Climate Warehouse

A global public metadata layer for the carbon markets

Agenda

September 2022

- **Overview of CW**
  - 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

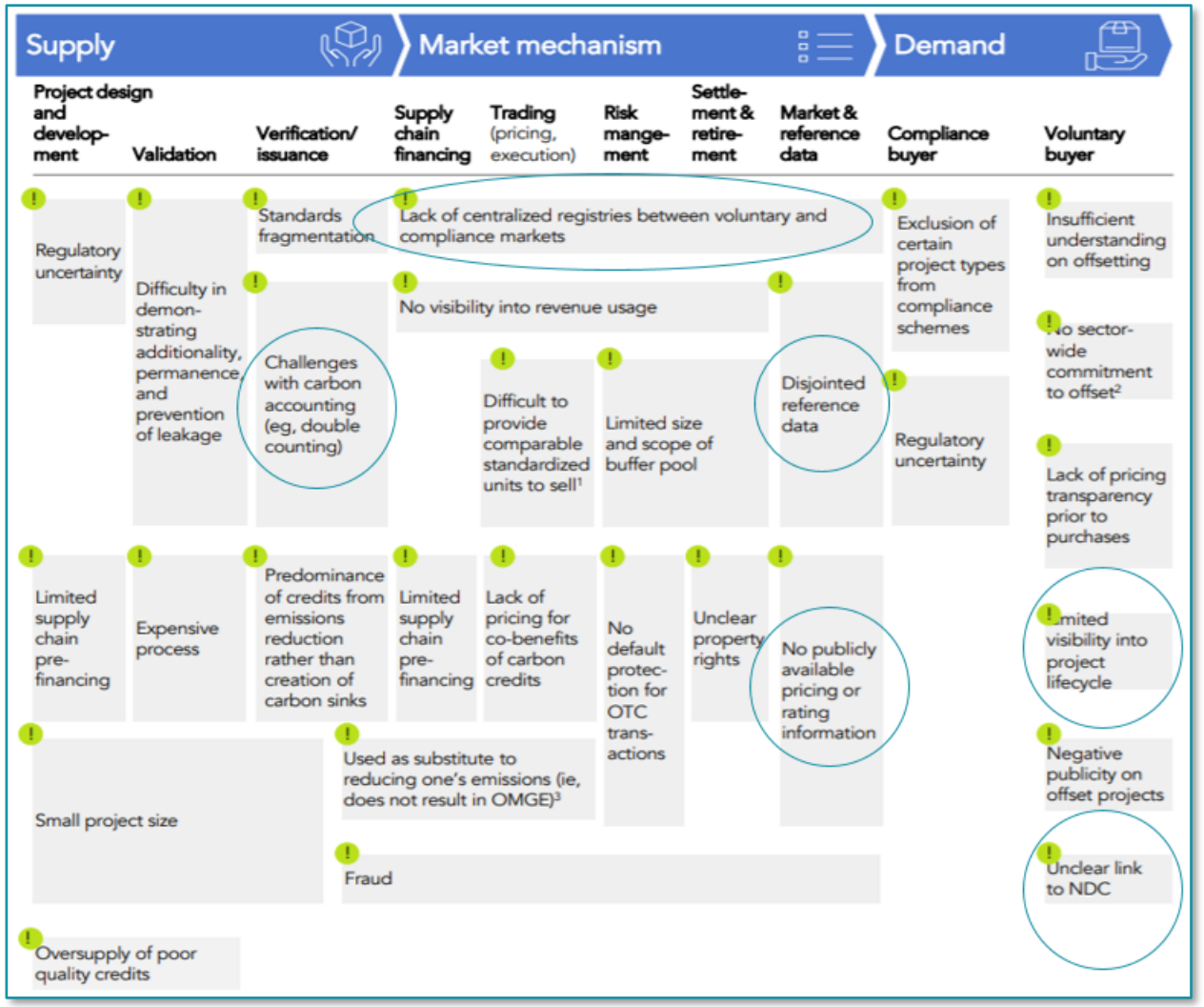
Annex: Prototype at a glance

Climate Warehouse Overview

Context-setting

- **Individual commitments through nationally determined contributions (NDCs).** The Paris Agreement introduced a bottom-up approach for addressing climate change.
- **Decentralized cooperative approaches to achieve their NDCs.** This is expected to lead to heterogeneous climate markets, which may have differences in governance rules and operate under different technological systems.
- **Climate Warehouse:** a decentralized information technology approach to connect climate markets systems.

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*

What is the value proposition?

A decentralized IT approach to connect climate markets

An open-shared meta data layer

1 

A common data taxonomy that enables reconciliation of data from registries. It facilitates a peer-to-peer connection among decentralized registries with the aim to link, aggregate and harmonize the underlying data

2 

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.

3 

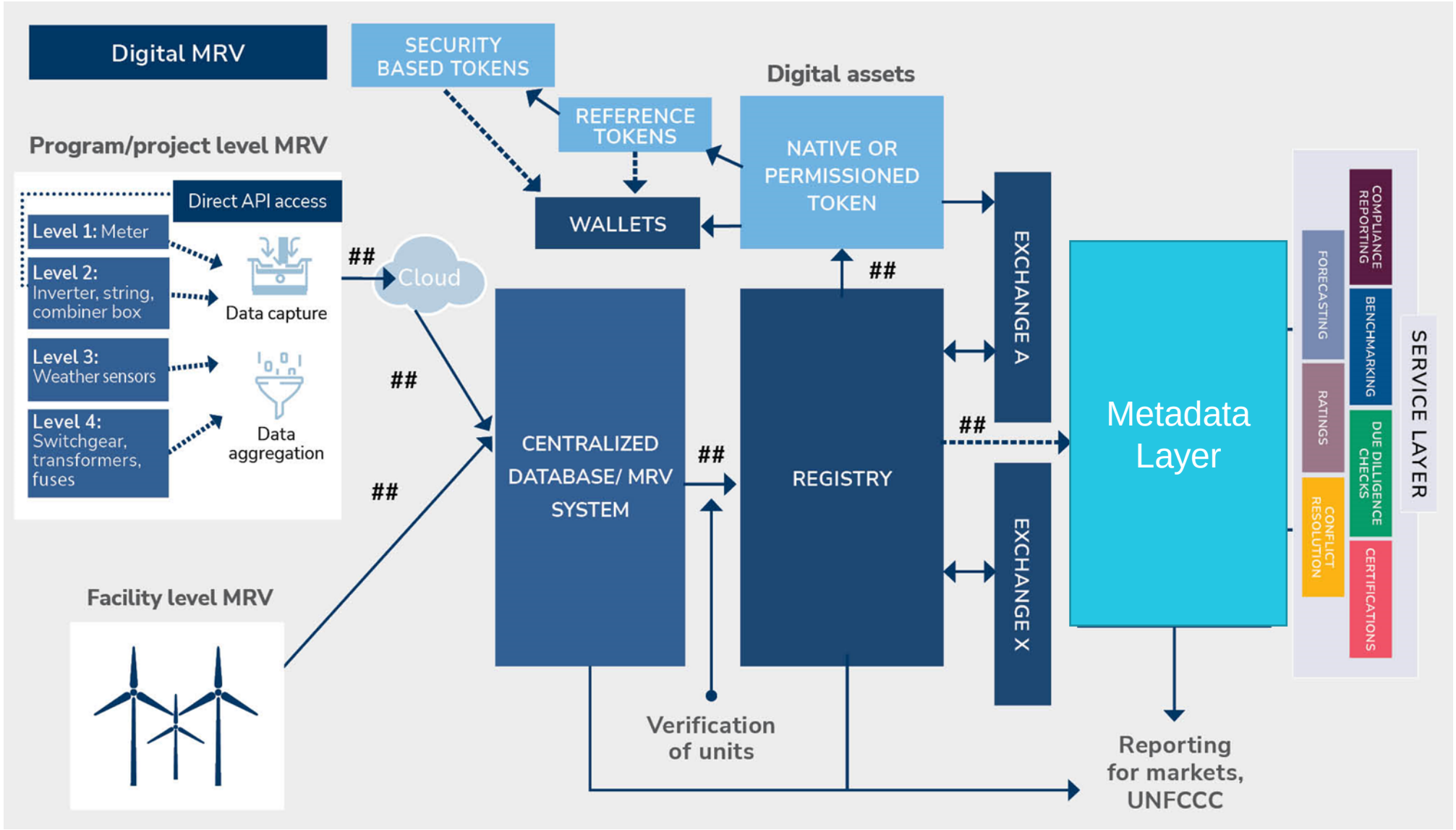
Surface publicly-available information on MOs and record status changes to provide information on how MOs are used.

