirements.

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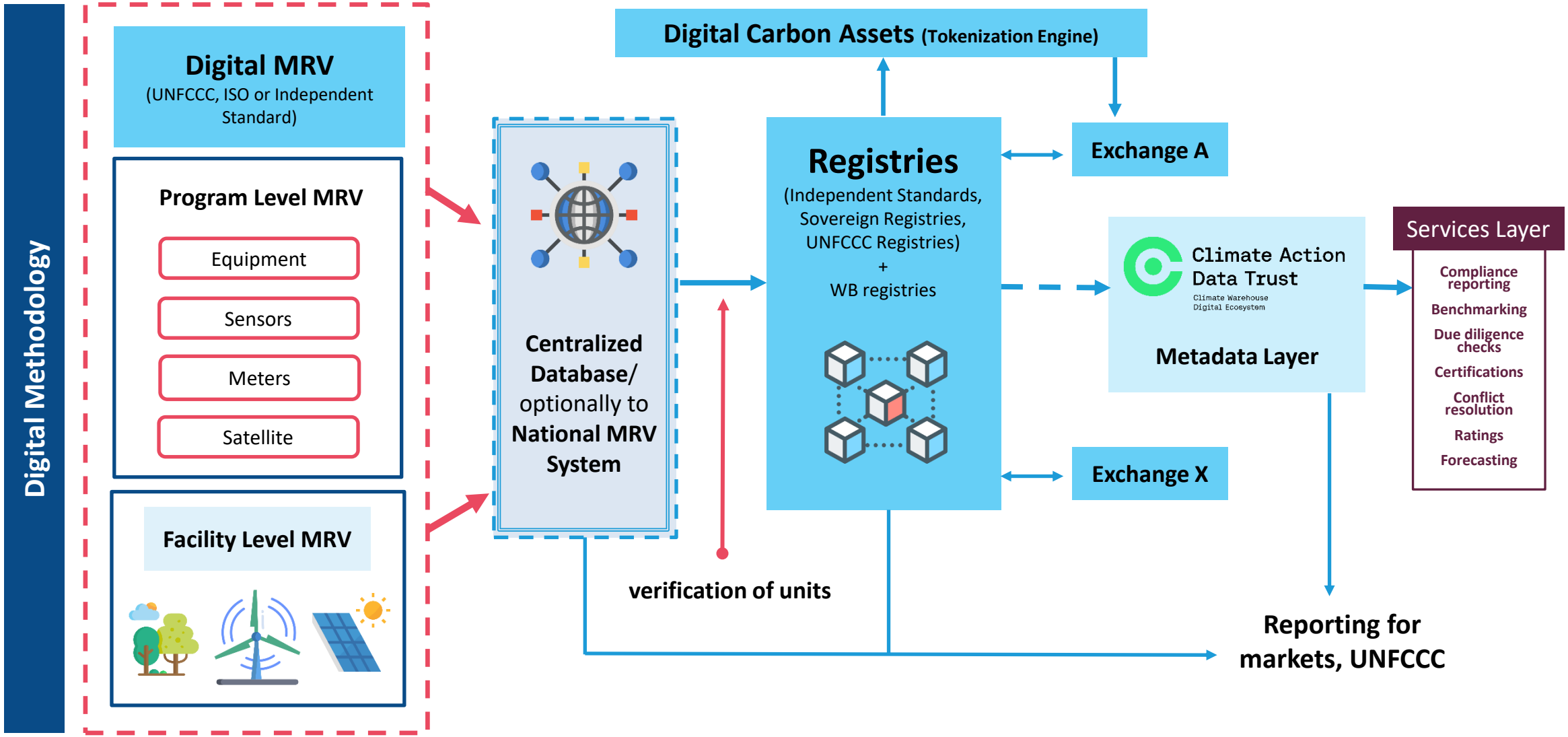
# Climate Action Data (CAD) Trust in the Data Ecosystem

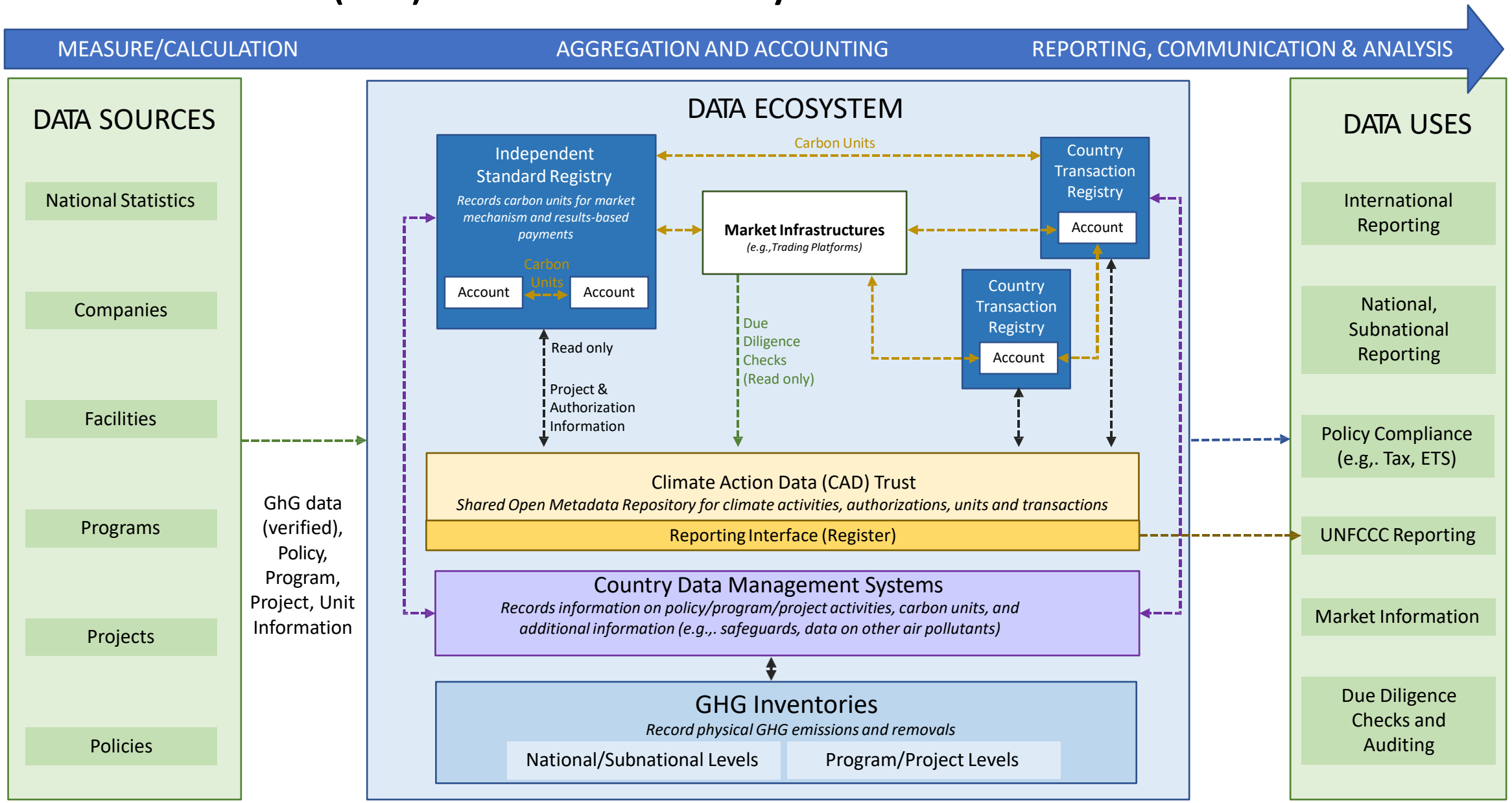
# End-to-End Digital Ecosystem for Carbon Markets




