



Working Paper on:
Scoping of the CRCF registry and minimum
requirements for certification scheme registries

**CRCF VERification Technical Assistance
(VERTA project)**

Service request 2023/07

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List of Abbreviations

AAU	Assigned Amount Units	MRR	Monitoring and Reporting Regulation
ACR	American Carbon Registry	MRV	Monitoring Reporting & Verification
AIB	Association of Issuing Bodies	MS	Member State
API	Application Programming Interfaces	MSR	Market Stability Reserve
AVR	(EU ETS) Accreditation and Verification Regulation	MST	Mitigation and Support Team
BECCS	Bioenergy with carbon capture and storage	OPR	Offset Project Registries
CAD	Climate Action Data (Trust)	PDD	Project Design Document
CAR	Climate Action Reserve	PoA	Program of Activities
CAR	Corrective Action Request	PoS	Proof of Sustainability
CARB	California Air Resources Board	REDII	Renewable Energy Directive 2018/2001
CCP	Core Carbon Principles	RSB	Roundtable for Sustainable Biomaterials
CCS	Carbon Capture and Storage	UDB	Union Database for liquid and gaseous biomass fuels
CCU	Carbon Capture and Utilisation	VCM	Voluntary carbon market
CDM	Clean Development Mechanism	VVB	Validation/Verification Body
CL	Clarification Request		
CO ₂	Carbon dioxide		
CRCF	Carbon removal certification framework		
DACCS	Direct Air Capture and CO ₂ Storage		
DNA	Designated National Authority		
DOE	Designated Operational Entities		
EB	Executive Board		
EC	European Commission		
EU ETS	European Union Emissions Trading System		
EUA	European Union Allowances		
EUTL	EU Transaction Log		
FAR	Forward Action Request		
GDPR	General Data Protection Regulation		
GS4GG	Gold Standard for Global Goals		
GHG	Greenhouse gas		
IAF	International Accreditation Forum		
IC	Integrity Council		
ICVCM	Integrity Council for Voluntary Carbon Market		
IR	Implementing Regulation		
ISCC	International Sustainability and Carbon Certification		
ITL	International Transaction Log		

1. Introduction

Through the European Climate Law, the EU is committed to being **climate neutral by 2050**, a target that underpins the European Green Deal Strategy ⁽¹⁾ and associated policies and measures. All sectors will need to play their part to reduce their greenhouse gas (GHG) emissions as quickly as possible to an absolute minimum. However, it will not be possible to reduce emissions from all sectors to zero. To achieve this goal, rapid emissions reductions will therefore need to be combined with a robust approach to remove carbon dioxide (CO₂) from the atmosphere.

In April 2024, the European Parliament approved the political agreement on the **Regulation establishing a voluntary EU-wide certification framework for carbon removals, referred to as the Carbon Removals and Carbon Farming (CRCF) Regulation.**⁽²⁾

The Regulation's aim is to **accelerate the development and uptake of carbon removal activities** by providing a consistent framework to recognise carbon removal and soil emission reduction claims that are high quality, regardless of the type of carbon removal activity the claim originates from. The Regulation distinguishes three groups of different carbon removal activities: permanent carbon removals (such as direct air capture with carbon capture and storage (DACCS), bioenergy with carbon capture and storage (bioCCS) and biochar); carbon farming such as peatland rewetting and regenerative agriculture practices and agroforestry; and carbon storage in products such as wood-based construction materials. The Regulation provides 'QUALITY' criteria for **high-quality carbon removals and soil emission reductions** (QUantification, Additionality, Long-term storage and sustainABILITY), and rules for third party verification of the authenticity of those removals or soil emission reductions.

The objective of this project is to **provide support to the Commission to develop implementing** rules for the verification of carbon removals, including the operation of certification schemes and certification bodies. Furthermore, this project supports the Commission to **start scoping the EU wide registry for carbon removals (CRCF Registry)**, and to identify **options for interoperability** of the existing registries for EC-recognised carbon certification schemes, especially in the interim period before the EU wide registry is launched.

This working paper builds on the review of the relevant EU and international good practice and examples of existing linkages between registries presented in the first interim report, as well as feedback received during the Fourth Carbon Removals Expert Group Meeting in April 2024³.

⁽¹⁾ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

⁽²⁾ https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/ENVI/DV/2024/03-11/Item9-Provisionalagreement-CFCR_2022-0394COD_EN.pdf

³ https://climate.ec.europa.eu/news-your-voice/events/4th-eu-carbon-removals-expert-group-meeting-2024-04-15_en

The following chapters are included in this paper:

- Chapter 2: Scope of Union Registry for carbon removals
- Chapter 3: Minimum requirements for certification scheme registries (including options for interoperability)

The working paper presents the **options for scoping a centralised registry** to be established within four years of the adoption of the Regulation and **minimum requirements for recognised certification scheme registries**, including options for **interoperability** of those registries during the transitional phase. The working paper will be presented at a stakeholder workshop in September 2024 and be published for public consultation thereafter. The stakeholder inputs will feed into the final recommendations to the European Commission, due by the end of 2024.

2. Scope of Union Registry for carbon removals

This chapter describes the options for the overall framework of the Union wide registry for permanent carbon removals, carbon farming and carbon storage in products, referred to hereafter as the “CRCF registry”. The basis for these options is guided by the legislative requirements included in the CRCF Regulation, while also considering a feasible approach that can ensure the development of a scalable carbon removals framework in the EU within a relatively short period of time.

2.1. Options for CRCF registry

2.1.1. CRCF requirements

Article 12 of the CRCF Regulation stipulates that within four years of entry into force of the Regulation, the Commission shall establish a Union registry for carbon removals, the “CRCF registry”. Annex II lists the information that will need to be included in the registry.

CRCF Article 12 Union wide registry for permanent carbon removals, carbon farming and carbon storage in products

[Based on the political agreement reached by the European Parliament in April 2024, pending updates of the final agreed text once available.]

1. [...] the Commission shall establish and duly maintain a Union wide registry for permanent carbon removals, carbon farming and carbon storage in products, to make publicly available the information related to the certification process, in an accessible way, containing, as a minimum, the information set out in Annex IIa [...] The Union registry shall use automated systems, including electronic templates, to make publicly accessible in a secure way the information related to the certification process, including the certificates of compliance and updated certificates of compliance, to enable the tracing of the quantity of certified units and avoid double counting. The Union registry shall be financed by annual fixed fees payable by users, proportionate to the use of the Union registry, to sufficiently contribute to the coverage of the annual operating costs of its establishment and management of the Union registry [...]

1a. Certified units shall be issued by certification registries or, by ... [OJ: 4 years from the entry into force of this Regulation], by the Union registry [...]

Any certified unit shall not be issued more than once and shall not be used by more than one legal or natural person at any point in time.

Permanent carbon removal units, carbon farming sequestration units and carbon storage in products units, and soil emission reduction units shall remain distinct from each other.

Annex IIa Minimum information included in the Union registry and certification registries referred to in Article 12

The Union registry and certification registries referred to in Article 12 shall include the following minimum information for each activity and each certified unit:

- a) name and type of the activity, including name and contact details of the operator or group of operators;
- b) location of the activity, including geographically explicit location of the activity boundaries, respecting 1:5000 mapping scale requirements for the Member State;
- c) duration of the activity, including start date and end date;
- d) name of the certification scheme, including its recognition decision referred to in Article 13, its rules and procedures and the list of appointed certification bodies referred to in Article 11, and its annual reports referred to in Article 14;
- e) reference to the applicable certification methodology referred to in Article 8;
- f) expected annual net benefit referred to in Article 4;
- g) any sustainability co-benefits referred to in Article 7;
- h) certification status, including certificates of compliance and certification and re-certification audit reports referred to in Article 9; quantity and status of the certified units (e.g. issued, retired, expired, cancelled, allocated to a buffer), and end-use purpose of the certified units and the using entity.

2.1.2. Implementation options

The CRCF registry discussion should in the first instance focus on one point – **the role of the CRCF registry within or alongside the existing certification scheme registries**. Specifically, will the CRCF registry be a **fully operational registry** with a front- and back-end, offering account holding services and a well-designed user interface, or will it be a **central repository** that individual certification scheme registries will connect to, but which will ultimately focus on the back-end checks against double counting, such as final validation of issuance of certified units and protection against fraud, while certification scheme registries continue to provide the front-end user experience.

The high-level scope of the two options is illustrated in Figure 1 and an overview of the key characteristics is described in Table 1 below. Those characteristics are discussed further in the following sections of this report.