4 

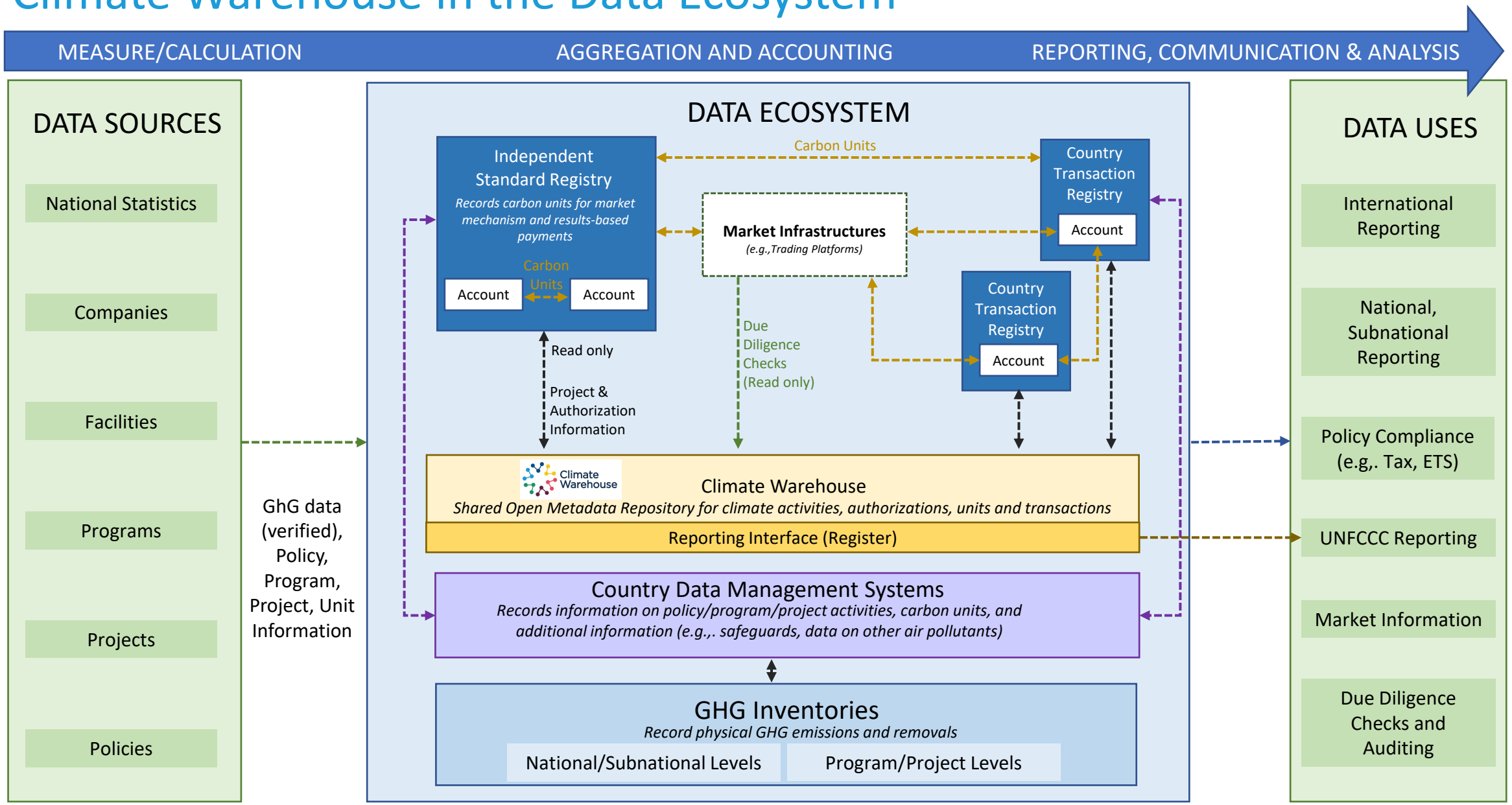
Enhance transparency and trust among market participants and enable tracking of MOs and reduce double counting risk. The Climate Warehouse would not hold assets or directly facilitate.