**Digital work-flow**

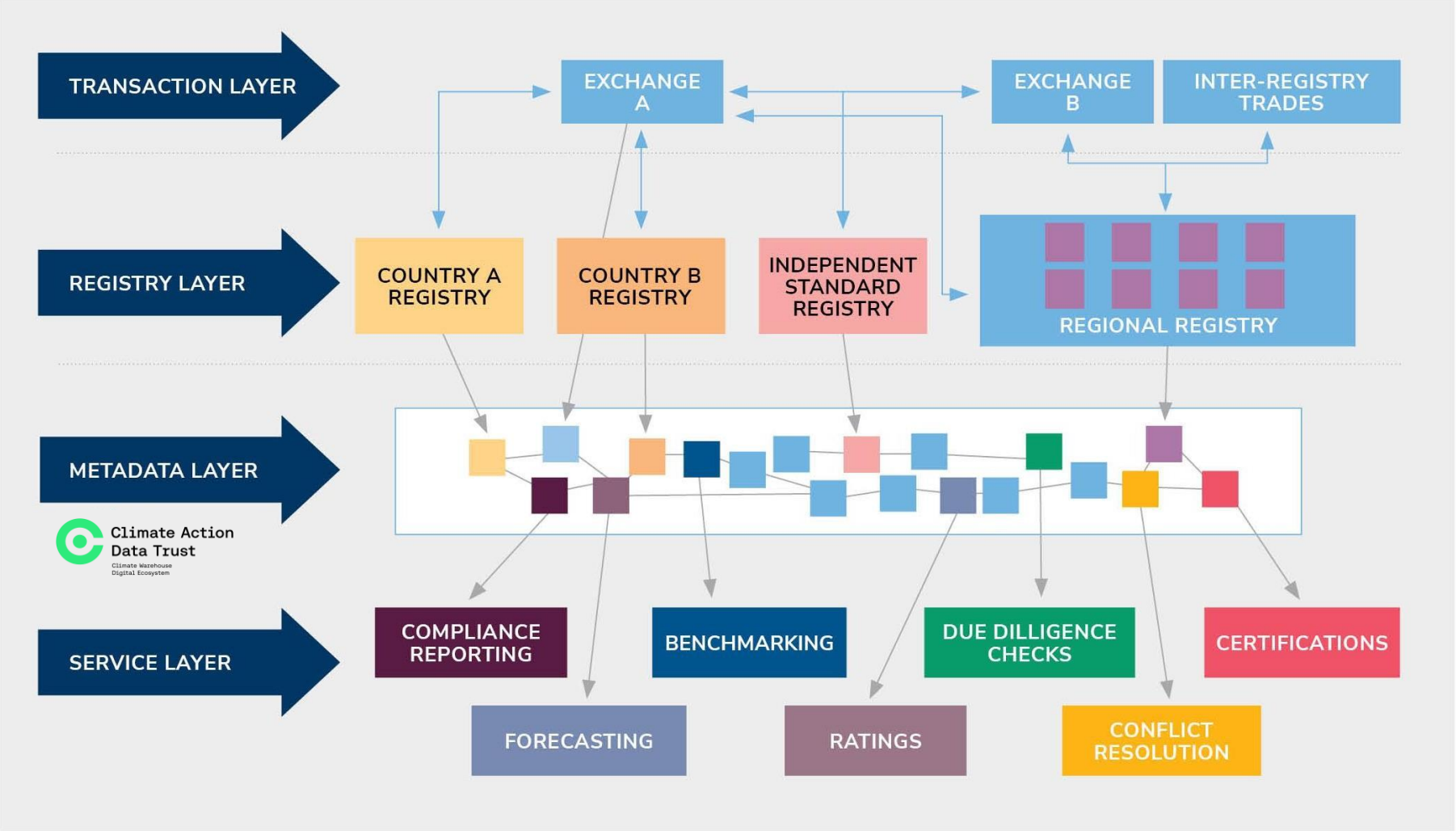
project preparation from document development, approval, validation to registration in applicable standards

# Climate Action Data (CAD) Trust in the Data Ecosystem

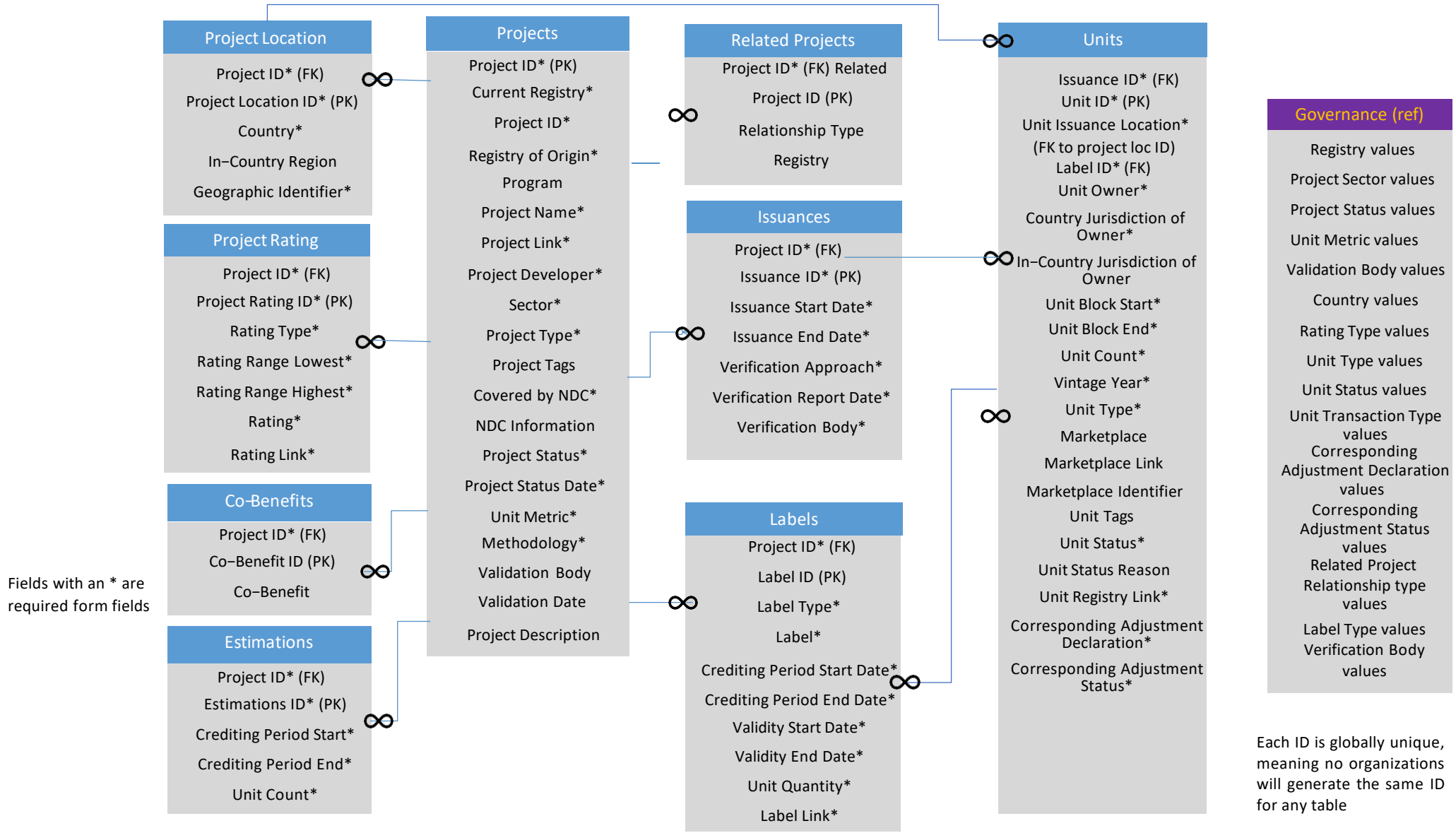


# Building a public good data layer

- Designed as an open shared infrastructure layer
- Common taxonomy of data facilitates communication between entities
- Registry service providers and countries share data to the Climate Action Data (CAD) Trust
- Public and private sector market players can host a node and build out the service layer