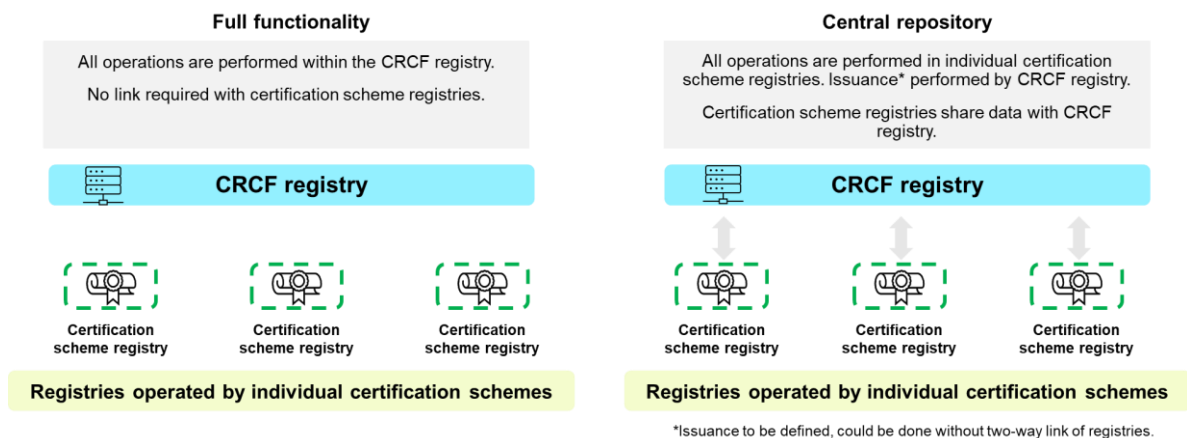


Figure 1. High level options for CRCF registry

The primary distinction between the two options is whether the CRCF registry will offer a full suite of services, requiring the development of both front-end and back-end functionality, or focus on the back end only providing more of a repository or “back office” and “dashboard” approach. The front end is generally what the user can see. In the registry context, this would mean the possibility for users to access their account data and perform transactions with certified units such as transfers or cancellations for use claims. The back end on the other hand includes all the elements that users will not actually see but make the registry function. For the CRCF registry specifically, this would include publishing information that meets the minimum requirements in Annex II for the purposes of transparency.

The first option therefore requires the **development of both front-end and back-end functionality** of the CRCF registry, referred to here as the **“full functionality option”**. The second option **focuses on the back end only** such that the CRCF registry has a central repository function and operates alongside existing certification scheme registries of EC-recognised certification schemes, rather than largely replacing their functionality, the **“central repository option”**.

Table 1. Overview of key characteristics of options for CRCF Registry

	Full functionality option	Central repository option
Data content	Mandatory data in Annex IIa Account holder data Transaction data	Mandatory data in Annex IIa Account holder data Transaction data
User population / user profiles	Free access to public (Different level security) User profiles for: <ul style="list-style-type: none"> • Operators • Trading intermediaries • End users • Certification schemes • Certification bodies • EC and Member States 	Free access to public No user profiles within CRCF registry, only within individual certification scheme registries
Receiving, holding, transferring and retiring of units	In the CRCF registry	In registries of EC-recognised certification schemes and reflected in the CRCF registry.
Issuance of units	In the CRCF registry	In registries of EC-recognised certification schemes, with a “final-issuer” role for the CRCF registry in line with the Regulation
Link to registries of other EC-recognised certification schemes	May not be necessary	Required
User management	Done by EC	Done by EC-recognised certification schemes
Data security	Centralised within CRCF registry - Individual accounts will hold certified units as financial assets,	Decentralised for user data - each certification scheme registry addresses with contractual

	Full functionality option	Central repository option
	the approach taken by the Union Registry for the EU ETS	arrangements between users and EC-recognised certification schemes Centralised for operational data – CRCF registry ensures data integrity
External data exchange	Linking not required	One-way link which will allow the publication of all legally required information on projects and certified units
Database ownership and management	EC owns and manages database and data	EC owns repository, but data is owned and managed by other EC-recognised certification schemes
Processes	<ul style="list-style-type: none"> • User validation • Document upload • Data entry • Certified unit transfer and acceptance • Issuance of certified units • Retirement of certified units 	<ul style="list-style-type: none"> • Issuance of certified units, process to be defined • Validation of certified unit retirement/use
Types of data in dashboard	Mandatory data in Annex IIa Limited account holder data Data on transactions (except retirement) to be published after a specific period of time	Mandatory data in Annex IIa Limited account holder data Data on transactions (except retirement) to be published after a specific period of time
Cost and set up time	High (similar to EU ETS Union Registry or Union database for biofuels)	Lower
User fees	High, due to higher operating costs	Low – technically the only use will be linked to issuance
Pros	<ul style="list-style-type: none"> • Can be built bespoke for CRCF needs • Potentially easier to integrate into Union Registry if desired in longer term • More control in EU 	<ul style="list-style-type: none"> • Faster set-up • Lower set-up cost • Allows existing VCM registries and markets to continue • Provides “single source of truth” / overview of EU carbon removals
Cons	<ul style="list-style-type: none"> • Longer set-up time required (although could still be done within 4 years) • Higher set-up cost 	<ul style="list-style-type: none"> • No centralised platform - project operators may need to have accounts in different registries • May be more difficult to integrate removals in other EU policies
Risks / implications for existing certification schemes	<ul style="list-style-type: none"> • High impact on business models of existing VCM who make money through registry fees 	<ul style="list-style-type: none"> • Limited impact on business models of existing VCM who make money through registry

	Full functionality option	Central repository option
	<ul style="list-style-type: none"> • More complex IT development brings higher risks of budget overrun or delayed implementation • Transitional phase with limited number of certification schemes 	<ul style="list-style-type: none"> • fees, depending on implementation • Lower costs to adapt to new system

Initial feedback received from existing certification scheme registries suggests that the **central repository approach is preferred** as it offers several additional benefits to alternative systems while also avoiding the risks related to the full functionality option. A central repository approach can:

- Focus on the main goal of the CRCF registry, delivering transparency, rather than investment into user interface.
- Reduce the development budget and therefore costs for the framework.
- Reduce risks linked to timing and budget overruns.
- Reduce costs for certification schemes to adapt.
- Increase likelihood that certification schemes with existing registries will seek approval under the CRCF Regulation before the establishment of the CRCF registry⁴

Another consideration which may affect the choice of scope for the CRCF registry is **whether (domestic) permanent carbon removals might in future be integrated in the EU regulatory framework**. Article 30 of the EU ETS Directive⁵ requires the Commission to submit a report by 31 July 2026 to the European Parliament and the Council assessing the pros and cons of how carbon dioxide removals could be accounted for and covered by a trading system. This means that there could be a possibility that certified units issued under the CRCF regulation could be allowed for compliance use in the EU ETS or a separate trading system in the future, even if there are restrictions on the volume and/or type of unit allowed. It is therefore relevant to also consider the potential for future linkages between the CRCF registry with the Union Registry for the EU ETS, and its impact on the options discussed.

There could be a timing issue with this consideration. The report assessing the possible integration of permanent carbon removals in the post -2030 period is due in mid 2026. However, a decision on the CRCF registry design should be taken sooner, since the CRCF Regulation is expected to enter into force by end of 2024 and therefore the CRCF registry would be established by end of 2028.

⁴ Noting the potentially short transitional period before the establishment of the CRCF registry, existing certification schemes may be reluctant to invest to join the framework and amend their registries if that investment becomes redundant within a short period of time.

⁵ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC Available at: <https://eur-lex.europa.eu/eli/dir/2003/87/oj>

If permanent carbon removals were allowed into the EU ETS, CRCF issued certified units will need to appear in the ETS Union registry, much like Kyoto mechanism credits which were allowed to be used previously. If the full functionality option is chosen, a link between the CRCF and ETS registries will be needed. If a central repository approach is chosen, it is likely that **each** recognised certification scheme registry will need to connect to the ETS registry. Either approach is possible, but in the central repository case, more potential links would be needed with external registries which would be harder to implement. In either case, the approach to linking could follow the documentary exchange approach described in section 3.4, if it is considered robust enough for the transitional period.

Regardless of which option is chosen, back-office services will remain a critical element of the CRCF. Given their importance, it is essential to begin identifying the technological solutions for their implementation. The back-office services will involve the development of three primary components: a Registry of Certification Bodies, a Registry of Carbon Removal Projects, and a Carbon Removal Unit Lifecycle Registry. These elements could potentially be built using Blockchain technologies, specifically EBSI (European Blockchain Services Infrastructure), which already supports – developed and tested - two of the three core components.