Climate Warehouse in the Data Ecosystem

End-to-End Digital Ecosystem for Carbon Markets

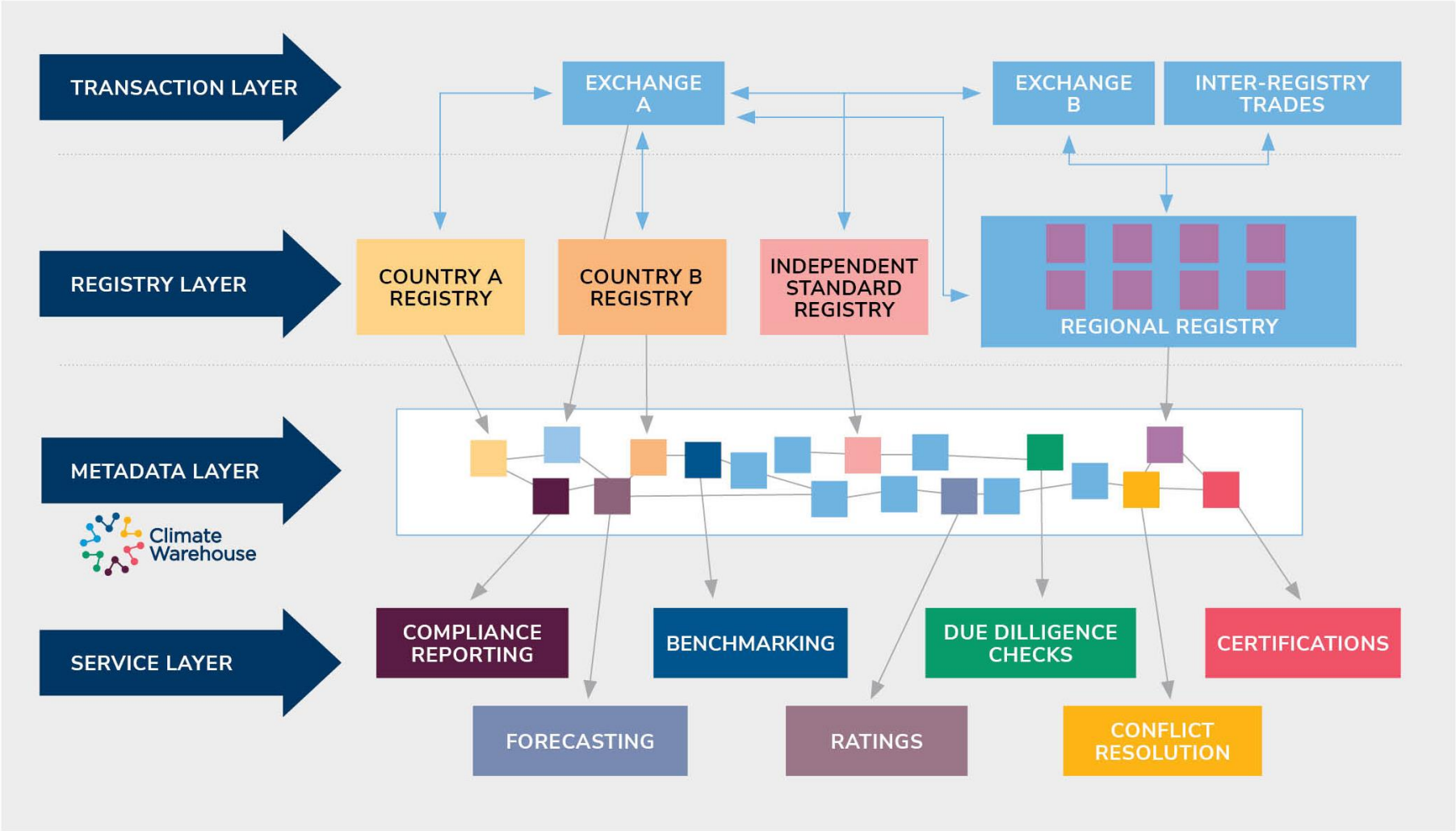


Climate Warehouse in the Data Ecosystem

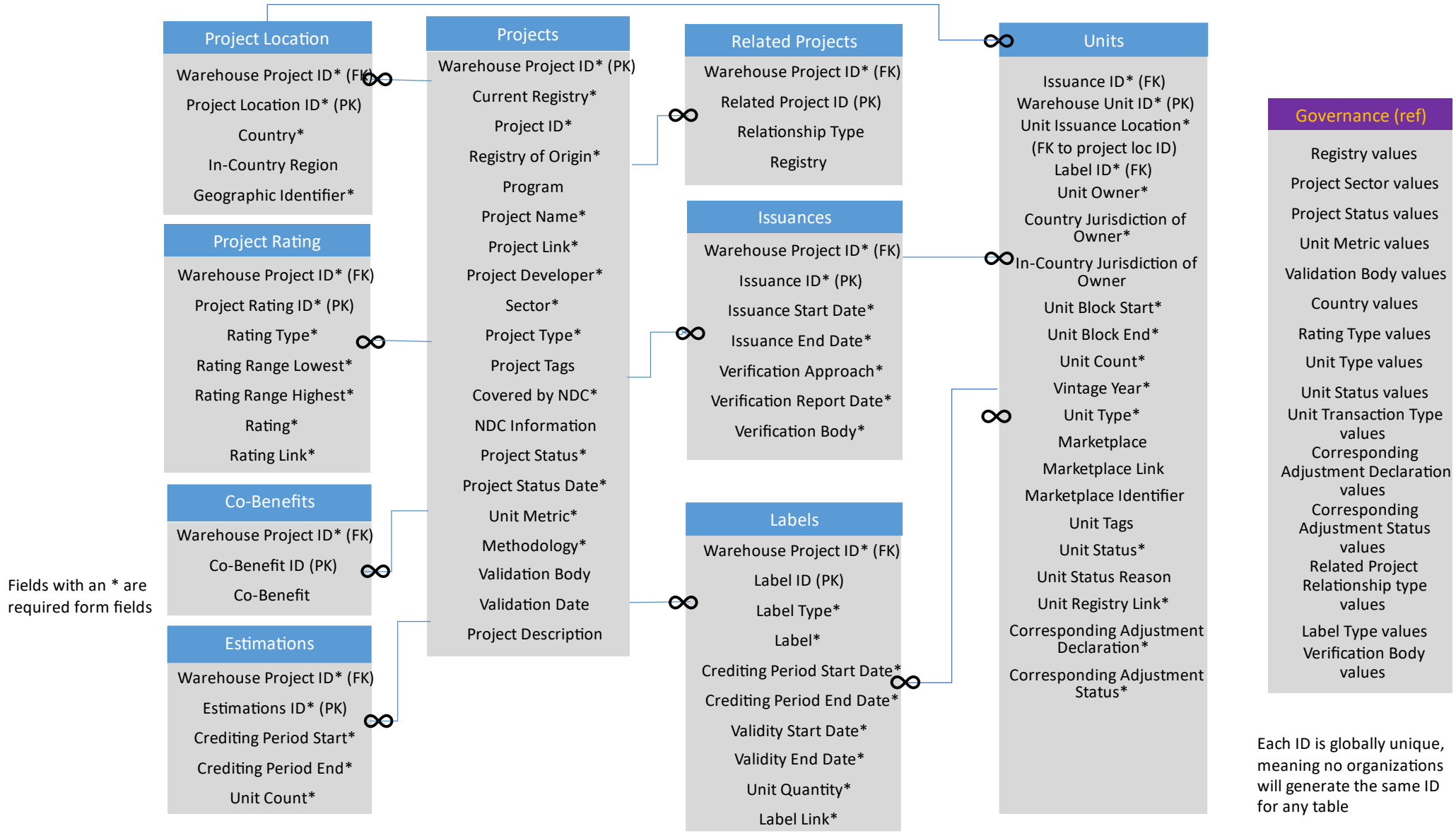


Building a public good data layer

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



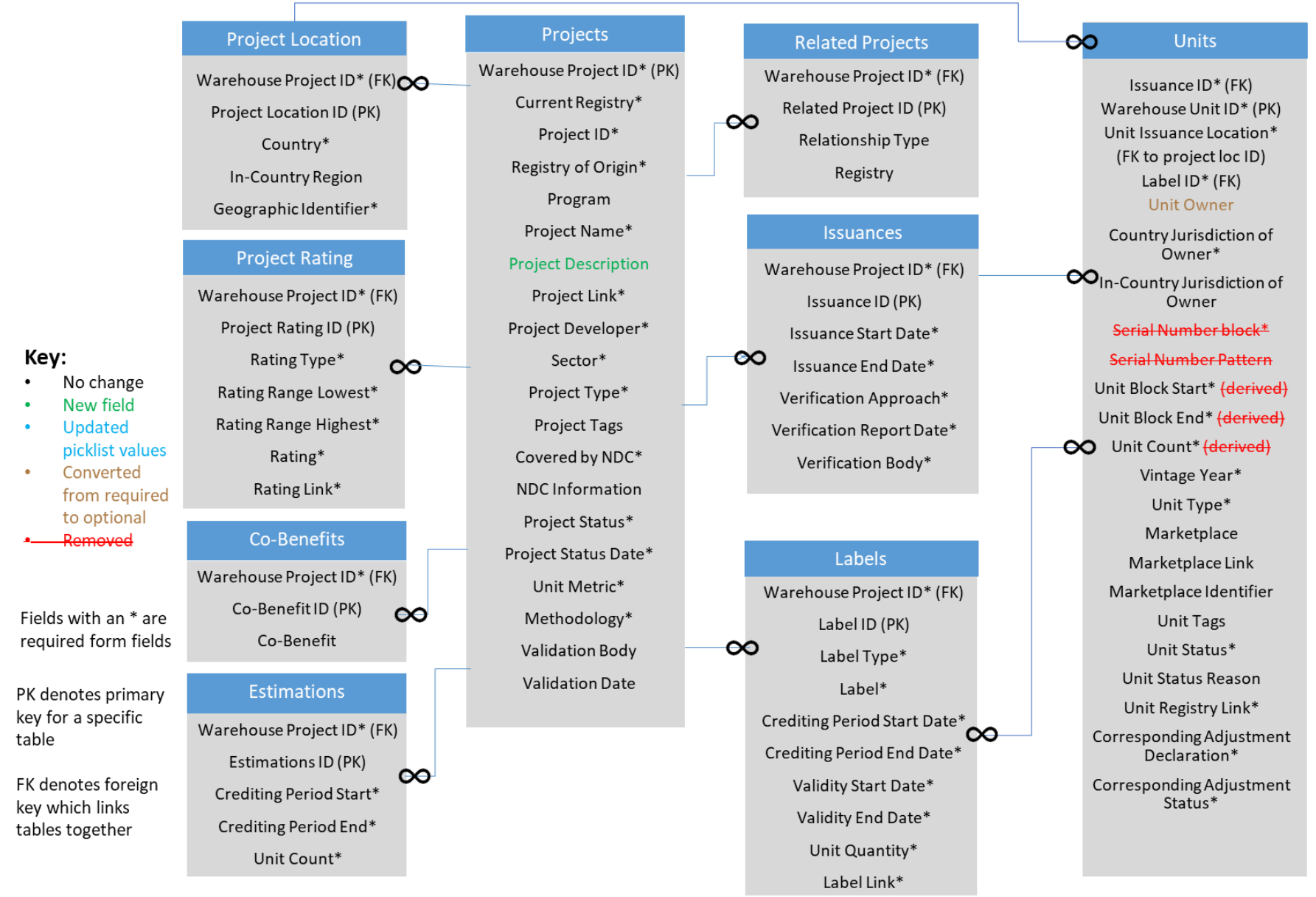
Initial Simulation III Data Model (March 2022)



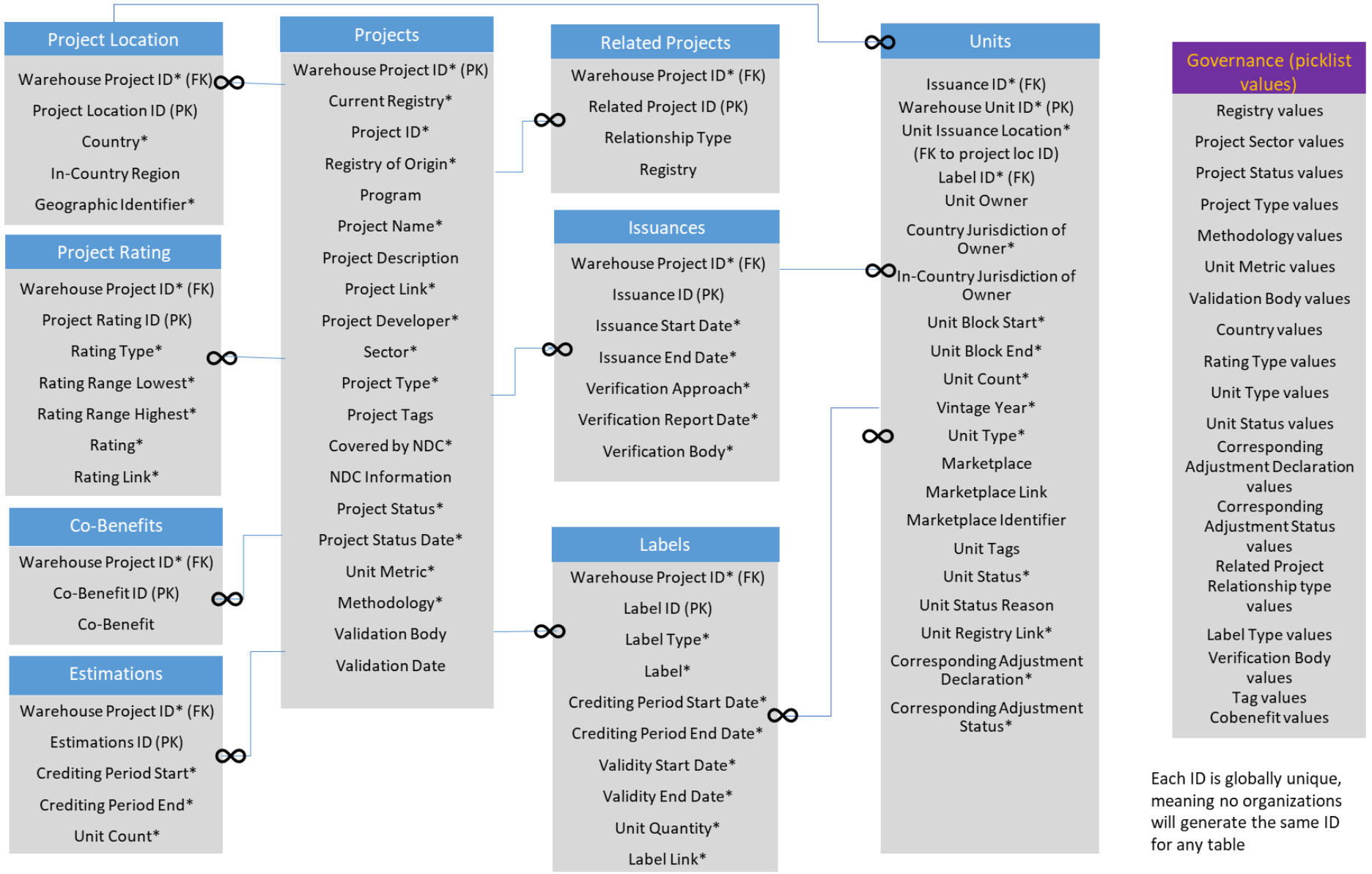
Fields with an * are required form fields

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



Updated Simulation III Data Model (August 2022)



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

Objectives of Simulation III

Prototype Development

- **Develop the 3rd version** of the prototype :
  - It is **open source** and **interoperable**
  - It is on a **public blockchain**
  - It has an **updated data model** and **functions** based on the lessons learned from Simulation II
- **Develop technical and functional documentation** for testing scenarios
- **Publish Observer Node** on theclimatewarehouse.org