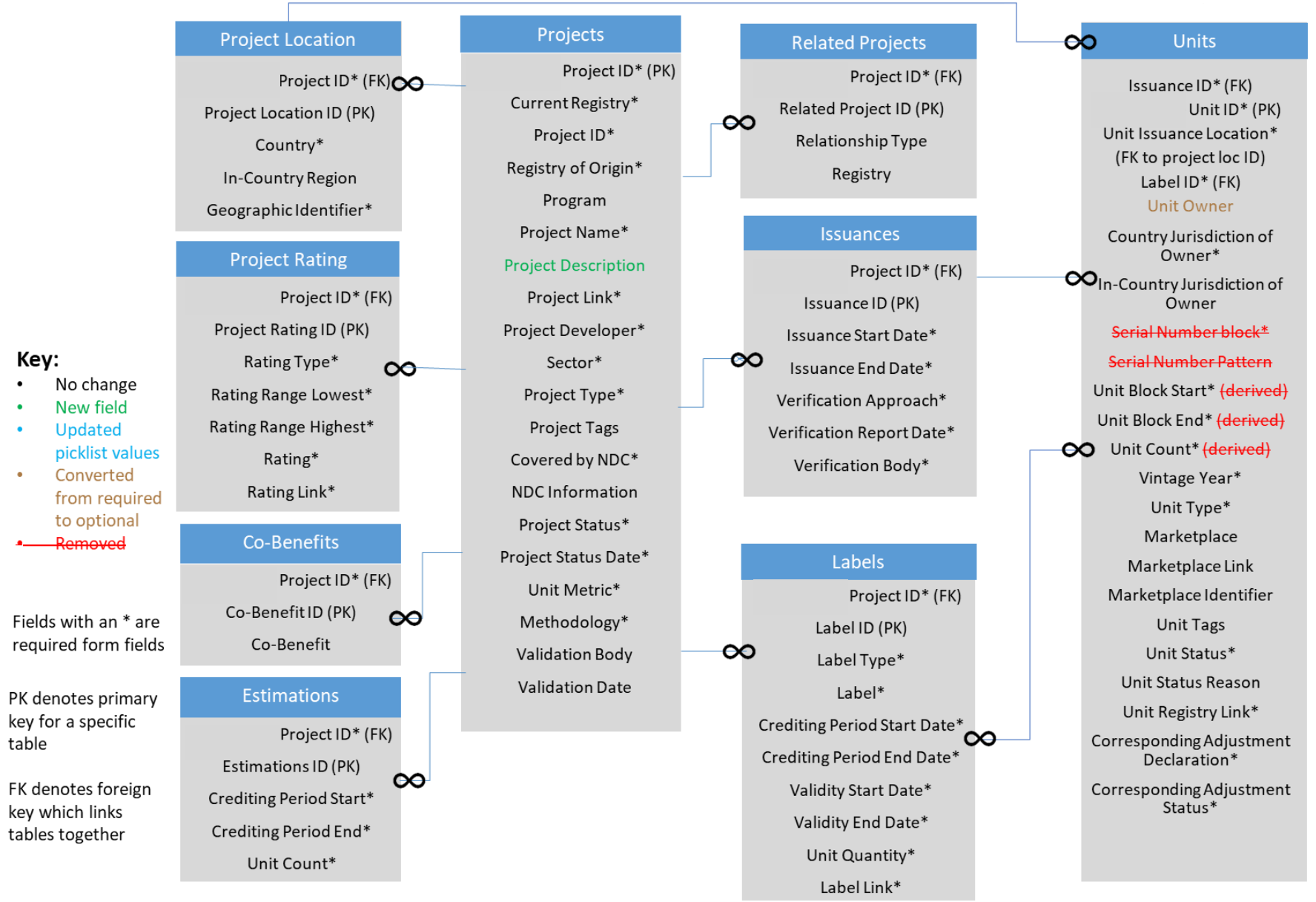
# Initial Simulation III Data Model (March 2022)




Fields with an * are required form fields

Each ID is globally unique, meaning no organizations will generate the same ID for any table

# Updates to the Simulation III Data Model Based on Feedback




**Key:**

- No change
- New field
- Updated picklist values
- Converted from required to optional
- ~~Removed~~

Fields with an * are required form fields

PK denotes primary key for a specific table

FK denotes foreign key which links tables together

Each ID is globally unique, meaning no organizations will generate the same ID for any table

# Overview of Testing and Simulation Activities

# Timeline

Product development, Stakeholder participation and Governance model

# Outcomes of Simulation III

## Platform & Governance

- **Developed operational prototype as a global public good that aims to empower a new global carbon market infrastructure** through a decentralized information technology platform built on blockchain technology
- **Implemented the recommendations from the governance consultations** on the operational platform conducted by IETA and the Government of Singapore:
  - Conducted fundraising
  - Formation of governing bodies
  - Set up independent legal entity anchored in Singapore
  - Official launch in December 6-8 2022

## Testing activities

**75** individual testers

**30** participating organizations

**11** governments

**40** weekly office hour sessions

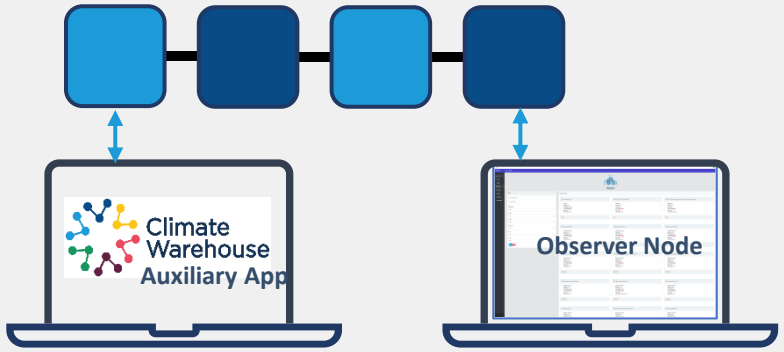
**58** testing sessions

**30** kick-off and onboarding meetings

**514** individual **points of feedback,** which helped identify **156** **development actions**, 139 of which were implemented during Simulation III and reflected in the final version of the operational prototype at the end of the simulation.

Key lessons learned and a complete log of all participant feedback shared with the governing body of the operational CAD Trust at the end of Simulation III in August 2022 (Climate Warehouse Simulation III – Final Report)

## Participation in CADT Simulation III (2022)




**22 full participants:**

Chile
Japan
Peru
Rwanda
Senegal
Singapore
Sweden
Switzerland
UK
Uganda

IFC
WB CATS
WB CMI

EcoRegistry Colombia
IHS Markit
SK Certification Center
GenZero

ACR
CAR
GCC
Gold Standard
Verra

**8 observers:**

Spain

EBRD
UNDP
UNFCCC

Climate Ledger Initiative
ClimateCheck
IETA
Open Earth Foundation

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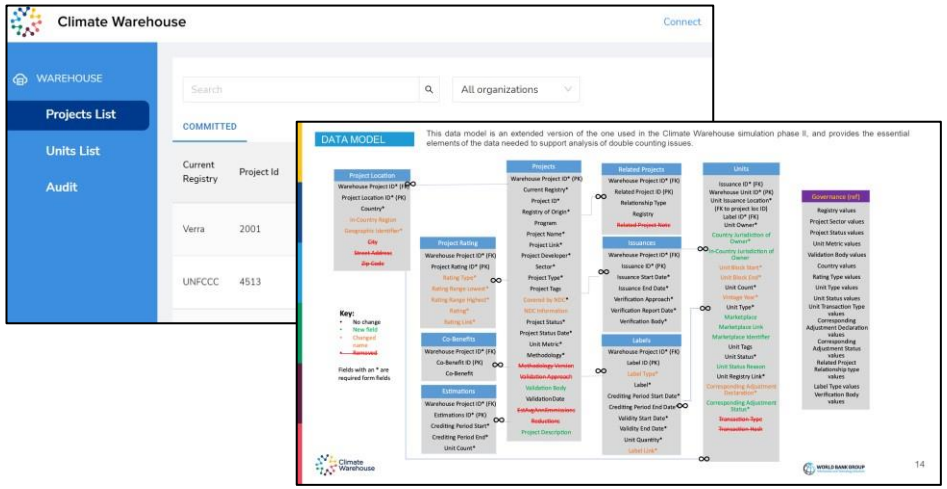
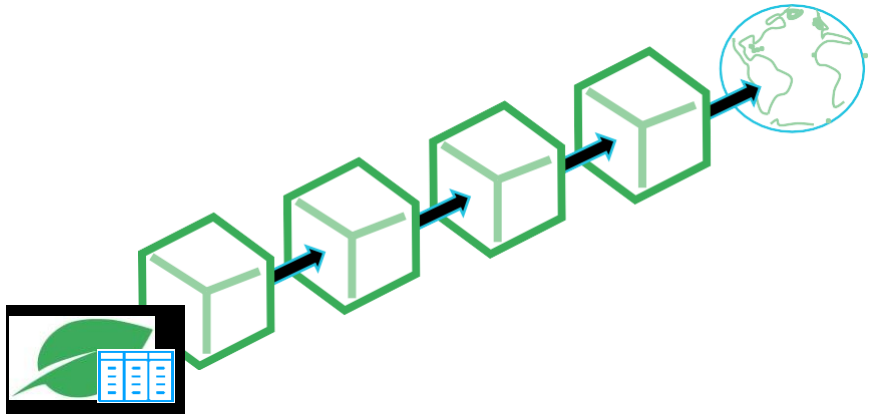
# The Prototype Architecture has two layers