Alternatively, the CRCF could partially leverage EBSI for certain elements while building the business-specific registry of carbon removal units using traditional technologies.

Another possibility is to fully develop the CRCF back office using conventional, non-blockchain technologies. Each option offers different degrees of costs, flexibility, scalability, and technological integration. Nonetheless, to ensure the creation of a future-ready system, consideration should be given to leveraging blockchain technology. Blockchain offers enhanced transparency, auditability security, and traceability—key features that align with the long-term objectives of the CRCF. By integrating blockchain, the system could also be better equipped to involve a large number of ecosystem players and to reduce the involvement of the Commission as its single service provider.

It is important in any case that the CRCF registry delivers on the functionality and transparency mandated by the Regulation and supports the avoidance of double issuance and double claiming. The following sections describe further the considerations set out in Table 1.

2.1.2.1. Core registry capabilities

Independent of the final scoping of the CRCF registry, as set of core requirements will need to be covered:

- Covering the entire lifecycle of a certification unit with focus on the “singleness” of the unit (no double issuance, no double claiming);
- Providing transparency on the carbon removal projects that underpin the registered units;
- Providing transparency on the certification process of the units and stakeholders involved.

Blockchain could offer a technological implementation of these requirements. As technical choice, it provides out of the box implementation of core features: data integrity and availability, non-repudiation of content, smart contracts for lifecycle and ownership management, centralized business rules, etc.

One example of blockchain use is the CAD Trust approach to aggregating information from different registries shows how to link registries which were designed to operate independently. The connection works via an Application Programming Interface (API) which, once developed, can generally be installed without incurring significant costs.

Individual certification scheme registries publish data using their own “instance” of the CAD Trust software (their CAD Trust Node). The CAD Trust software creates encoded data files representing the data entered by the registry and is made publicly available. This data is then accessible to observers and subscribers of the platform. Anyone can download and run the open-source CAD Trust software, and can find and download the published data based on the registry ID.

In the case of the CRCF registry, the European Blockchain Services Infrastructure (EBSI) could be used for publishing the relevant information, including on transactions. Individual scheme registries could publish using the EBSI network and the network could be the de-facto CRCF registry.

EBSI is an existing solution that can contribute to the creation of the back-office services required regardless of the complete, final scope of the registry. EBSI has the potential to accelerate the development of the key back-office services, such as:

- a decentralised registry of **Certification Bodies** – like the existing Trusted Issuers Registry of EBSI
- a registry decentralised of **Carbon Removal Projects** - like the existing Legal Entities Registry of EBSI
- and a **Carbon Removal Unit Lifecycle Registry** – this is something that EBSI currently does not offer. Its creation could follow one of two approaches:
 - Simple timestamping service of carbon unites creation, and deletion/ this option would be combined with relational databases either at central level (option A) or at local level (OPTION B).
 - Full ledger of transactions with tokenised carbon unites managed and smart contracts enforcing their terms and conditions.

The EC would need to implement the necessary controls to avoid double issuance and double claiming on EBSI and implement a public dashboard for the CRCF data published on EBSI. Using EBSI for issuance and data storage will ensure non-repudiation of certified units and their use. Using the eID wallets existing on EBSI would ensure against identity fraud.

An alternative, documentary approach, as adopted in the Californian Cap-and-trade system to link the compliance registry and approved certification scheme registries could be even easier to implement. Since the CRCF does not envisage transfers of units from one certification scheme registry to another, the approach could be adapted such that individual registries automatically provide information on registered project activities and issued units, complying with the minimum requirements. The information

will still be made public within the existing registries, as has largely been the case to date, while a centralised database could address the question of interoperability, by providing an interim platform to aggregate data and check for potential double entries either when certifying activities or issuing units.

Going further, below are more detailed capabilities as derived from the core needs and potential overall scope:

2.1.2.2. High level capabilities

With **full functionality**, the CRCF registry should provide the following capabilities:

- Secure account access
- Possibility to hold different types of certified units, some of which will have an expiration date
- Possibility to transfer certified units
- Possibility to receive certified units
- Possibility to retire units on own account and/or on behalf of third parties, including providing the reason for the retirement
- Possibility to upload relevant documents
- Possibility to request issuance

If all of the above are implemented, there may be no necessity to link to other registries and exchange data with them.

With the **central repository** approach, all of the potential transactions with certified units mentioned above will be performed in the respective registry of the certification scheme selected by the project operator. The CRCF registry will only show the information already created within those registries in one place for easy tracking of different projects.

It is important to consider how Article 12(1a) of the Regulation, which mandates that “issuance” of certified units should be done by the CRCF registry could be implemented. This requirement could be interpreted to mean that the CRCF registry needs to be set up with full functionality as it needs to issue the certified units. However, since the issuance process has not yet been developed, it may be possible to define it such that the requirements of the Regulation are met while implementing the central repository approach. The details of the issuance process for existing registries differ, but it can somewhat simplistically be described as a data checking process. When an operator wishes to issue certified units, the certification body produces a verification report based on data provided by the project operator and the certification scheme performs relevant checks on that report and data before issuing certified units. Once data is confirmed, potential double issuance risks are checked, and fees are paid, the units appear with serial numbers in the relevant registry account and account holders can transact with them. One option therefore could be that the CRCF registry provides the last step of the process. Specifically, the certification schemes could still do the checks and the serial numbers, which will be needed to ensure subsequent tracking, could be issued in the CRCF registry. This could be coupled with, for example, an additional confirmation that there is no other registered project in a specific location that is using a specific methodology.

2.1.2.3. Processes

Depending on the option chosen for the CRCF registry, there will be a significant difference in the processes that the CRCF registry will need to perform in line with the different high-level capabilities defined in the previous section.

With **full functionality**, the CRCF registry will need to perform at least the following processes:

- Validation and registration of new users, for each user type specified in section 2.1.2.4
- Entry of project activity data by project operators, as per transparency requirements
- Secure upload of project activity documentation (by project operators), certification of compliance and recertification (by certification bodies or certification schemes)
- Issuance of certified units
- Transfer (and acceptance) of certified units
- Retirement of certified units, including entry of reason and beneficiary

Under the **central repository** approach, all processes will be performed within the individual certification scheme registries, except issuance and possibly validating unit retirement/use. As discussed in section 2.1.2.1, since the overall functionality of the CRCF registry will be limited, issuance could be reduced to allocating serial numbers as a final step in the issuance process, while certified units are ultimately created and held within the respective scheme registries.

2.1.2.4. User population / user profiles

This element will be affected by the design option chosen, since there will need to be at least two categories of users if the full functionality option is implemented.

Apart from the **general public**, who can view all registry data that is not confidential (a decision on whether to ask for user registration to access the data or like EUTL/CAD Trust allow free usage in a public dashboard needs to be taken), a separate secure **user access for account holders** will need to be created. Account holders will include project operators, but also trading intermediaries and end users of certified units. Account holders will also need to be able to perform different types of registry transaction with certified units. Depending on final design, it may be appropriate to set up several types of user accounts that provide different functionalities. For example, not all accounts may be allowed to retire units on behalf of third parties.

Certification schemes will also need separate access to the CRCF registry, to be able to confirm project certification and certified unit issuance. Similarly, **certification bodies** (and their auditors / verifiers) will need to access project data, again to provide certification and recertification opinions. Further, **the EC and Member States** may also be part of the user population, for example to change certification scheme approval/recognition status, depending on the final choice of the CRCF registry scope.

Under the central repository option, since no user accounts will need to be created, no specific user profiles may be needed either if, as mentioned above, free access is provided to the general public. This would also provide the highest level of transparency without compromising security only non-confidential information will be shared.

2.1.2.5. User management

If the CRCF registry is developed with **full functionality**, user accounts will need to be created where certified units can be held and where users can perform transactions. Even if private individuals are allowed to open accounts and hold units ⁽⁶⁾, it is expected that the majority of accounts will be held by organizations, which would require at least two users. If multiple users are allowed, as suggested, user rights can restrict edit and/or view rights for specific roles.

Under the **central repository** option, user accounts could be created for tracking purposes, but they are not generally required. The Union Registry for the EU ETS allows free access to all public information via the EUTL without the need to create an account. The approach taken by the CAD Trust, which aims to aggregate voluntary carbon market information, is similar.

2.1.2.6. Data content

The overall scope of the CRCF registry is defined by the CRCF regulation. The registry should provide transparency and issue certified units. This is not affected by the option for the development of the Registry that is chosen.