Testing Activities

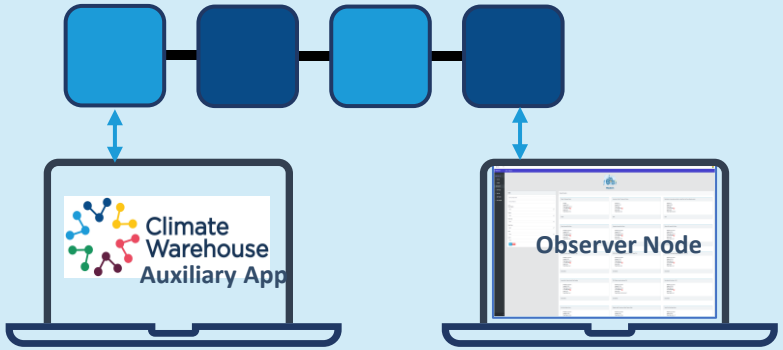
- **Outreach and engage with partners** of the Climate Warehouse
- **Onboard and create hosted environments** for participants for testing activities
- **Conduct sprint sessions** with participants to test the 3rd version of the prototype

Governance

- Implement the recommendations from the **governance consultations on operational Climate Warehouse** with IETA and the Government of Singapore:
  - Set up independent legal entity
  - Conduct fundraising
  - Formation of governing bodies

Results of Simulation III

WAREHOUSE DATA LAYER BLOCKCHAIN



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
Temasek

ACR
CAR
GCC
Gold Standard
Verra

8 observers:

Spain

EBRD
UNDP
UNFCCC

Climate Ledger Initiative
ClimateCheck
IETA
Open Earth Foundation

OPERATIONAL CLIMATE WAREHOUSE GOVERNANCE

IETA, WB, Singapore NCCS

Governance Consultation with private, public and non-profit ecosystem partners:

Implementation of the governance and operating model for the Climate Warehouse as a public good.

Fundraising and formation of governing bodies of the Climate Warehouse.

High Level Outcomes of Simulation III

75 individual testers
30 participating organizations
58 testing sessions
40 weekly office hour 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.

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

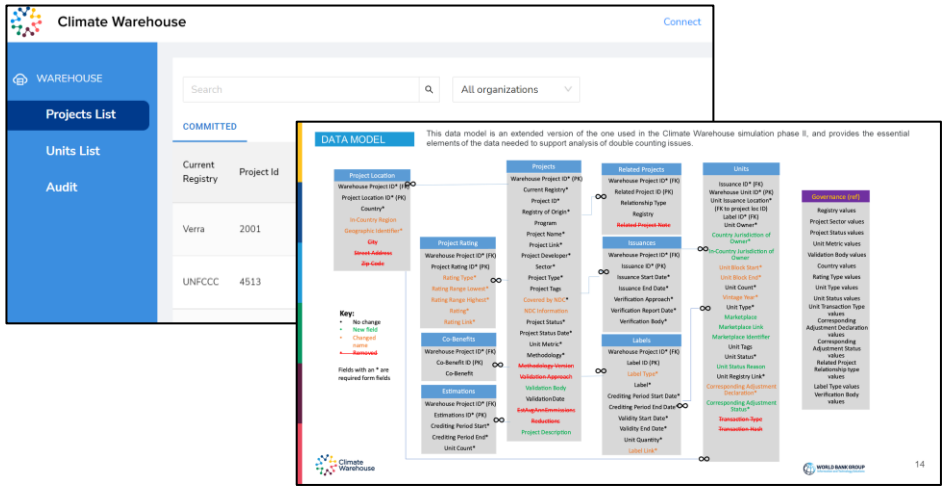
Next Steps:

- Transition to the governing body of the operational Climate Warehouse, under the leadership of IETA, in close collaboration with the World Bank and the government of Singapore
- Launch the operational Climate Warehouse (expected in mid-October 2022)

Prototype Architecture

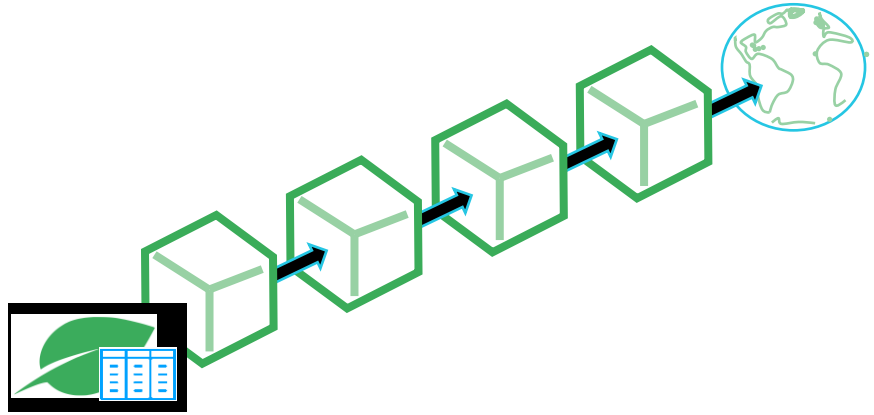
The architecture has 2 layers –
the Climate Warehouse data layer and the public blockchain layer