## CADT Data Layer…




- Defines a common data model and taxonomy
- Reconcile data across registries
- Identify potential double counting
- Enable auditing and reporting

## …Tested on a Public Blockchain Layer



- Transparent and Immutable Data
- Auditable
- Accessible and Inclusive
- Public and Transparent
- Open source
- Peer-to-peer governance

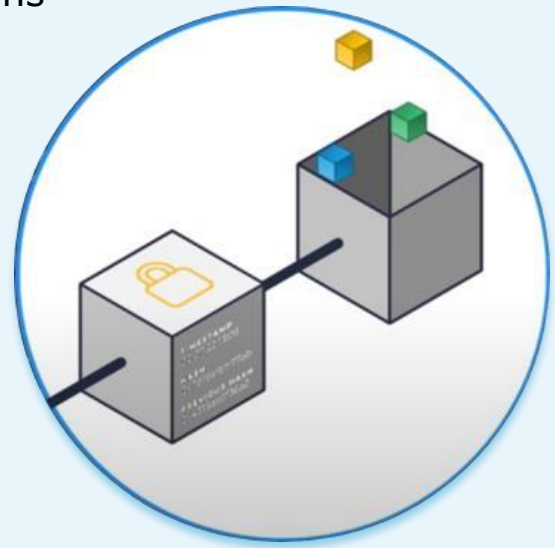
# Prototype Architecture

## The blockchain layer supports inclusiveness, accountability, transparency and integrity

**Transparency**
Fully auditable and secure record of transactions

**Integrity**
Fully immutable and traceable

**Accountability**
- Decentralized governance/peer-to-peer support
- Only registries can edit their own data, allowing countries to flexibly choose their approaches
- Follows the Article 6 bottom-up approach



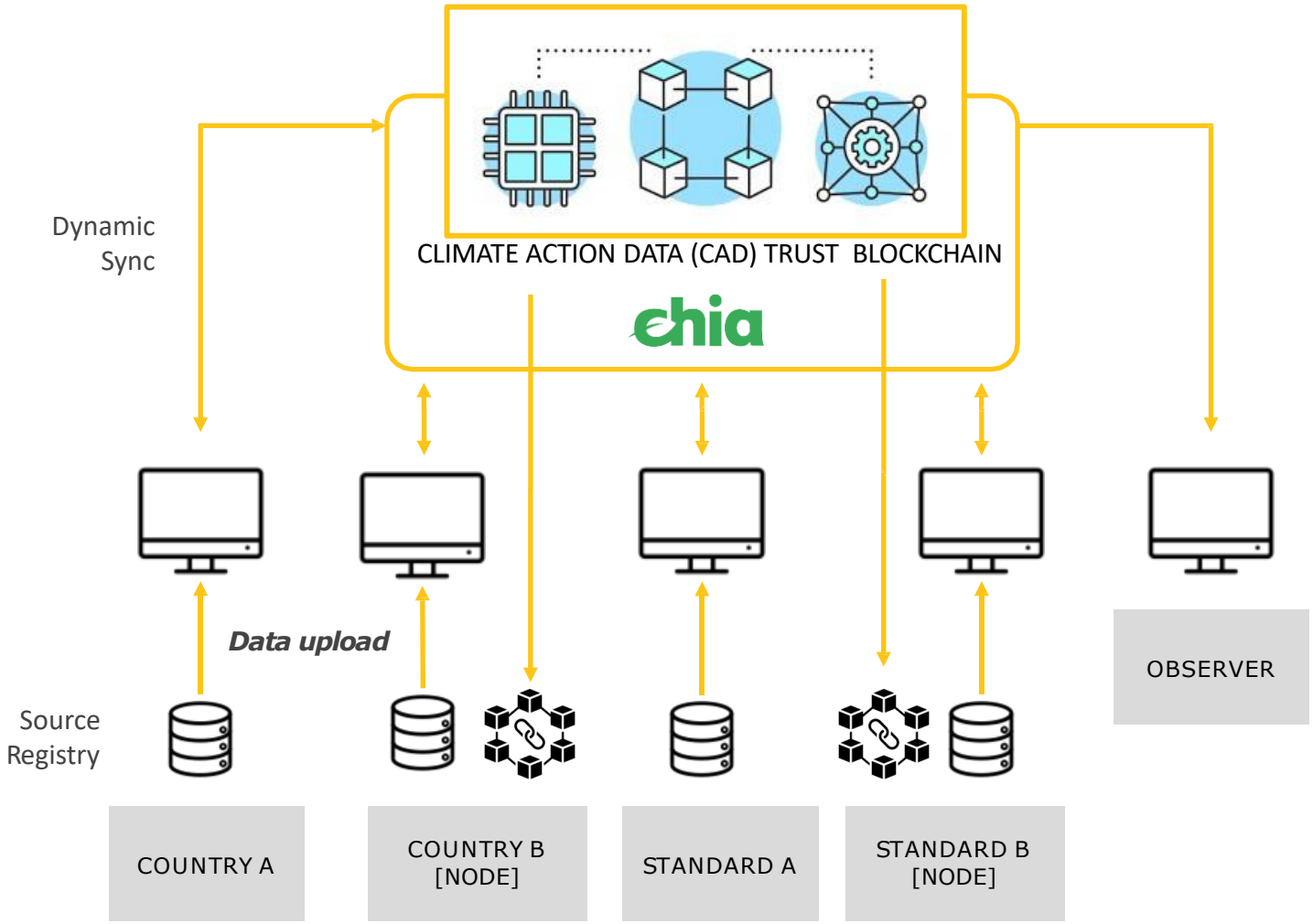
**Inclusiveness**
- Public, fully open source and permissionless
- Anyone in the network can access both the data layer and Chia Network blockchain node and add blocks

The Chia Blockchain Layer

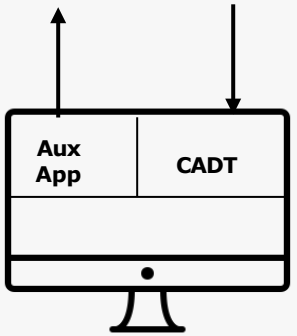
The World Bank's collaborative partnership with Chia is non-exclusive. It is for open-sourced public good, bears no costs or intellectual property rights from the World Bank and promotes interoperability.

# Prototype Architecture

There are 3 ways to integrate data – User Interface, API and Spreadsheet import/export




## User Interface




The CADT web application has two main interfaces with the blockchain. One is the Auxiliary App, which helps *Integrated Participants* manage their data sync and entry point into CADT. The other is a tab that showcases the data in the CADT blockchain. *Node Participants* hold a full copy of the blockchain via direct integration

.

*Observer participants* view the CADT data via an Auxiliary App made available by the WBG.

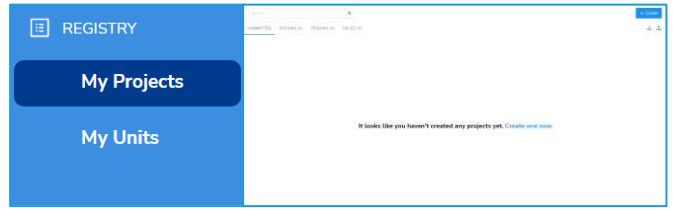
# The Prototype Architecture has two key functions

## CADT View


**CADT View provides high-level views** on project & unit- level data, audit history and conflicts

- **Project Level:**
  - View Project detail information
  - Sort and filter projects
- **Unit Level:**
  - View Unit detail information
  - Sort and filter unit serial number blocks
  - View status change history of unit blocks
  - View transfer history of unit blocks moving between connected registries
- **Audit:**
  - Audit registry data by organization
- **Conflicts:**
  - View and sort conflicts log, providing a demonstration of how double counting risks among connected registries can be identified.