The mandatory data content is listed in Annex IIa of the CRCF regulation and there is no flexibility to not comply with the requirements in terms of the type of data what should be made publicly available, regardless of the design option chosen for the CRCF registry.

In addition, Article 12(1a) stipulates that there will be four types of certified units that need to be distinguished ⁽⁷⁾. The specific methodology (being developed by the Commission) applied by each project activity to generate certified units will determine the type of unit(s) that can be issued. Therefore, this requirement by itself will in no way be affected by the option chosen for the final CRCF registry design and scope. Approved certification scheme registries will need to include and make publicly available all mandatory data in Annex IIa, and the registries will need to be able to issue and transact the types of certified units appropriate to the methodology(ies) that the certification schemes are approved for.

⁽⁶⁾ Existing registries take different approaches – Verra, which operates one of the VCM registries does not allow private individual accounts while the Union Registry for the EU ETS does.

⁽⁷⁾ “Permanent carbon removal units, carbon farming sequestration units and carbon storage in products units, and soil emission reduction units shall remain distinct from each other.”

The main difference between the two options is where the original data is held and where it can be updated.

Apart from the mandatory data, which includes the project activity description and data on planned and issued certified units, their retirement/use and the end-purpose, account holder data may also be published. This could follow the EU ETS example which provides information ⁽⁸⁾ on accounts held in the registry, without disclosing personal data. In addition, transaction data, while initially confidential, could also be made public after a specific period of time. Again, this would follow the provisions of the EU ETS, under which the Union registry for the EU ETS must provide transaction data, including account holder names of both parties to a transfer, for up to three years after the transfer occurred. Finally, as evidenced by existing certification scheme registries, it is expected that some of the data will need to be in the form of documents with links provided in the dashboard.

With the **central repository** approach, all primary data will be entered and amended within the respective certification scheme registry. Any changes and additions will be reflected and validated in the CRCF registry. Depending on how issuance is defined, the only primary data from the CRCF registry could be the serial numbers assigned to certified units on issuance as suggested in section 2.1.2.1.

Under **full functionality**, all primary data will be entered and amended within the CRCF registry.

2.1.2.7. Database ownership and management

Database ownership and management will only depend on the final design of the CRCF registry as far as data ownership is concerned. The development of the registry and its maintenance should be performed by the Commission, in alignment with the regulatory text. Regardless of who owns the data, it should be maintained securely and confidential information needs to be safeguarded.

Under the **full functionality** option, the most logical approach would be for the European Commission to also own and manage the database, while certification schemes, certification bodies and account holders will enter data on project activities, certification status and transactions with certified units.

With the **central repository** approach, however, approved certification scheme registries will need to provide data in a common format to the central CRCF registry platform. Therefore, whilst the European Commission would own and manage the repository, data ownership will likely need to remain with the individual certification scheme registries who will be responsible for ensuring compliance with the Regulation.

It is not expected that data ownership will have a significant impact, however. This is because most relevant data will be made public in any case to ensure transparency. Some specific confidential elements linked to project approval and transaction /

⁽⁸⁾ The information includes, account holder name, address and (if relevant), company registration number

account holdings data are generally not made public by existing scheme registries, in line with confidentiality provisions in registry use agreements. This is not expected to change regardless of the CRCF option chosen. If transaction data is to be released publicly, like with EU ETS allowance transfers, this will need to be reflected in certification scheme registry use agreements.

2.1.2.8. Data security

Data security and privacy should be guaranteed by the minimum requirements for approved certification scheme registries (described in chapter 3), and by relevant EU regulations such as GDPR or Commission Decision 2017/4614 ⁽⁹⁾, which defines IT security and information security policies that need to be complied with regardless of the decision on how the CRCF will function. The main difference between the two options is who is responsible for ensuring data security and privacy.

With **full functionality**, where individual accounts will hold certified units as financial assets, the approach taken by the Union Registry for the EU ETS, as discussed in section 3.2.2, could be applied as the best existing example, while considering potential updates in line with recent developments in the data security in general.

Under the **central repository** option, data security will need to be considered within the individual certification scheme registries, in line with the minimum requirements specified in section 3.2.2. Since certification scheme registries will continue to operate independently, even if they comply with the minimum requirements, there will likely also be higher risk associated with this option due the higher numbers of actors involved.

2.1.2.9. External data exchange

Regardless of CRCF option chosen, the registry will need to exchange information with the registries of approved certification schemes, but the details will differ between the two options.

With **full functionality**, if all of the project information, including information on transactions with certified units, is contained within the CRCF registry, there may be no need to link registries.

Under the **central repository** option, a one-way link from the approved certification scheme registries to the CRCF repository may be sufficient to allow the publication of all legally required information on projects and certified units. In addition, consideration should be given to how the requirement for the CRCF registry to issue certificates can be implemented, as discussed in section 2.1.2.1. Further, a role for the CRCF registry in validating certified unit requirements could also be considered.

⁽⁹⁾ [Commission Decision \(EU, Euratom\) 2017/46 of 10 January 2017 on the security of communication and information systems in the European Commission](#)

2.2. Set up and operation of CRCF Registry

This section sets out how the CRCF registry could be set up in practice, building on the two main options described in the previous sections. Regardless of the option chosen, a software solution will need to be developed. This will require careful planning to deliver successfully and on time. The level of effort, time and cost will vary depending on the option chosen. In both cases, it will be important to consider how the CRCF registry approach will affect the business model of existing certification schemes, who currently rely on registry fees for a majority of their income.

2.2.1. Process to set up the registry

The first step in the development of the CRCF system of registries is to decide on the overall approach and structure of the CRCF registry, considering the two options discussed in the previous section.

If the CRCF registry is a **central repository**, the next step will be to define all data fields and their formats in line with the minimum requirements in electronic templates, which could be shared, APIs, or another form of linking will need to be developed so that existing registries can connect to the CRCF registry. Existing registries will also need to align and likely need to amend some of the formatting of the information they hold as there will inevitably be differences between what is required for the CRCF and what they currently have.

Irrespective of which option is chosen, a process of more detailed registry scoping, planning and development will be required, following the public consultation to be conducted later this year. The Commission should also take the following key steps:

- After the decision on the overall approach, the Commission should decide whether to develop the CRCF registry internally or to use an external contractor.
- We recommend creating a dedicated **technical working group** to support this process. The group's role will be to advise on specific technical aspects and serve as a sounding board to the development team throughout process. Such a body could include representation from the European Commission, Member States, certification schemes, certification bodies and key industry associations in the VCM.
- Before official launch, it is also recommended to plan for a period of **piloting with key users** (all parts of the value chain if the full functionality option is chosen, and mainly with certification schemes if the central repository option is chosen).

The overall approach to the CRCF registry chosen will also affect the actions to take in the transitional period. This is discussed further in section 3.4.3. In that section, we suggest starting to link certification scheme registries during a transitional period using a documentary approach with electronic templates and moving to the **central repository** approach for the CRCF as a general recommendation. If **full functionality** is chosen for the end state of the CRCF, no other option may be viable due to the short duration of the transitional period. There is a risk that existing certification schemes

decide to wait for the full CRCF registry to become available, rather than update their registries to align with the CRCF.

2.2.2. Cost of set up and user fees

The cost to set up the registry will vary between the two options discussed. Logically, a CRCF registry with **full functionality** will cost significantly more to develop and will take longer to implement. Specifically, the user interface and its functionality will require significantly more time for testing. Typical risks linked to developing large IT projects – cost overruns and delays mainly – are likely to be significantly higher for the **full functionality** option.

The CRCF Regulation is clear that the CRCF registry will need to collect annual fixed fees “proportionate to the use” to cover annual operating costs. Since it is also clear that operating costs will vary depending on the option chosen, fees should be significantly lower if the **central repository** approach is selected.

There are several issues that need to be considered carefully in the context of fees and the regulatory text.

First, the Regulation text stipulates that the CRCF registry “shall be financed by annual fixed fees payable by users, proportionate to the use of the registry” (Article 12). There are two main options to address the regulatory requirement, but neither seems to align exactly with the Regulation text. The primary fee that existing certification scheme registries use, the “issuance fee” per certified unit, provides the best option to have a fee proportionate to the use of the registry and aligned with the moment that the user can get an income from using the CRCF. However, whilst the fee per unit issued can be fixed, this approach is not an annual fixed fee. Furthermore, if only an issuance fee is levied, then account opening and holding costs will not be covered.