Climate Warehouse 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

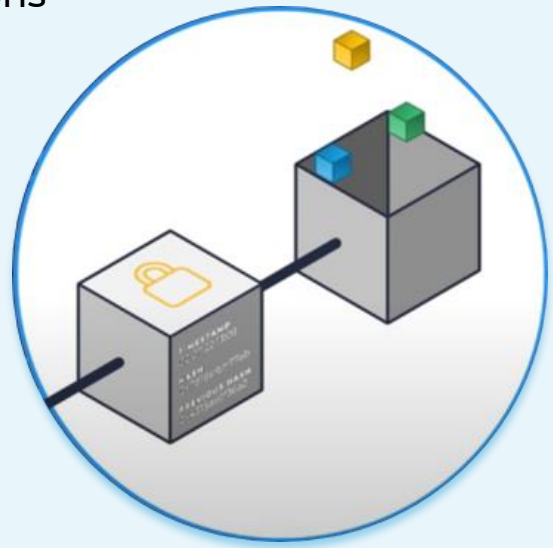
Prototype Architecture

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



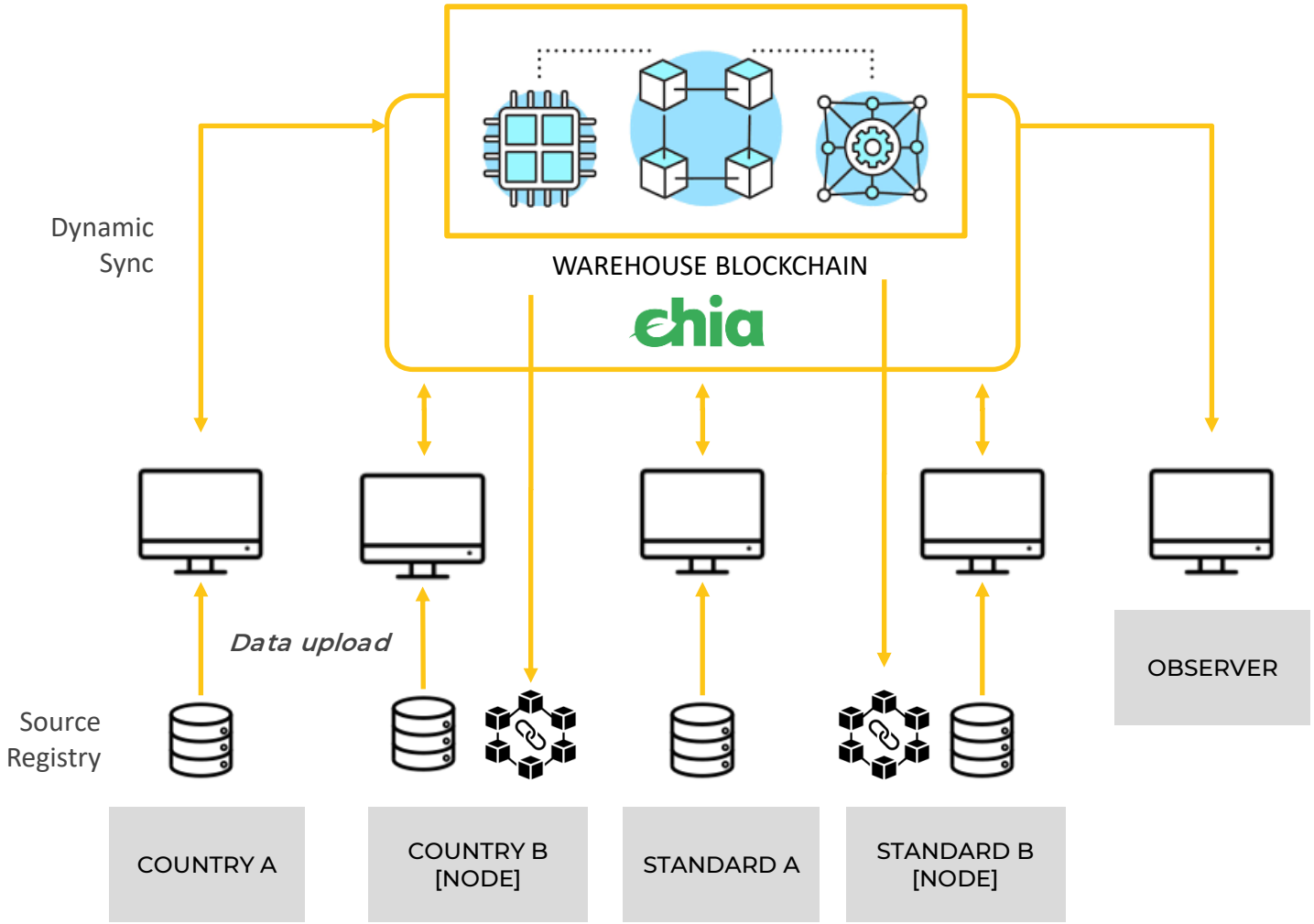
Inclusiveness
- Public, fully open source and permissionless
- Anyone in the network can access both the data layer and Chia Network blockchain node and add blocks

The Chia Blockchain Layer

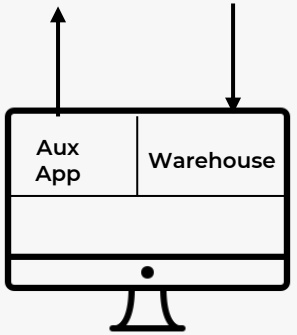
The World Bank's collaborative partnership with Chia is non-exclusive. It is for open-sourced public good, bears no costs or intellectual property rights from the World Bank and promotes interoperability.

Prototype Architecture

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



User Interface



The Warehouse 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 the Warehouse. The other is a tab that showcases the data in the warehouse blockchain. *Node Participants* hold a full copy of the blockchain via direct integration. *Observer participants* view the Warehouse data via an Auxiliary App made available by the WBG.

Prototype Architecture

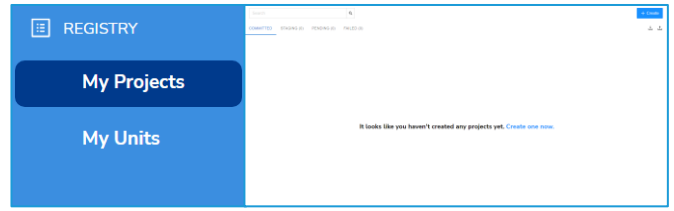
The Climate Warehouse has 2 key functions: the Warehouse View and the Auxiliary Application

Warehouse View

Warehouse 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

Goal and Scope of Work

Goal

Simulate how **participant registry systems can integrate** with the Climate Warehouse, 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 Warehouse 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

Testing Activities

Phase I

Phase II

Phase III

Phase IV

Group 1 (Internal testing)	Group 2	Group 3	Feedback consolidation and documentation
• World Bank Carbon Assets Tracking System • World Bank Carbon Markets and Innovation Unit	• Chile • Japan • Singapore • Sweden • Switzerland • IHS Markit • Verra • Climate Action Reserve* • American Carbon Registry* • Gold Standard • Global Carbon Council**	• Rwanda • Senegal • Peru • Uganda • United Kingdom • EcoRegistry Colombia • Temasek • IFC • SK Certification Center	**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
Observers: • International Emissions Trading Association • Open Earth Foundation	**Observers**: • Spain • UNFCCC • EBRD • UNDP	**Observers:** • Climate Ledger Initiative • ClimateCheck	
March – April 2022	April – May 2022	May – July 2022	July - August 2022

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

Testing Activities

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 Warehouse	**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 Warehouse 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 Warehouse software
User Interface (UI) – Testing that is centered around entering, manipulating, or viewing data within the Climate Warehouse UI	**Tester Profile** – Anyone who is curious about what the Climate Warehouse displays, or anyone who will be replicating data in the Climate Warehouse using the UI. We recommend most participants test this area.	**Importance** – The Climate Warehouse UI is the visual representation of the power of the Climate Warehouse. It is imperative that the UI works well for everyone involved with the Climate Warehouse.
API – Testing the Climate Warehouse API endpoints to understand how they are structured with the intent to integrate own registry with CW APIs	**Tester Profile** – Technically sophisticated registries that intend to integrate with the Climate Warehouse to automatically update Climate Warehouse 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 Warehouse.
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 Climate Warehouse 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.

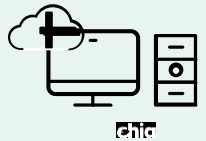
IT Requirements - Deployment Type

1. Local Installation

Install the open-source software required to run the Climate Warehouse 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.

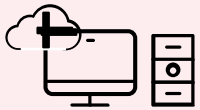
Use this option if your local machine security permissions are strict, but you still want to install the Climate Warehouse software and/or test the Climate Warehouse APIs.

3. Cloud – Chia Hosted Instance

Chia Network, Inc. will host a cloud instance with pre-installed Climate Warehouse software. Users will access the Climate Warehouse by using credentials given by Chia Network, Inc.

Use this option to quickly be able to test the Climate Warehouse 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 Climate Warehouse	Install the necessary software to run Climate Warehouse on a local machine	2-4 hours; requires call with testing support team
Access Climate Warehouse	Access a cloud instance of Climate Warehouse with pre-installed software	5-10 minutes
Create Organization	Create your organization within the Climate Warehouse	5-10 minutes
Create Project(s)	Create projects within the Climate Warehouse, 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 Climate Warehouse Data	Generate reports using Climate Warehouse 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 Climate Warehouse	5-15 minutes
Track audit history	Use the audit function within the Climate Warehouse 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 CW	**Data model and fields**	**User interface**
- Accessing the hosted instance or installing it locally - Creation of organization - Creation of projects and units - Review organizations and projects	- Feedback on the data dictionary - Is there any missing data you would need? - Can you follow the asset development lifecycle/issuance of retirement?	- Is the user interface providing enough clarity? - 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 Climate Warehouse

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

4. The CW 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 Climate Warehouse Stakeholder Entities: Benefits

Stakeholder type	Benefits
Governments	• Increases visibility and credibility of a country's climate activities • View MOs to potentially purchase • Promotes new project activity • Can increase market participation of private sector • Can provide an aggregate view of projects within their jurisdiction, ability to identify duplicative projects • Increases accountability
Independent Standards	• Reduces burden on monitoring external systems for due diligence processes because of the ease of aggregating information together • Facilitates trust and transparency between systems
UNFCCC	• Aggregate reporting
Exchanges	• Decreases market fragmentation and eases integration • Promotes standardization and asset integrity • Adds information security to the data needed from registries for transactions • 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 Warehouse must be able to **bridge process flows across participants**
- Participants must validate the Climate Warehouse'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.