## Auxiliary Application




**The Auxiliary App mimics registry functions**, allowing participants to add/update project & unit-level data during testing

**Project Level:**

- Add and update project details, their lifecycle status
- Add high level rating information
- Link related projects together
- Add labeling information including support for letters of authorization

**Unit Level:**

- Add issuances and status the lifecycle of unit blocks
- Assign labeling information to unit blocks
- Break unit blocks into smaller blocks for transferring and statusing
- Sell and transfer unit blocks to other registry systems
- Change unit ownership
- Copy unit information into from transferred units into local registry

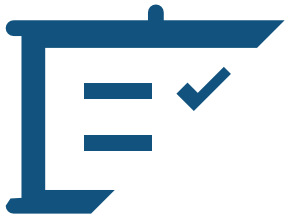
# Testing Scope and Process

# Scope of Testing – Simulation III

## Goal

Simulate how **participant registry systems can integrate** with the Climate Action Data (CAD) Trust, upload data, and synchronize real-time changes to information

## Scope of Work



- Define **minimum standards for participation and technical infrastructure**
- Test and enhance the **data model and fields**
- Explore whether and how **public blockchain technology** meets the CADT requirements and allows for functions to **identify double counting and change MOs information in real-time**
- Test and enhance the user interface **(Auxiliary App)**
- Gather **feedback** and provide **capacity building support** and understand potential barriers to participation that need to be overcome in an operational phase
- Prepare a **summary report**, including climate change and technology findings and recommendations based on the collected feedback

# Timeline and Participation

Phase I

Phase II

Phase III

Phase IV

## Group 1 (Internal testing)

- World Bank Carbon Assets Tracking System
- World Bank Carbon Markets and Innovation Unit

**Observers**:
- International Emissions Trading Association
- Open Earth Foundation

March – April 2022

## Group 2

- Chile
- Japan
- Singapore
- Sweden
- Switzerland
- IHS Markit
- Verra
- Climate Action Reserve*
- American Carbon Registry*
- Gold Standard
- Global Carbon Council**

**Observers**:
- Spain
- UNFCCC
- EBRD
- UNDP

April – May 2022

## Group 3

- Rwanda
- Senegal
- Peru
- Uganda
- United Kingdom
- EcoRegistry Colombia
- Temasek
- IFC
- SK Certification Center

**Observers:**
- Climate Ledger Initiative
- ClimateCheck

May – July 2022

## Feedback consolidation and documentation

**Capture feedback in six tools:**
- Test scripts
- Feedback notes
- Feedback survey
- Feedback tracker
- Action items tracker
- Participant & feedback profiles

**Produce documentation:**
- Simulation III final report
- Transition plan
- Simulation III onboarding package

July - August 2022

These groupings may be subject to change due to availability and preferences of participants

# Roadmap of Testing – Simulation III

| | |
|---|---|
| *March- April* | **Phase I** |
| | Internal testing |
| *April-July* | **Phase II** |
| | External testing |
| | **Phase III** |
| | External testing |
| *July-August* | **Phase IV** |
| | Wrap-up and feedback consolidation |

## Pre-testing activities

1. *Communication Blast*
2. *Kick-off Meeting and demo*
3. *Onboarding and environment set-up Meeting*

## Testing activities

1. *Testing Office Hours/E-mail check-ins*
2. *Test booklet completion**
3. *Feedback forms by scenario*

## Post-testing activities

1. *Final feedback form*
2. *Informal feedback meeting*

# Testing Areas – Who Should Test By Functional Area

| | | |
|---|---|---|
| **Installation** – Testing that is solely focused on installing and running the prerequisite software to run the Climate Action Data (CAD) Trust | **Tester Profile** – Person who would be managing the software in the production state. This person wants to know how to properly install and maintain the Climate Action Data (CAD) Trust software | **Importance** – Allows the person managing the software in the future to be confident in what is needed from an infrastructure perspective and how to manage new releases of Climate Action Data (CAD) Trust software |
| **User Interface (UI)** – Testing that is centered around entering, manipulating, or viewing data within the Climate Action Data (CAD) Trust UI | **Tester Profile** – Anyone who is curious about what the CADT displays, or anyone who will be replicating data in the CADT using the UI. We recommend most participants test this area. | **Importance** – The CADT UI is the visual representation of the power of the CADT. It is imperative that the UI works well for everyone involved with the Climate Action Data (CAD) Trust. |
| **API** – Testing the Climate Action Data (CAD) Trust API endpoints to understand how they are structured with the intent to integrate own registry with CADT APIs | **Tester Profile** – Technically sophisticated registries that intend to integrate with the CADT to automatically update The Climate Action Data (CAD) Trust based on registry transactions. | **Importance** – Understanding the API endpoints will allow testers to think about how they build the automated integration between their registry and The Climate Action Data (CAD) Trust. |
| **Mirrored Database** – Testing the ability to perform SQL queries using a traditional MySQL database | **Tester Profile** – Any person who has previous SQL experience and is comfortable performing database functions to manipulate data in a specific manner | **Importance** – Testing the mirrored database will allow users to understand how they can use traditional tools to create dashboards (like for double counting) while still using the decentralized blockchain |
| **Excel Import/Export** – Testing the excel upload/download features | **Tester Profile** – Any registry personnel that will have the data expertise to update the CADT using data file uploads. | **Importance** – This testing area is important for registries that choose to integrate using file transfer instead of using the API or Auxiliary App. |

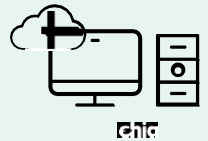
# IT Requirements - Deployment Type

## 1. Local Installation

Install the open-source software required to run the Climate Action Data (CAD) Trust on a physical computer your organization owns.

Use this option if you have security permissions to install software on your device and have at least 75gb of spare diskspace.

## 2. Cloud – Chia AWS Workspace



Chia Network, Inc. will spin up a blank AWS workspace which users will connect to using a browser or the AWS workspace app.

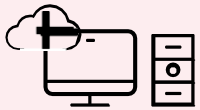
Use this option if your local machine security permissions are strict, but you still want to install the CADT software and/or test the Climate Action Data (CAD) Trust APIs.

## 3. Cloud – Chia Hosted Instance

Chia Network, Inc. will host a cloud instance with pre-installed CADT software. Users will access the Climate Action Data (CAD) Trust by using credentials given by Chia Network, Inc.

Use this option to quickly be able to test the Climate Action Data (CAD) Trust UI without needing to install on your own machines.

## 4. Cloud – Own Organizational Cloud



- Self-sovereign and participants fully own their data
- Permissionless publicly viewable / auditable data
- Permissioned write functionality to protect tables
- Ability to permission sensitive data when necessary
- Versatile data entry, export & reporting
- Data model built to be easily upgraded or revised

# Time Requirement

The below details the minimum time commitments for each test scenario. Testers are encouraged to test beyond the scenarios to ensure robustness of the application.

| Test Scenario | Scenario Description | Time Commitment |
|---|---|---|
| Install CADT | Install the necessary software to run CADT on a local machine | 2-4 hours; requires call with testing support team |
| Access CADT | Access a cloud instance of CADT with pre-installed software | 5-10 minutes |
| Create Organization | Create your organization within the Climate Action Data (CAD) Trust | 5-10 minutes |
| Create Project(s) | Create projects within the CADT, either through manual entry, excel upload, or API calls | 30-120 minutes |
| Create Unit(s) | Create units associated to specific projects through manual entry, excel upload, or API calls | 30-120 minutes |
| Report on CADT Data | Generate reports using CADT data by either downloading a static excel file, or by accessing a mirrored database | 10-60 minutes |
| Unit lifecycle | Simulate the unit lifecycle by issuing, splitting, transferring, and eventually retiring the unit | 30-90 minutes |
| Subscribe to other Organizations | Subscribe/unsubscribe to other organizations that are participating in the CADT | 5-15 minutes |
| Track audit history | Use the audit function within the CADT to see audit history for selected organizations | 10-30 minutes |
| **Total** | | **~4-11.5 hours** |

# Overall Timing of Phase II

- These dates are movable, and simulation activities can start earlier for users if they set up their auxiliary App more quickly
- The feedback from simulation will inform the specifications for an operational system.

| Activity | Dates |
|---|---|
| ***Set up*** | |
| Environment set-up | Week 1 |
| ***Testing*** | |
| Test Booklet Completion | Week 2 |
| | Week 3 |
| Feedback collection | Week 4 |