The second type of fee charged by registries is an account maintenance fee. This could be fixed annually, but is not proportionate to use. To link an account maintenance fee to the “use” of the registry, the fee could vary either by total holdings of certified units or transacted certified units per year by applying different thresholds. For example, accounts with holdings of less than 100,000 certified units on average in a year could be liable for one level of fee, while those with holdings above that amount, for another level of fee. With this approach, however, the level of the fees due by a user will only be known retroactively, which brings payment risk for the Commission. An alternative to mitigate that risk could be to collect fees in advance, based on an assumption of average use and to potentially amend the payment for the next period based on actual use.

The two types of fees described above (issuance and account maintenance), could both be applied with a fixed issuance fee per unit and a fixed annual account fee, that could be linked to the holdings of certified units or transactions with them. This would ensure that account opening and maintenance costs, which are not proportional to use, are also covered.

Furthermore, the Regulation text suggests that fees will need “to sufficiently contribute covering the annual operating costs of establishment and management of the Union

registry” (Article 12). The Commission will need to estimate annual operating costs and divide that over an estimated number of annual users to determine an annual fee, proportionate to use of the registry. In general, this can be done, although it may be difficult to predict up-front the exact number and scale of users, especially as the market ramps up. The Commission should expect that the fees will not have an exact coverage of the annual costs initially and should set out a process to transparently review and adjust annual fees as necessary. Allocating the establishment costs of the registry to annual fees will be difficult. The Commission will need to cover the up-front costs to establish the registry as there will be no users to pay fees before it is launched. On an ongoing basis, it will be difficult to allocate set-up costs to users in a way which avoids over-charging users once the set-up costs are covered.

Second, certified units are issued normally in the account of the project operator, who is also liable for the fees prior to issuance. Those fees are then usually passed through to the end buyer via the price of the certified units. An alternative could be to charge a fee after the first transaction with a unit. The first transaction will either be a transfer to another account or retirement. This approach would account for project operators who may also be end users, however, there is a risk that project operators who have not sold their units will not pay any fees for the use of the registry and therefore a risk that annual operating costs are not covered.

Thirdly, the fee provision in the CRCF Regulation will have an impact on the existing business models of certification schemes and this needs to be assessed. As mentioned, many certification schemes receive a majority of their income from registry fees, both as fixed annual account fees and issuance fees per unit. Once the CRCF registry is operational, whatever the option chosen, there are two possibilities. There will either be an additional cost for project operators and trading intermediaries, or certification schemes will need to reduce their income from the work that they do under the CRCF.

With **full functionality**, the impact on certification schemes will be bigger, since they will not be able to charge either account holding or issuance fees, but the fundamental issue of certification scheme income remains in both cases.

The reference systems reviewed during the first phase of this project provide different examples. The EU ETS Union registry is funded by the Commission, but fees are collected by Member States and they vary significantly both in value and in how they are set. Under the REDII, the Commission covers the costs of the development and operation of the Union Database for renewable fuels, while economic operators pay the voluntary schemes (the equivalent of the certification schemes) a fixed annual fee according to their size.

Under the **central repository** option, all operations will be performed within certification scheme registries and it will be difficult to justify charging fees for the CRCF registry. Since the registry will, however, play a role in the issuance of certified units on behalf of certification schemes, one option could be that **certification schemes pay the fees** on behalf of users. Those fees should be sufficient to cover the expected annual costs of the CRCF registry once the framework is operational. In this way, the existing business models of certification schemes can be largely maintained even if they will need to contribute a fixed fee per issued certified unit towards the transparency of the framework.

3. Minimum requirements for certification scheme registries

This chapter presents the **minimum requirements for registries of certification schemes** recognised by the Commission. Minimum requirements for certification registries will be detailed by the Commission in an implementing regulation.

This chapter presents recommendations on several key topics. In case of recommended text that could be directly adapted from existing EU legislation, the text is quoted with grey highlighting to indicate specific context that would need to be updated for registries of certification schemes recognised under the CRCF Regulation.

3.1. CRCF requirements

The minimum requirements for any certification scheme registries recognised by the Commission are mentioned in Article 12 of the CRCF Regulation and the information to be published is listed in Article 11 and Annex IIa. The EC is empowered to set out minimum requirements for those registries in an implementing regulation.

Article 12 of the CRCF Regulation stipulates that the CRCF registry needs to be set up within four years of entry into force of the Regulation. There will consequently be a transitional period of at most four years before the CRCF registry comes online, during which certification schemes recognised by the Commission will need to **maintain their own certification registries** “to make publicly and securely accessible the information resulting from the certification process”. The final option chosen for the CRCF registry will impact the ongoing role of the certification scheme registries under the CRCF.

Furthermore, registries should use **automated systems** and **electronic templates** and shall be **interoperable** with the registries of other (EC-recognised) certification schemes. The interoperability requirement is not further defined in the CRCF Regulation, except in its objective to avoid double counting. The next sections cover the minimum requirements, while section 3.4 explores interoperability options.

CRCF

[Based on the political agreement reached by the European Parliament in April 2024, pending updates of the final agreed text once available.]

Article 11 Operation of certification schemes

4. Certification schemes shall publish in their certification registries [...] a list of the appointed certification bodies, stating for each certification body by which national accreditation body it was accredited or by which national competent authority it was recognized and which national competent authority is monitoring it.

Article 12 Union wide registry for permanent carbon removals, carbon farming and carbon storage in products

1. Until the establishment of the Union registry, a certification scheme shall establish and duly maintain a public certification registry to make publicly accessible and in a secure way the information resulting from the certification process, including the certificates of compliance and updated certificates of compliance, containing, as a minimum, the information set out in Annex IIa, to enable the tracing of the quantity of units certified [...] A certification registry shall use automated systems, including electronic templates, and shall be interoperable with registries of other recognised certification schemes in order to avoid double counting. The Commission shall adopt implementing acts setting out the structure, format, and technical details of the certification registries, of the recording, holding or use of certified units [...]

Annex IIa Minimum information included in the Union registry and certification registries referred to in Article 12

The Union registry and certification registries referred to in Article 12 shall include the following minimum information for each activity and each certified unit:

- a) name and type of the activity, including name and contact details of the operator or group of operators;
- b) location of the activity, including geographically explicit location of the activity boundaries, respecting 1:5000 mapping scale requirements for the Member State;
- c) duration of the activity, including start date and end date;
- d) name of the certification scheme, including its recognition decision referred to in Article 13, its rules and procedures and the list of appointed certification bodies referred to in article 11, and its annual reports referred to in Article 14;
- e) reference to the applicable certification methodology referred to in Article 8;
- f) expected annual net benefit referred to in article 4;
- g) any sustainability co-benefits referred to in article 7;
- h) certification status, including certificates of compliance and certification and re-certification audit reports referred to in Article 9; quantity and status of the certified units (e.g. issued, retired, expired, cancelled, allocated to a buffer), and end-use purpose of the certified units and the using entity.

3.2. Best practice

In general, the existing voluntary carbon market studied in the first phase of this project are able to meet the minimum requirements described in Article 12 and provide almost all the information listed in Annex IIa. The information is provided either in the registry entries for each project, in attached documents such as verification reports, ⁽¹⁰⁾ or on the certification scheme websites in the case of rules and procedures and the list of approved certification bodies. As such, it is expected that limited budget and time will be needed to adapt those registries to align with the minimum requirements listed in the Regulation – depending on the level of detail and specificity that the Commission implementing rules set out.

The implementing regulation to be adopted by the Commission will need to develop specifications for how the data is formatted or presented, even if the data is already largely available in the existing certification registries. Elements such as data fields, their format, and standard terminology will need to align so that data can be comparable and mitigate the risk of double counting through transparency as intended. This is particularly important since there are currently many examples of several terms being in use for the same concept, and those will need to be aligned with the CRCF for recognised certification schemes. For example, certification bodies under the CRCF are variously known as VVBs, DOEs or simply auditors, depending on which framework is considered.

Annex IIa includes the mandatory data points, but the list may need to be expanded with standard elements like country names, Commission approved carbon removal methodologies, national accreditation bodies and competent authorities.

The following sections set out best practice and then recommendations for minimum requirements for certification scheme registries related to transparency, cybersecurity safeguards and emergency operation procedures.

3.2.1. Transparency

Transparency of information included in the registry is crucial to enable a certification scheme to be externally credible. It allows a broad range of stakeholders to review how the scheme is governed and operates. In addition, the publication of specific project details and certified unit information allows further scrutiny of individual projects, unit issuance and claims made with the relevant units. Transparency is specifically mentioned in the Regulation as a means of promoting trust in the certification of carbon removals.