Climate Warehouse 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 Warehouse

Council (~10 members)

Leads strategy/policy mandate

Secretariat

Technical Committee

- Data specification development
- IT development

User Forum

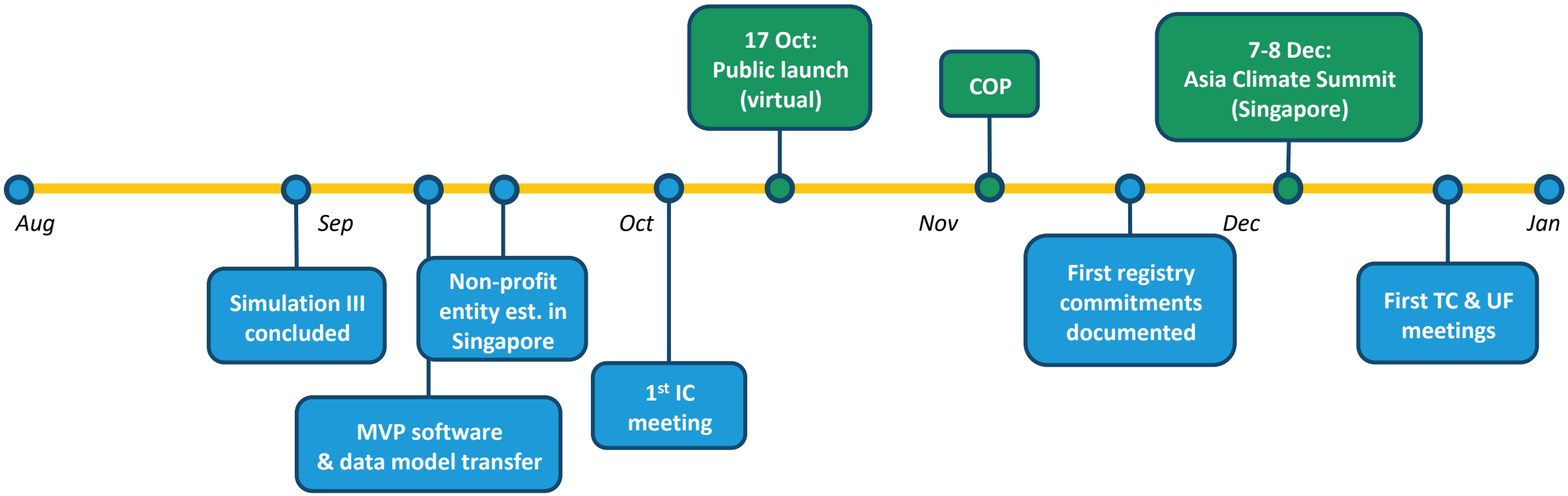
- Open to registered and approved Warehouse community participants
- Community consultation forum
- Potentially: Council recruitment