*These days may be subject to change depending on the availability and preference of participants

# Your Feedback

- During this testing activities, we will gather **feedback** to continue refining the 3rd version of the prototype as well as inform the simulation activities

| Running and using the CADT | Data model and fields | User interface |
|---|---|---|
| - Accessing the hosted instance or installing it locally<br>- Creation of organization<br>- Creation of projects and units<br>- Review organizations and projects | - Feedback on the data dictionary<br>- Is there any missing data you would need?<br>- Can you follow the asset development lifecycle/issuance of retirement? | - Is the user interface providing enough clarity?<br>- How can the user interface improve? |

# Next Steps

1.Organizations to **nominate** participants (both IT/business roles) for the testing process

2. Select **deployment type** (slide 20) and **areas of testing** (slide 19)

3.Participants will receive **onboarding packages**:

- Instructions to login in the Chia/WB node
- Test scripts by scenario
- Data Dictionary
- Technical Guide
- Onboarding PPT on The Climate Action Data (CAD) Trust

[The CADT team can organize before or after an onboarding meeting and demo upon request]

4.The CADT team will organize a **joint testing session**

5.The team will provide **on-going support** to users

E-mail check-ins

Office hours

6.The team will collect **on-going feedback** from users

# Lessons Learned

# Insights by CADT Stakeholder Entities: Benefits

| Stakeholder type | Benefits |
|---|---|
| **Governments** | • Increases visibility and credibility of a country's climate activities<br>• View MOs to potentially purchase<br>• Promotes new project activity<br>• Can increase market participation of private sector<br>• Can provide an aggregate view of projects within their jurisdiction, ability to identify duplicative projects<br>• Increases accountability |
| **Independent Standards** | • Reduces burden on monitoring external systems for due diligence processes because of the ease of aggregating information together<br>• Facilitates trust and transparency between systems |
| **UNFCCC** | • Aggregate reporting |
| **Exchanges** | • Decreases market fragmentation and eases integration<br>• Promotes standardization and asset integrity<br>• Adds information security to the data needed from registries for transactions<br>• Increases volume of standard asset types |
| **Project Developers** | • Building trust in the accounting of MOs will enable transparency and trade, benefiting project developers |
| **Verification Bodies** | • Access to aggregated information, ability to audit transactions and changes to data |
| **Buyers and Traders** | • Aggregated trustworthy data to search through. Easier access to project developer information |

# Initial insights from simulation III testing

## Simulation III scope

- Sim III **pushes participants to envision an interconnected ecosystem**, beyond their own standalone system
- Data added to the Climate Action Data (CAD) Trust must be able to **bridge process flows across participants**
- Participants must validate the CADT's level of **data granularity, status information and units transfer methodology**

## Benefits & Feedback

**Benefits**

- Increased transparency and data sharing
- Addressing double counting risks across registries
- Identifying a common data model
- Interaction with experts across registries
- Ability to access information outside of their own systems

**Feedback**

- Difficulty defining minimum standards needed to link registries
- IT complexity, upgrades to existing systems, building integration
- Ability to connect regional registry systems
- Multiple groups within the same organization will need to coordinate and play a role

## 3 types of experts are needed

**Policy Setter**

- Provides policies, guidelines, strategy for implementing, projections on future impacts on the inner workings of the organization
- Needs to understand how the data will be used internally and by partners in the future, what changes need to occur for this to happen, and what is possible due to technology advances.

**Registry Administrator**

- Create procedures for implementing policies
- Needs to understand how workflows will change in the future, implications for their technology tools and the data that needs to be available and captured.

**IT Support**

- Ensure data structure and registry functions are fit for purpose
- Needs to understand direction of policies, field definitions to figure out equivalencies for integration.

# The Climate Action Data (CAD) Trust Governance

- Consultations process and results
- Interim structure and model
- Next steps

# Governance and Finance consultation

September 2021 – March 2022

## 70+

### Entities involved

- Governments
- Independent standards
- Exchanges
- Traders
- Project developers
- Private sector
- Financial institutions
- Technology providers
- NGOs
- Think tanks
- Law firms
- Multilateral development banks
- Observer: UNFCCC

## 5

### Governance models reviewed

- Western Climate Initiative, Inc (WCI, Inc.)
- Integrity Council for Voluntary Carbon Markets (IC-VCM)
- EU-Swiss ETS link
- Joint Crediting Mechanism (JCM)
- British Standards Institution (BSI) & Enterprise Singapore (ES)

## 6

### Focus groups conducted

- 4 on governance (46 entities)
- 2 on finance (45 entities)

*+ polls and surveys for participant feedback throughout*

# Learnings and working recommendations

## Identified priority missions

1. Bring transparency to the market:
   - mitigation outcomes
   - carbon credit lifecycle
   - corresponding adjustments
2. Reduce risk of double counting
3. Enable carbon market services built on comprehensive, real-time data

## Recommendations

- Deliver **unified data reporting specifications** for all carbon crediting programmes, potentially as an (inter)national standard
- Encourage **wide programme participation** in the public blockchain to track unit data
- **Efficient, yet consultative governance**: collaboration between governments, VCM standards, and carbon market participants
- Use **grants** to enable a public good service first and aim for **eventual financial sustainability**

# Interim governance structure of the operational Climate Action Data (CAD) Trust


**Council (~10 members)**

Leads strategy/policy mandate

**Secretariat**

**Technical Committee**

- Data specification development
- IT development

**User Forum**

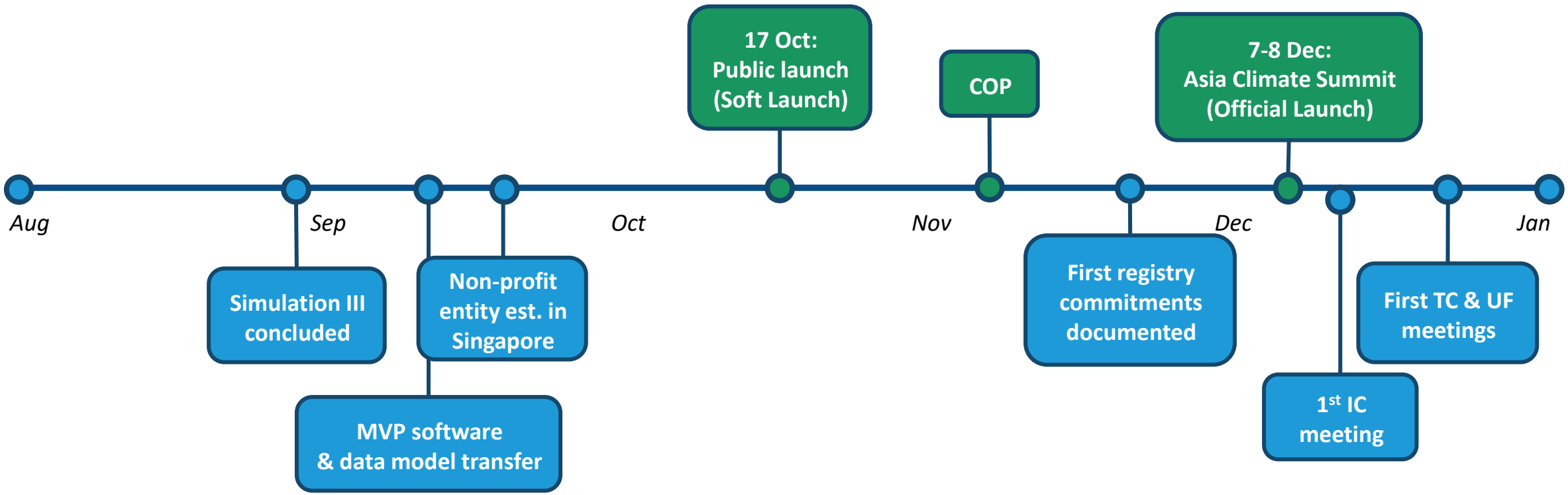
- Open to registered and approved CADT community participants
- Community consultation forum
- Potentially: Council recruitment