The voluntary carbon market schemes researched as part of this project are all already deemed eligible ⁽¹¹⁾ or have submitted applications to comply with the Core Carbon Principles (CCP) of the Integrity Council for the Voluntary Carbon Market (ICVCM). The

⁽¹⁰⁾ Specific information that may be missing for some projects or registries would be the 1:5000 mapping scale, even if detailed geographic coordinates are normally provided, and potentially the using entity linked to each certified unit.

⁽¹¹⁾ <https://icvcm.org/assessment-status/>

CCP assessment framework guidelines are described further in Chapter 4 of the working paper on verification rules that is published in parallel to this working paper.

The data transparency requirements of the other reference systems reviewed, namely the certification of sustainable bioenergy under the REDII, cover similar topics.

Several Annexes of Commission Delegated Regulation (EU) 2019/1122 on the functioning of the ETS Union Registry include tables with data fields which list requirements for information on account holders, the installation and annual emissions and allocations which need to be included in the Union Registry for the EU ETS. Annex XIII specifically includes all the information to be made public. While the text cannot be directly amended for the CRCF context, we propose taking a similar approach and listing in detail the elements included in Annex IIa.

In addition, the ICVCM CCPs provide specific text which could be considered as well:

ICVCM CCPs: A. Governance, 2. Tracking

The carbon-crediting program shall operate or make use of a registry to uniquely identify, record and track mitigation activities and carbon credits issued to ensure credits can be identified securely and unambiguously.

Criterion 2.1 Effective registries

In addition to CORSIA requirements related to carbon credits in the carbon-crediting program registry, the carbon-crediting program shall:

1. require identification of the entity on whose behalf the carbon credit was retired;
2. require the identification of the purpose of retirement;
3. have procedures to address erroneous issuance of carbon credits that identify remedial measures (e.g., cancellation, compensation through replacement) and the entities responsible for implementing these

CORSIA ⁽¹²⁾ requirements are:

Programs should have in place procedures that ensure that:

- a. units are tracked;
- b. units are individually identified through serial numbers;
- c. the registry is secure (i.e., robust security provisions are in place); and
- d. units have clearly identified owners or holders (e.g., identification requirements of a registry). The program should also stipulate
- e. to which, if any, other registries it is linked; and,
- f. whether and which international data exchange standards the registry conforms with.

All of the above should be publicly disclosed information.

The aim of ensuring transparency within the CRCF aligns well with the approach and the type of information that the reference systems use, while the list of elements in Annex IIa allows for a comprehensive coverage of the specific information that should be made publicly available to fulfil this aim.

3.2.2. Cybersecurity safeguards

Safeguards for ensuring that data is stored securely and minimises the risk of double counting and fraud are critical to the robust operation of certification scheme registries.

⁽¹²⁾ The ICVCM makes reference to CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) criteria for eligible units and built on them to develop CCPs.

The CRCF Regulation states that information should be made public “in a secure way”. The reference systems examined in this project understandably do not make public the details of the cybersecurity safeguards that they employ, and detailed information was not available on the topic.

The safeguards relevant to the Union Registry ⁽¹³⁾ for the EU ETS, while not comprehensive, can be considered as an example of an available approach to cybersecurity safeguards in the context of the CRCF, noting also the significant practical experience gathered during the years of operation of the Union Registry. Furthermore, the Union Registry for the EU ETS complies with Commission Decision 2017/461 ⁽¹⁴⁾ which sets out principles for IT security for all Communication and information systems in the European Commission. Those safeguards should be considered when developing the CRCF registry. The Union Registry for the EU ETS was however developed a few years ago so more recent approaches could also be considered once a final decision on the scope of the CRCF registry is taken.

Although registries of certification schemes recognised under the CRCF are not managed by the Commission, it would be appropriate to consider these types of principles in the context of the minimum requirements for certification scheme registries under the CRCF.

Another example considered in the first interim report was the CAD Trust approach using blockchain. The focus there is on ensuring data integrity via the immutability of the blockchain, which means that data remains tamper proof. Blockchain is a specific technology that could be used when setting up the CRCF registry, however, it could be unfeasible to implement during the transitional period if it is not the technology selected once the CRCF registry is established.

Finally, the risk of identity fraud also needs to be addressed. There should be a minimum level of scrutiny of registry users that is applicable to all recognised certification schemes. For example, a mandatory use of eIDs issued under the eIDAS Regulation ⁽¹⁵⁾, as recently amended ⁽¹⁶⁾, is one approach to consider. Any mandatory requirement on this aspect however should not act as a deterrent, noting previous challenges and the fact that the latest amendments have not yet been tested in practice. Existing registries sometimes outsource Know Your Customer (KYC) checks required before account opening. This should be allowed as long as the approach meets the minimum requirements.

⁽¹³⁾ Section 2 Security and Authentication of Commission Delegated Regulation (EU) 2019/1122 of 12 March 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards the functioning of the Union Registry. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1122>

⁽¹⁴⁾ Commission Decision (EU, Euratom) 2017/46 of 10 January 2017 on the security of communication and information systems in the European Commission. Available at: <https://eur-lex.europa.eu/eli/dec/2017/46/oj>

⁽¹⁵⁾ Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.0073.01.ENG

⁽¹⁶⁾ Regulation (EU) 2024/1183 of the European Parliament and of the Council of 11 April 2024 amending Regulation (EU) No 910/2014 as regards establishing the European Digital Identity Framework. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32024R1183>

The ICVCM text on tracking, quoted in the previous section, also contains elements on cybersecurity which could be adapted. Additionally, specific provisions in Commission Delegated Regulation (EU) 2019/1122 on the Union Registry for the EU ETS could be adapted as well:

Commission Delegated Regulation (EU) 2019/1122

Article 63

3. Communications between authorised representatives or national administrators and the secure area of the Union Registry shall be encrypted having regard to the security requirements set out in the data exchange and technical specifications provided for in Article 75

5. If the security of the credentials of an authorised representative has been compromised, this authorised representative shall immediately suspend its access to the relevant account, inform the administrator of the account thereof and request new credentials. If the account cannot be accessed in order to suspend the access, the authorised representative shall immediately request the national administrator to suspend its access

Article 64

3. In addition to the credentials referred to in paragraph 1, an authorised representative shall use secondary authentication to access the Union Registry, having regard to the types of secondary authentication mechanisms set out in the data exchange and technical specifications provided for in Article 75.

Article 65

1. The central administrator may temporarily suspend access to the Union Registry or any part thereof where it has a reasonable suspicion that there is a breach of security or a serious risk affecting the security of the Union Registry within the meaning of Commission Decision (EU, Euratom) 2017/46, including the back-up facilities referred to in Article 60. In case the reasons for suspension persist for more than five working days, the Commission may instruct the central administrator to keep the suspension in place.

3.2.3. Emergency operation procedures

Emergency operation procedures (EOP) are written procedures, instructions and checklists used in the event one, or more, of the registries becomes inoperable. These could include, for example, system backup approaches, disaster recovery plans, data restoration and communication protocols.

As with cybersecurity standards, no information on EOPs was available from reference systems, other than the Union Registry of the EU ETS which only provides limited information on this topic.

Relevant text is available in Commission Delegated Regulation (EU) 2019/1122:

Commission Delegated Regulation (EU) 2019/1122

Article 60 Availability and reliability of the Union Registry

1. The central administrator shall take all reasonable steps to ensure that:
 - a. the Union Registry is available for access by account representatives and national administrators 24 hours a day, 7 days a week;
 - b. the communication links referred to in Article 6 are maintained 24 hours a day, 7 days a week;
 - c. backup hardware and software necessary in the event of a breakdown in operations of the primary hardware and software is provided for;
 - d. the Union Registry responds promptly to requests made by account representatives.
2. The central administrator shall ensure that the Union Registry incorporates robust systems and procedures to safeguard all relevant data and facilitate the prompt recovery of data and operations in the event of failure or disaster.
3. The central administrator shall keep interruptions to the operation of the Union Registry to a minimum.

3.3. Recommendations

We recommend that the Commission sets out minimum requirements on the following topics in the implementing regulation:

- Transparency
- Cybersecurity safeguards
- Emergency operation procedures

We do not recommend that the Commission sets out detailed requirements for the type of technology underlying the functioning of registries of recognised certification schemes. This is discussed further in the context of interoperability of certification registries in section 3.4.3.

3.3.1. Transparency

Recognised certification scheme registries will need to include and make public all the information in Annex IIa of the CRCF Regulation. The certification scheme registries will need to adhere to any standard **definitions and terminology** as well as any **data fields and format** defined in the implementing regulation, in line with an electronic template that will need to be submitted.