Next steps

Outlook

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

2022 Outlook

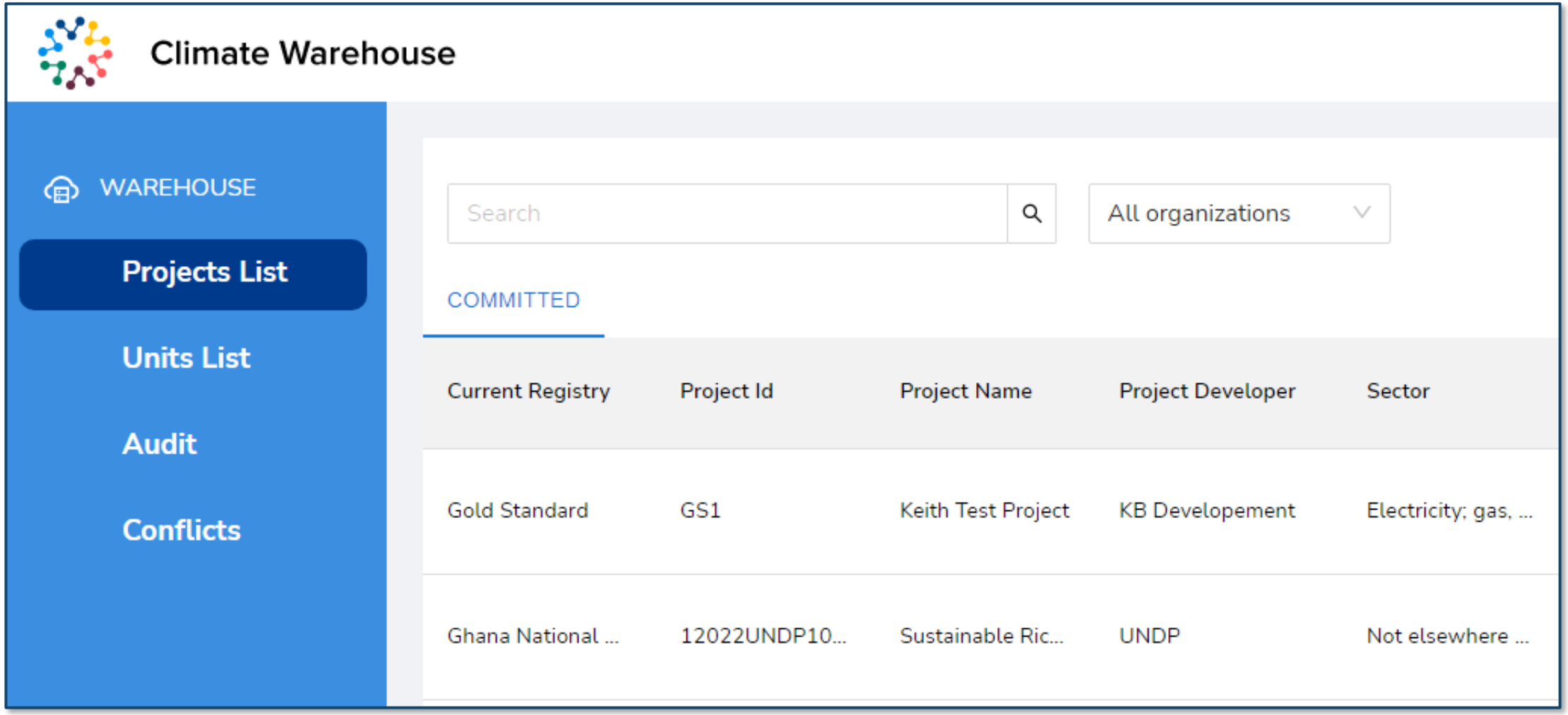


Prototype Wireframes

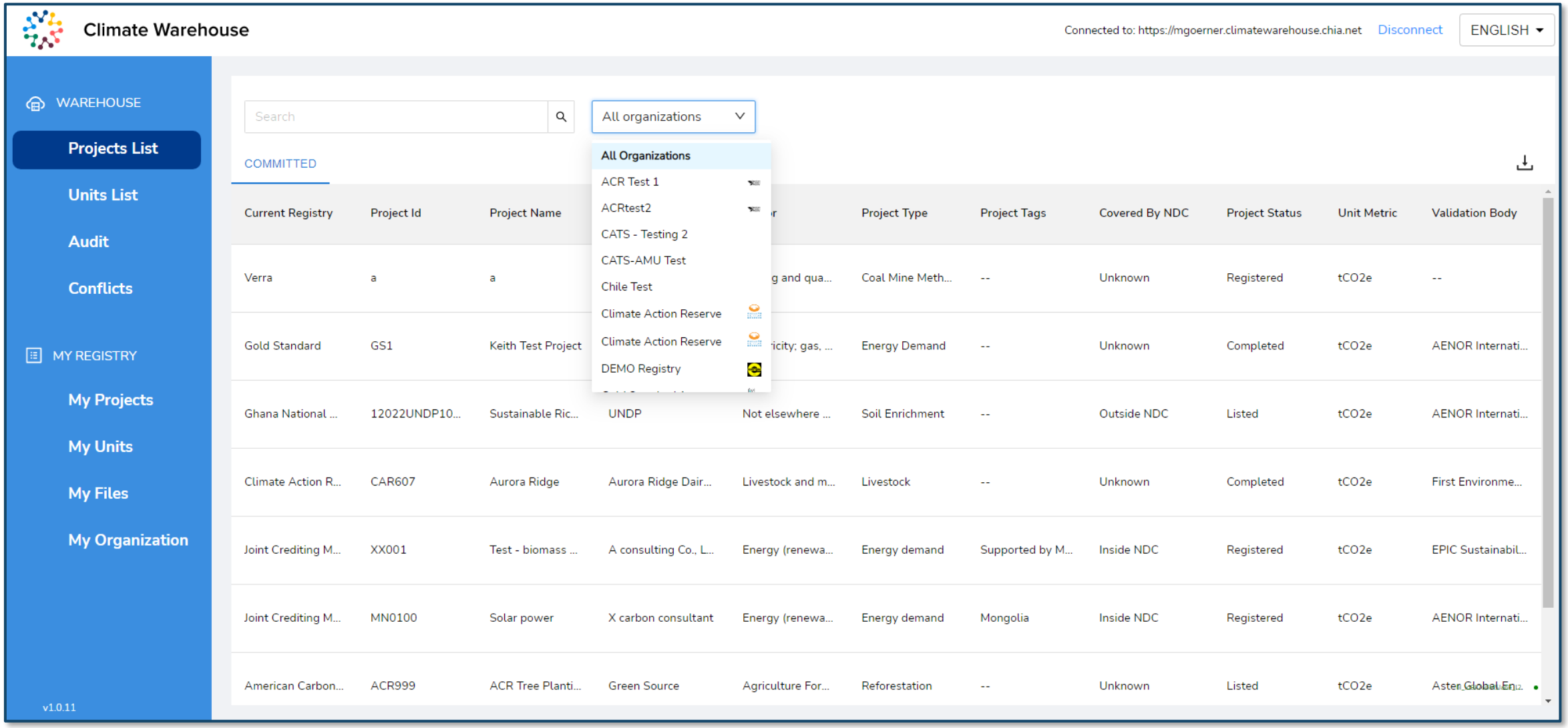
The Public Observer Node is live!

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 Warehouse. It currently shows sample data to illustrate how project and unit related information will surface in the Climate Warehouse once participants upload their data.

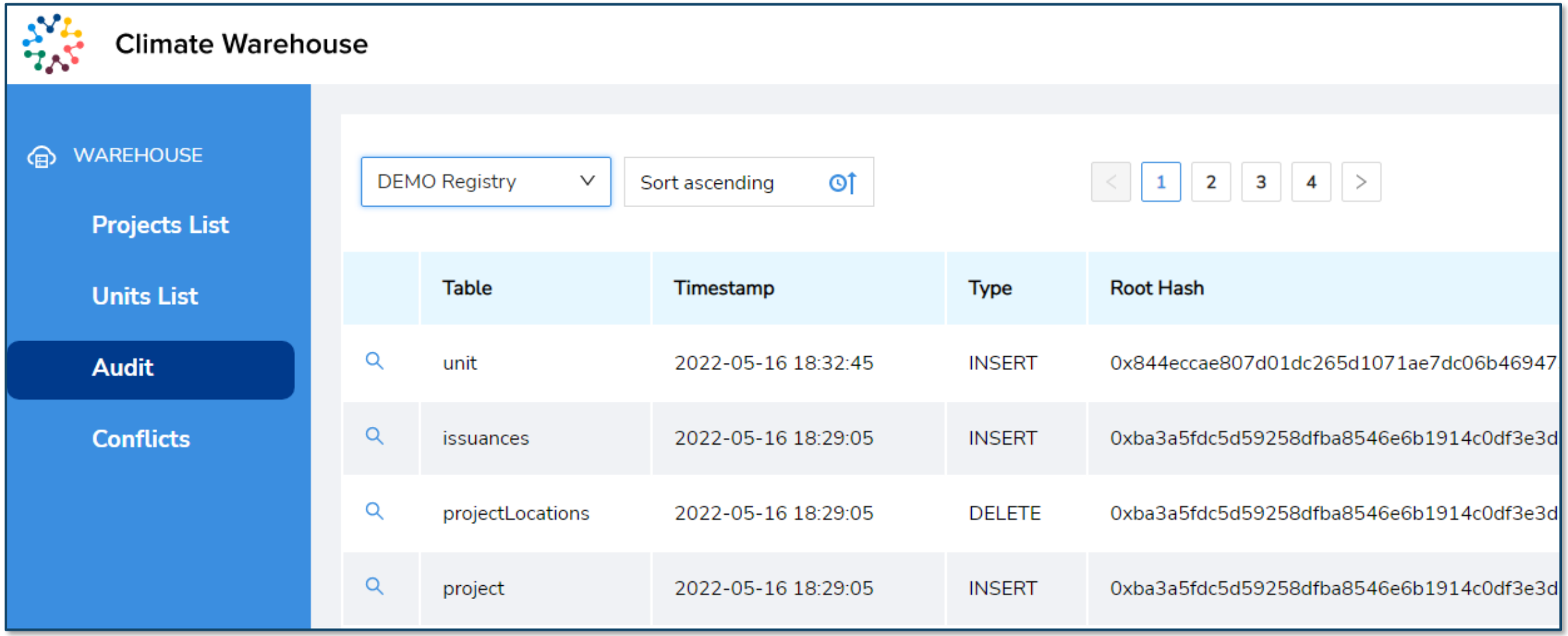
Wireframes – Climate Warehouse



Wireframes – Auxiliary App



Wireframes – Audit Function



Technical guide at a glance

Climate Warehouse

TECHNICAL GUIDE

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Additional Content:

- Climate Warehouse website: http://www.theclimatewarehouse.org

Simulation I	Simulation II	Simulation III
• Summary Report • Video	• Summary Report: *To be released soon* • Demo Session	• Public Observer Node • Video: *To be released soon*

- Knowledge Base: https://www.theclimatewarehouse.org/knowledge

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For further information:

- Website: http://www.theclimatewarehouse.org
- Video: https://www.youtube.com/watch?v=cXwTV2bAnvI

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Thank you