# Next steps

# Outlook

| | Inception phase<br>2022 | Interim period<br>2023-2024 | Permanent governance<br>2025 onwards |
|---|---|---|---|
| Governance | • IETA, World Bank, and Singapore Government provide governance and support<br>• IETA provides Secretariat functions<br>• Interim Council recruitment | • Interim Council in charge of strategic decisions and transition to permanent governance<br>• IETA provides Secretariat functions | • Permanent Council elected and Council rotation established<br>• Secretariat transitioned to an independent entity |
| Priorities | • Establish a legal entity<br>• Fundraising<br>• IT platform handover<br>• Engagement with independent standards<br>• Public launch | • Data specification development<br>• Adoption by independent standards and national registries<br>• Marketing, user adoption | • Further adoption by registries and governments<br>• Build a service layer<br>• UNFCCC reporting interaction<br>• Long-term strategy |
| Funding | • Grant funding | • Grant funding | • Grant funding<br>• Move to self-sustaining finance |

# Metadata Layer - Timeline

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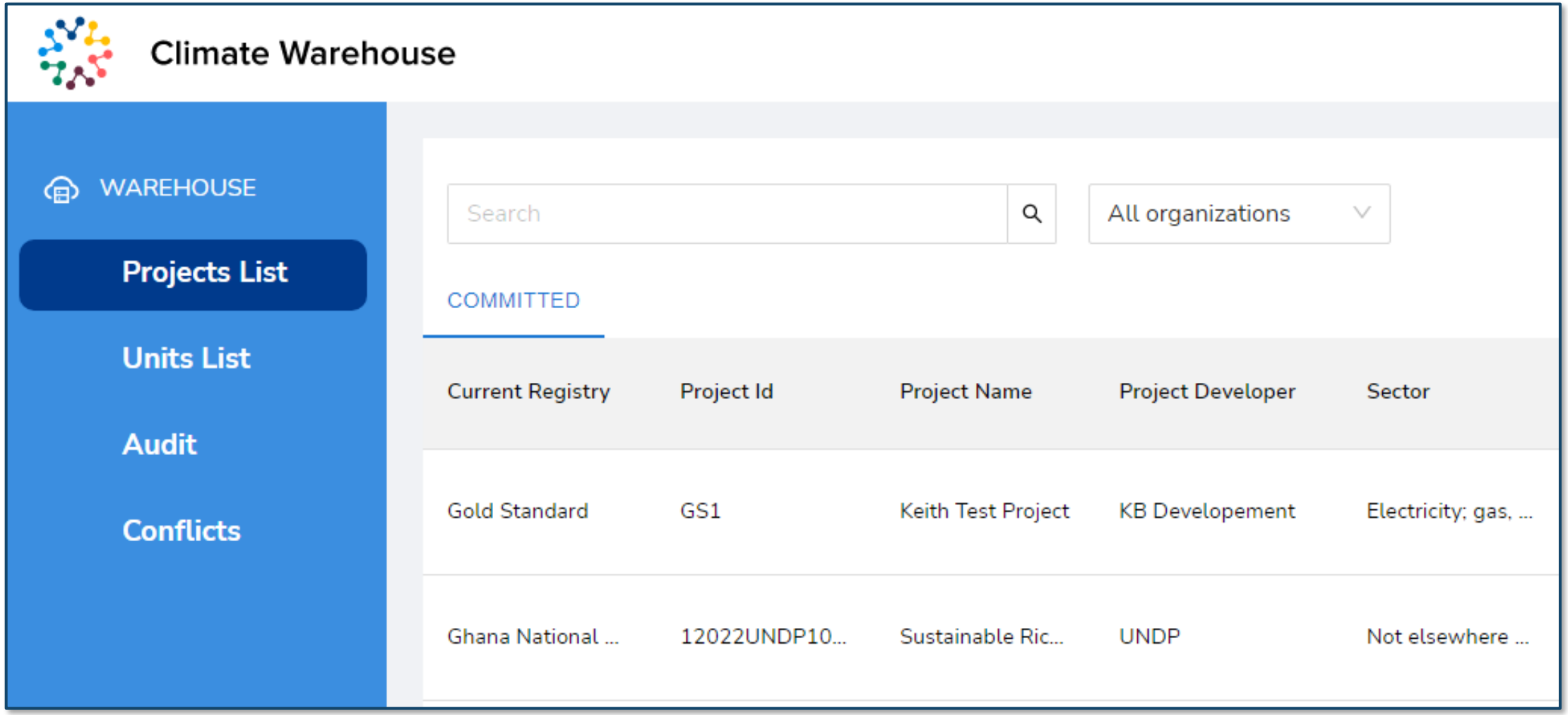
# Prototype Wireframes

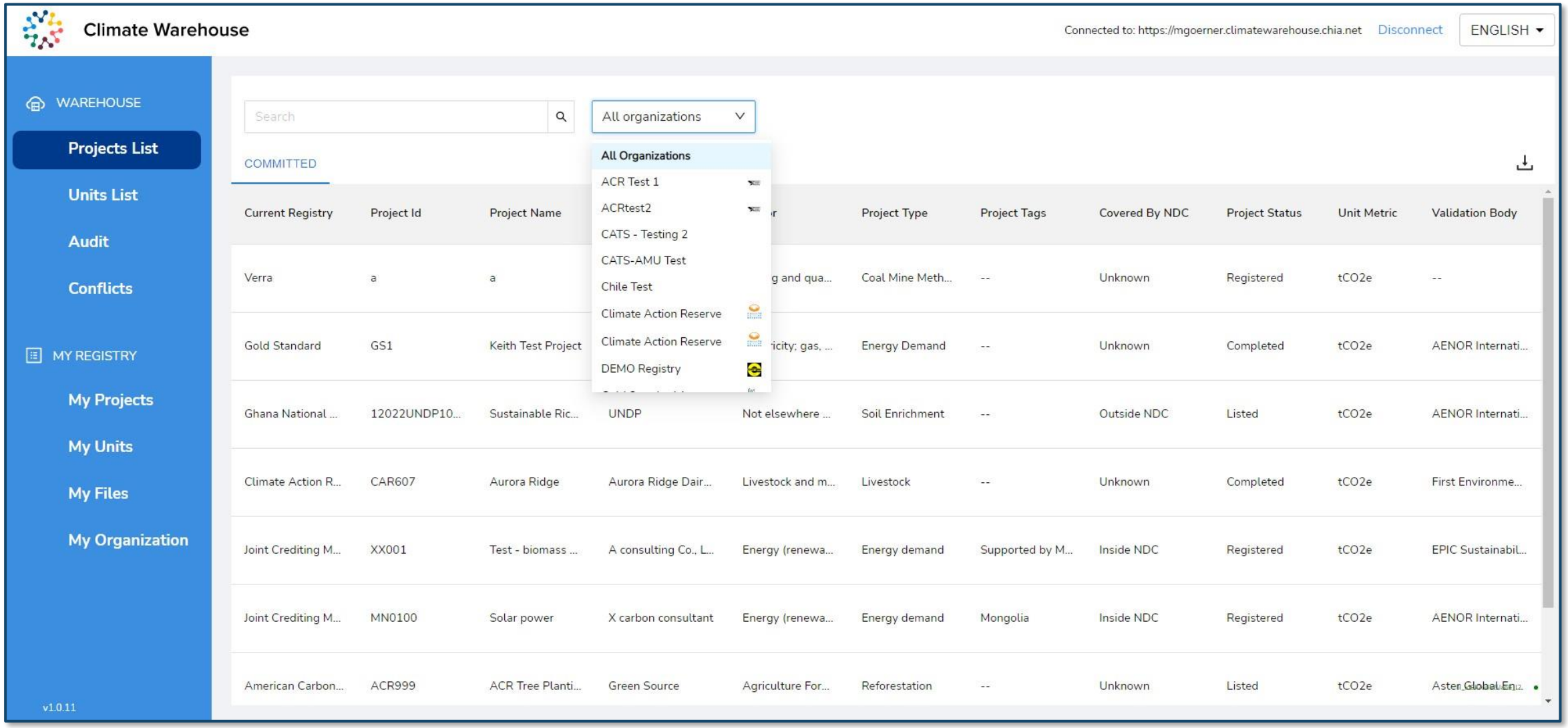
# The Public Observer Node is live!

The Public Observer Node aims to facilitate the understanding of necessary registry functions and data requirements for tracking transactions of units and demonstrate how the information is tracked through the Climate Action Data (CAD) Trust. It currently shows sample data to illustrate how project and unit related information will surface in the Climate Action Data (CAD) Trust once participants upload their data.