In addition, recognised certification scheme registries will need to be able to appropriately hold, trade and importantly automatically expire (temporary) CRCF certified units, in alignment with the CRCF regulations and the relevant carbon removal methodologies being covered. The expiry of units in particular is likely to be new for many registries.

3.3.2. Cybersecurity safeguards

For the transitional period, it may not be feasible to require recognised certification schemes to align fully with the cybersecurity requirements set out in the Union registry for EU ETS regulation, due to the administrative cost and anticipated limited duration of

the period before the CRCF registry becomes operational. Still, to ensure a robust system, it is recommended to require registries of recognised certification schemes to comply with the basic safeguards applicable to the Union Registry for the EU ETS, listed in Commission Delegated Regulation (EU) 2019/1122 including:

- Encryption of communication between authorised representatives and registry administrators.
- Suspension of account access when security of credentials of authorised representative have been compromised.
- Use of secondary authentication (also termed two-factor authentication), in addition to credentials for accessing the registry.
- Suspension of access in cases of security breaches or security risks.
- Suspension of access to certified units in case of a suspected fraudulent transaction.

In addition, we recommend that certification scheme registries comply with the principles listed in Article 3 of Commission Decision 2017/46:

- **Authenticity:** the guarantee that information is genuine and from bona fide sources
- **Availability:** the property of being accessible and usable upon request by an authorised entity
- **Confidentiality:** the property that information is not disclosed to unauthorised individuals, entities or processes
- **Integrity:** the property of safeguarding the accuracy and completeness of assets and information
- **Non-repudiation:** the ability to prove an action or event has taken place, so that this event or action cannot subsequently be denied
- **Protection of personal data:** the provision of appropriate safeguards in regard to personal data in full compliance with Regulation (EC) No 45/2001
- **Professional secrecy:** the protection of information of the kind covered by the obligation of professional secrecy, in particular information about undertakings, their business relations or their cost components as laid down in Article 339 of the Treaty on the Functioning of the European Union (TFEU)

Finally, it is recommended to consider requiring an eID issued by an EU country for registry account opening, however further assessment of the feasibility of this option is needed to ensure that such a requirement will not be too burdensome, noting the very recent regulatory changes adopted.

3.3.3. Emergency operation procedures

Since existing registries will already have EOPs and the expected duration of the transitional period will be short, we recommend a more limited approach for what is required for recognised certification scheme registries, focussing primarily on data integrity maintenance and therefore a system backup requirement.

We recommend that each registry is configured to regularly back up its data to at least one other back-up server which should be stored in a different physical location than

the production server. This is designed to protect data against physical damage to the site of the server.

3.4. Interoperability of certification scheme registries

This section describes the most logical and cost-effective set-up of an **interoperable system of registries** during the transitional phase before the Union wide registry for carbon removals is operational.

For efficiency and to support the development of a working framework as soon as possible, we recommend considering together both the high-level options for the CRCF registry design and the transitional arrangements for interoperability of certification scheme registries. This is to ensure that steps taken towards interoperability during the transitional period can continue to be useful and relevant once the final CRCF registry has been established.

Two options for the approach to the CRCF registry are described in Chapter 2 – **full functionality** and a **central repository** approach. Regardless of the option chosen, the short duration of the transitional period leads to a risk that certification scheme registries may be reluctant to invest in interoperability if the steps are only relevant for the transitional period. As such, care must be taken to ensure that implementation guidelines and efforts by the certification schemes in the transition period are directed towards the target scope and operating model of the CRCF registry specifically as well as the CRCF as a whole.

3.4.1. CRCF requirements

Article 12 of the CRCF Regulation establishes the requirement for registries of recognised certification schemes to be interoperable to avoid double counting of certified units.

CRCF Article 12: Union wide registry for permanent carbon removals, carbon farming and carbon storage in products

[Based on the political agreement reached by the European Parliament in April 2024, pending updates of the final agreed text once available.]

1. [...] A certification registry shall use automated systems, including electronic templates, and shall be interoperable with registries of other recognised certification schemes in order to avoid double counting. [...]

Double counting is usually considered a risk in the context of international greenhouse gas (GHG) accounting. For the CRCF, the main concern would be to avoid **double issuance** where the same project activity is registered with more than one certification scheme and issues certified units for the same activity in different registries, and **double claiming** where the retirement of one certified unit is claimed by more than one end-user and/or counted towards more than one GHG target.

The maximum duration of the transitional period, during which the potential risk of double counting should be mitigated by registry interoperability is four years. However, realistically the duration of the transitional period will be significantly less. This is due to the time it is expected to take to approve carbon removal methodologies, recognise certification schemes, accredit or recognise verifiers, and ultimately develop projects that can start to generate certified units in the context of the CRCF. Noting the status of the various elements of the CRCF under development and specifically the ongoing work on methodologies for generating certified units, it is highly likely that the transitional period will be no longer than two years, possibly even much shorter.

It is therefore important to consider how to address the interoperability requirement such that, on the one hand, the potential risk of double issuance and double claiming is minimised, while on the other, there is sufficient incentive for existing or newly established certification schemes to ensure that their registries are interoperable before the establishment of the CRCF registry. Noting the goals of the European Green Deal, and the expected pass-through of administrative costs to project developers and ultimately users of certified units, consideration should also be given to keeping costs proportionate and to a minimum.

3.4.2. Best practice

Interoperability is not further defined in the CRCF Regulation beyond “to avoid double counting”. Existing voluntary carbon market registries researched as part of this project operate independently and are not currently interoperable. Therefore, any requirement to introduce interoperability will be new for them.

For certification schemes active in the voluntary carbon market, the main approach used to guard against **double issuance** is contractual, i.e., project developers need to provide evidence of ownership and relevant approvals, while also declaring that the potential project is not registered with another scheme. These aspects can be additionally verified against information in other registries to confirm lack of double issuance. The risk of **double claiming** is itself addressed by including information on the retirement (use) of a certified unit within a registry by recording both the claimant and the reason for the retirement. Both of these risks specifically can be largely mitigated through transparency, as discussed in 3.2.1.

An additional way to guard against double issuance could be to check the geographic coordinates of planned project activities and compare them against those of existing registered project activities. While it is theoretically possible that two different CRCF project activities are located in the same area, as a first check, location would be sufficient to flag the risk of double issuance and enable further investigation to ensure the risk is minimised. The GeoJSON data interchange format¹⁷, as used for the EU Deforestation Regulation due diligence statements, could be considered as one of the data points to be exchanged via electronic templates in line with the interoperability requirement of the CRCF Regulation.

Different approaches can be applied for linking registries to make them interoperable. An overview of examples studied in the first interim report of this project is presented in Table 2, including feedback received during the Technical Expert Group meeting in April 2024.

¹⁷ [The Deforestation Due Diligence Registry - European Commission \(europa.eu\)](https://european-council.europa.eu/media/en/press-communications/infographic/interoperability-registry)

Table 2. Technical approaches for interoperability

Approach	Existing example	Initial assessment
Link via a transaction log	Architecture created for the different types of emissions credits under the Kyoto Protocol system of registries.	Possible, but development of transaction log will at least partially duplicate efforts to develop CRCF registry and it does not seem feasible to develop from a timing perspective during the transitional period.
Direct link between registries	End-state goal of the link between the Union Registry (EU ETS) and the Swiss ETS registry. For the time being, there is only a provisional solution with regular batch transfers between the registries.	Possible, but requires significant budget and time to develop due to the need to connect bilaterally over 10 registries. The links will likely be obsolete in less than 4 years once the CRCF registry is established.
Centralised platform	The link that the CAD Trust is establishing with VCM registries to be able to aggregate market information in one place.	Possible and this is also the preferred option mentioned by existing VCM registries.
A document-based solution	The approach taken in the California Cap-and-trade system where the “link” is essentially an exchange of documents.	Possible, provided robust approach to documentary exchange is applied. Not clear if it complies with interoperability requirement.

It seems clear that only the first two options presented in Table 2 are not feasible for full implementation within the time constraints and the very limited anticipated period of operation of a transitional system of interoperable registries. The rationale is linked to the limited time to develop a solution for the transitional period while also allowing existing certification schemes and their registries, if aligned with the CRCF framework, to apply for recognition and support the development of carbon removals in the EU.

Further, it is expected that certification schemes will have limited available budgets to update their registries in the transition period and develop interoperability functionality. Not only because cost pass-through is a concern, but also because it is very unlikely that any existing registry would invest significant amounts into a transitional system for a framework that is still in development and has no approved methodologies yet and no specific source of demand for certified units.

3.4.3. Recommendations

It is unlikely that the risks of either **double issuance** or **double claiming** will be significant during the expected relatively short transitional period. This is because, apart from the time needed to finalise the CRCF itself and approve methodologies, it will take some time to develop and implement projects and for those projects to start generating certified units.

There are three options to address the risk of double counting and potentially the interoperability requirement, noting the constraints discussed in previous sections. However, it is very important to flag that interoperability by itself cannot fully guarantee that the risk of double counting is completely mitigated. This is because there is a plethora of existing voluntary certification schemes, with new ones appearing regularly.

It is not realistic to assume that they will all seek certification under the CRCF and that therefore the whole universe of project activities could be checked via interoperable registries recognised under the CRCF. It is highly likely that even with interoperability of registries, manual checks coupled with contractual requirements within the certification scheme's terms of use, as applied today by VCM schemes, will still be needed.

The **first option is to use the VCM approach** applied to date. This option primarily relies on ensuring transparency of registries and requiring certification schemes to have robust contractual provisions, including a declaration by the project operator that the project activity is not registered with another certification scheme. However, it is not clear whether this approach sufficiently complies with the CRCF regulation (even if interoperability is not strictly defined).

Second, the documentary exchange approach could be used. This can be implemented by developing an electronic template that allows to check a planned project activity's main characteristics against existing projects' data. For convenience, the template could be either MS Excel or MS Word based and include the data points listed in Annex IIa of the CRCF Regulation.

The process then could follow a simple three step approach:

1. Prior to project activity registration, each certification scheme completes a pre-defined electronic template with project data and shares it with all other recognised schemes.
2. Since each scheme will have information on all planned projects from the templates it received from all other schemes, it can check against those templates to ensure that the submitted project is not registered with any other scheme.
3. Once the check is complete, the scheme shares an updated template confirming project activity registration.

This approach is likely to require a significant amount of administration by the certification schemes if the number of schemes increases, but may be sufficient and manageable within the transition period before the CRCF registry is available.

The third option could be to implement **interoperability by including a larger role for the Commission** in the process. Certification schemes could submit regular reports to the Commission with project activity data in a pre-defined standard format as an electronic template and the Commission could check and compare to ensure no double registration or double issuance is claimed. This is similar to the documentary exchange option, but requires less overall administration as the data is sent to a central point (the Commission) rather than having to share between all recognised certification schemes.

We recommend starting with a documentary exchange via electronic templates, which can naturally transition to direct links (potentially via APIs) or a more robust alternative such as the EBSI mentioned in section 2.1.2, if the CRCF registry will be established as a **central repository**.

If the CRCF registry is established with **full functionality**, the most feasible approach would again be a documentary exchange, however, without a transition to another set-up since all functions of existing registries will be taken over by the CRCF registry.

Regardless of the final decision on the CRCF Registry, all three options could be applied and all of them would mitigate double counting risk in the transitional period.

Given the transitional nature of the interoperability requirement, we recommend to ensure that any steps taken are low effort – whilst still ensuring clear steps to avoid double issuance and double counting – and that any steps taken will still be useful once the CRCF registry is operational or that do not require an undue burden to set up if they will no longer be needed once the CRCF registry is operational.

Appendix A: Registry systems/databases reviewed

This appendix lists the EU and international registries and databases reviewed as part of this project.

Union Database for biofuels

Bioenergy consumed in the EU and counted towards the Renewable Energy Directive 2018/2001 (the REDII, and in the future in the recast REDII, Directive 2023/2413¹⁸) has to meet sustainability criteria, such as avoiding direct land use change and meeting a minimum GHG saving threshold. Voluntary schemes recognised by the EC are the main way that economic operators demonstrate compliance with the sustainability criteria. The sustainability criteria, auditing and governance rules are described in the REDII and the rules for voluntary schemes are further elaborated in Implementing Regulation 2022/996. The roles are set out in the figure below.

On 15 January 2024 (¹⁹), the EC launched the Union Database for liquid and gaseous fuels (UDB) a global traceability tool with the aim to trace consignments of renewable and recycled carbon fuels and the respective raw materials used for their production - from the point of origin of the raw materials to the point where fuels are put on the EU market for final consumption.

All companies in the supply chain need to be certified. Certified **companies** can 'claim' that they produce or collect sustainable biomass and trade the biomass to downstream companies to convert into sustainable fuels (e.g., biofuel, biomethane) for the validity period of their certificate. Sustainability information is passed down the supply chain between companies for each transaction in the form of a Proof of Sustainability (PoS) to demonstrate compliance with the sustainability criteria. In the bioenergy scheme, the PoS is the equivalent of the certificates used in other reference systems. This sustainability information will also need to be registered in the UDB. This information (PoS) is used as the basis to demonstrate to MS that the bioenergy complies with the criteria and can therefore count towards the REDII.

EU organic agriculture

The EU organic certification system allows operators to produce, prepare, distribute, and market (see full list of activities in Article 34(1) of EU 2018/848) agricultural- and food products using an EU organic label.

The **EC** operates a central database, the EU TRACES Registry Management System, which captures all active operator certificates for EU organic certification. For verification in third countries, it has a system of surveillance with the MS which includes organising audits to verify the implementation of the EU organic control system. Control

¹⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L2413&qid=1699364355105>

⁽¹⁹⁾ https://energy.ec.europa.eu/news/eu-database-biofuels-becomes-operational-2024-01-15_en#:~:text=The%20Union%20database%20is%20a,EU%20market%20for%20final%20consumption.

bodies must submit an accreditation certificate and control authorities must submit an assessment report issued by the competent authority to attain recognition.

EU ETS Union Registry

The EU ETS is a cap-and-trade system which limits GHG emissions from companies operating in the energy and industrial sector, aircraft operators in the EU, and from 2024, maritime transport. Tradable certificates – called European Union Allowances (EUAs) – need to be surrendered to meet reported emissions. Some industries get a proportion of their emissions as free allowances (EUAs), based on industry benchmarks, and some must purchase all their EUAs via auctions. The Union Registry documents ownership of allowances held in electronic accounts by operators. The EU Transaction Log (EUTL) automates compliance requirements for the transaction between accounts in the Union Registry.

Voluntary carbon market

Existing certification schemes for carbon removals and/or avoided emissions in the voluntary carbon market which operate their own registries can be classified into two main categories: International and National. We researched five examples of certification standards/schemes:

Certification Standard	Scheme owner	Scope	Registry
Verra Carbon Standard (VCS) ⁽²⁰⁾	Verra	International	Self-administered
The Gold Standard (GS) ⁽²¹⁾	The Gold Standard Foundation	International	Self-administered
The Puro Standard ⁽²²⁾	Puro.earth	International	Self-administered
Label bas-Carbone (Low Carbon Label) (LCL) ⁽²³⁾	Ministère de l'Écologie	National	Self-administered

⁽²⁰⁾ VCS-Standard_v4.3. Available at: https://verra.org/wp-content/uploads/2022/09/VCS-Standard_v4.3-watermarked.pdf

⁽²¹⁾ Gold Standard validation and verification standard. Available at: <https://globalgoals.goldstandard.org/113-par-validation-and-verification-standard>

⁽²²⁾ Puro Standard General Rules Version 3.1. Available at: <https://7518557.fs1.hubspotusercontent-na1.net/hubfs/7518557/General%20Rules/Puro%20Standard%20General%20Rules%20v3.1.pdf>

⁽²³⁾ Label Bas Carbone Décrets, arrêtés, circulaires. Available at: https://www.legifrance.gouv.fr/download/pdf?id=zZ2KTMyl-HoWvJ3vWAI34jd_UBFOozErfazVoiAXJB2Q=

Certification Standard	Scheme owner	Scope	Registry
UK Peatland Code ⁽²⁴⁾	IUCN UK Peatland Programme	National	UK Land Carbon Registry

In the case of the three international VCM schemes (**Verra**, **Gold Standard** and **Puro.earth**) and France’s **Label bas-carbone**, the same entity is also the registry operator, i.e., the body responsible for the technical operation of the carbon removal registry. However, the **UK Peatland Code** is developed and administered by the IUCN UK Peatland Programme, but removals are hosted on the UK Land Carbon Registry, which hosts projects for multiple different certification standards.

(24) UK Peatland Code 2.0. Available at: https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2023-03/Peatland%20Code%20V2%20-%20FINAL%20-%20WEB_0.pdf