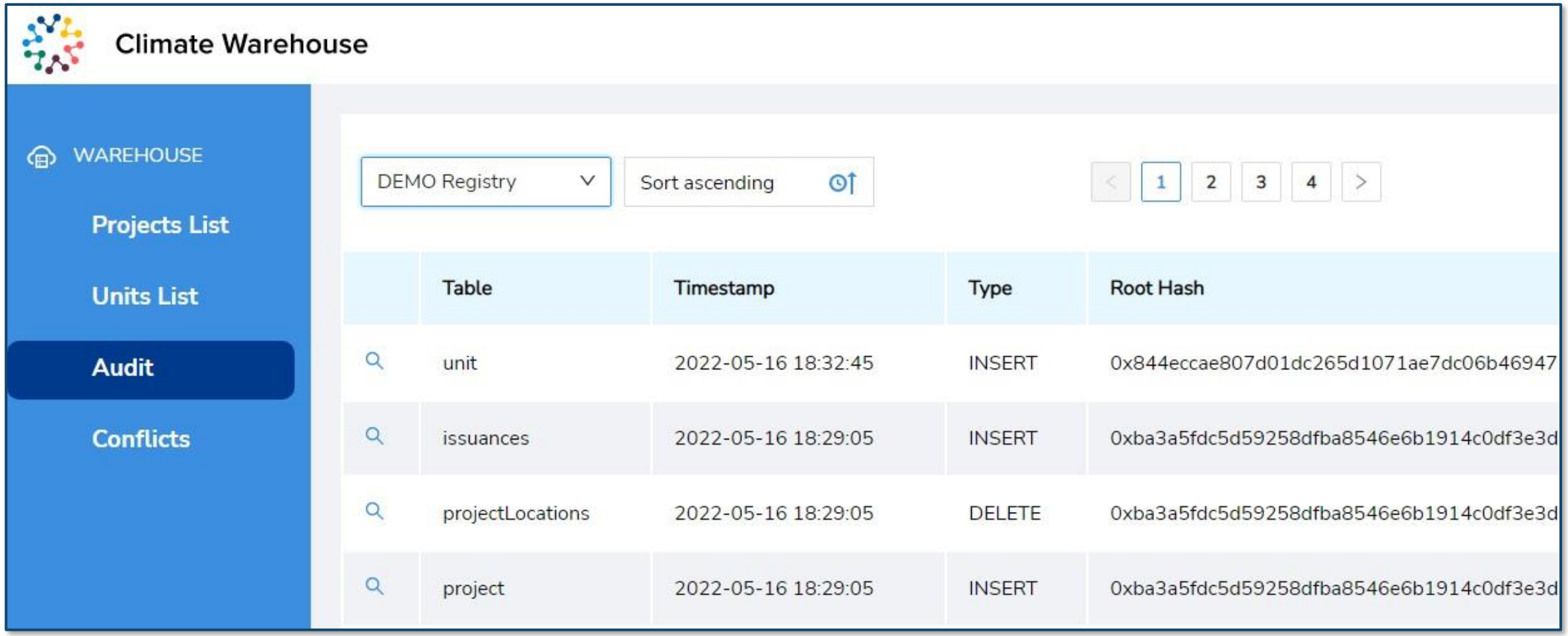
# Wireframes – Climate Action Data (CAD) Trust



# Wireframes – Auxiliary App



# Wireframes – Audit Function



# Technical guide at a glance

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TECHNICAL GUIDE

**TABLE OF CONTENT**



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# Knowledge
## Resources

**WEBSITES**

- Website: Climate Warehouse Program
  - Webpage: CAD Simulation III
- Website: Climate Action Data (CAD) Trust
- Website: Climate Warehouse Library – Open Learning Campus (OLC)

**CLIMATE WAREHOUSE LIBRARY – OPEN LEARNING CAMPUS (OLC)**

**1. Webinars:**

- Webinar: Climate Warehouse: End-to-End Digital Ecosystem for Carbon Markets (2022)
- Webinar: Climate Warehouse: A Meta-data Infrastructure to Support Transparency and Integrity of Climate Markets (2022)
- Webinar: Testing the use of blockchain to build a meta-registry for decentralized climate markets (2019)
- Webinar: Catalyzing the next generation of climate markets through the World Bank´s Climate Warehouse Initiative. (2019)
- Webinar: Simulation of the Blockchain Meta-Registry
- Webinar: Benchmarking A Global Price For Carbon. (2021)

**2. Technical Papers and Reports:**

- Article 6 Approach Paper Serie (2020)
- Summary Report on Enhancing Carbon Pricing and International Carbon Market Readiness Through the Mitigation Action Assessment Protocol (2021)

**WORLD BANK BLOG**

- Blog Post: Carbon Markets: Why Digitization Will Be Key to Success(2022)
- Blog Post: Lessons from creating mitigation outcomes(2021)

**CLIMATE WAREHOUSE PROGRAM – KNOWLEDGE BASE**

**1. Publications: Climate Action Data (CAT) Trust Data**

**Reports:**

- Final Report: Climate Warehouse Simulation III (Report) (2022)
- Summary Report: Simulation II – the Connecting Climate Market Systems (2022)
- Summary Report: Simulation I – Connecting Climate Market Systems (2019)

**Technical papers:**

- Test Scripts: Simulation III (2022)
- Technical Guide for Testing: Simulation III (2022)
- Data Model: Simulation III (2022)
- Chia White Paper: Blockchain technology for the Climate Warehouse (2021)

**Videos:**

- Net Zero: The Integrity Pathway (2022)
- Climate Warehouse: Helping countries leverage climate markets and carbon pricing (2022)
- Demo: Climate Warehouse Simulation II (2021)

**Webinars and Workshops:**

- CAD Workshop: A meta-data infrastructure to support transparency and integrity of climate markets (2022)
- Workshop: Building an enabling environment for operationalizing Article 6 (2021)
- Webinar: Is Blockchain/DeFi the Future for Carbon Credits? (2022)
- Webinar: Emerging Digital Technologies for Post-2020 Climate Markets (2020)

**2. Publications: Digital Monitoring, Reporting, and Verification Systems (d –MRV)**

- Report: Digital Reporting, Monitoring and Verification Systems (2022)

**3. Data visualization:**

- Tool: How do we ensure environmental integrity under the Paris Agreement?

# Knowledge
## Media Articles

| | | |
|---|---|---|
| | **Ledger Insights** | World Bank backs blockchain project to harmonize carbon registry data (28 Oct 2022) |
| | **Regulation Asia** | Singapore to Host Platform to Unify Carbon Market Registry Data (29 Oct 2022) |
| | **Ledger Insights** | World Bank backs blockchain project to harmonize carbon registry data (28 Oct 2022) |
| | **Finextra** | Climate Action Data Trust launched to unify carbon credit registry data (26 Oct 2022) |
| | **ESG Investor** | This Week's Tech and Tools News: MSCI Launches Climate Action Index (28 Oct 2022) |
| | **Disruption Banking** | Climate Action Data Trust to unify carbon credit registry data (26 Oct 2022) |
| | **BeSpacific** | Climate Action Data Trust (27 Oct 2022) |
| | **Político** | Crypto, but for the climate (27 Oct 2022) |
| | **Business Time** | Global platform to unify carbon credit registry data to be domiciled in Singapore (26 Oct 2022) |
| | **IETA** | IETA Article "Climate Action Data Trust to unify carbon credit registry data" (26 Oct 2022) |
| | **Carbon Pulse** | Carbon Pulse Article "World Bank to launch carbon credit metadata layer in December"(11 Oct 2022) |
| | **Financial Times** | Financial Times Article "World Bank to launch carbon credit metadata layer in December" (11 Oct 2022) |
| | **Carbon Pulse** | Carbon Pulse Article "Interview: World Bank to launch metadata project to clean up carbon market's information problem" (7 Jul 2022) |
| | **Financial Times** | Bureaucratic World Bank goes experimental with a blockchain for carbon offsets (7 Feb 2022) |

Climate Warehouse

Climate Action Data Trust

Climate Warehouse Digital Ecosystem

# For further information:

- Website: http://www.theclimatewarehouse.org
- Video: https://www.youtube.com/watch?v=cXwTV2bAnvI
- Climate Warehouse Library – Open Learning Campus: https://olc.worldbank.org/content/climate-warehouse

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# Thank you