

DECENTRALIZED AUTONOMOUS ORGANIZATION «INTEGRATED PROGRAM FOR CLIMATE INITIATIVES»

Smart contracts and blockchain technology-based ledger for environmental assets, including carbon compliance units', environmental mitigations credits' registration and transaction data

On May 24, 2016, the Russian Carbon Fund has officially unveiled the Integrated Program for Climate Initiatives (IPCI) and IPCC-based [Carbon Registry](#).

“The Integrated Program for Climate Initiatives is designed to develop a distributed network of mitigation contributors based on common principles, rules and criteria, as well as provide an accounting platform which can achieve absolute emission reduction targets in compliance with quantitative emission limitation commitments. The goal of the Integrated Program for Climate Initiatives is to integrate corporate and regional mitigation initiatives.”
([Sustainable Europe](#))

The IPCC derives from ongoing subnational and corporate climate initiatives and aims at providing for common investment instruments, which are based on climate change mitigation outcomes including high quality carbon offset credits.

In parallel with the Carbon Registry, alternative [decentralized ledger](#) for environmental assets, including carbon compliance units, environmental mitigations credits registration and transaction data is being developed and tested.

The Integrated Program for Climate Initiatives (the IPCI)

Rationales and motives for implementation of the IPCI

- Promoting implementation of “green economy” and low-carbon development principles on the basis of direct and explicit insertion of environmental costs and values into practice, business custom, transactions, economic activity, including investment, procurement, and decision-making policies,
- Taking into consideration unique, universal and global economic and environmental properties of GHG emissions and climate change mitigation outcomes-based assets and liabilities,
- With a perspective of establishment of a new system of international climate commitments and mechanisms on the basis of the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC),
- Forestalling limitation of greenhouse gas emissions by the governments
- With a view on further development and integration of international GHG emission control systems and programs,
- Overcoming jurisdiction barriers and intermediary transaction costs barriers for environmental mitigation.

The IPCI principles

- Entitlement of the companies and individuals to keep and trade the fruits of their environmental mitigation activities,
- Creation of common environment and common space for fair international environmental footprint-based competition,
- Compatibility of rules, regulation mechanisms, commitments and rights,
- Fungibility and transferability of mitigation instruments and outcomes.

IPCI ends and means

IPCI goal is to integrate climate initiatives in the form of distributed network of mitigation contributors on the basis of common principles, rules, criteria, and platform to account for quantitative commitments-based and project-based mitigation outcomes, to achieve absolute emission reduction targets and ultimate balance of anthropogenic greenhouse gas emissions and anthropogenic increase in removals of GHG by sinks and reservoirs (“carbon neutrality”).

IPCI goal is sought by means of introduction of progressive adjustments to existing GHG emission reduction methodologies, standards and rules; by means of Carbon Registry linked to decentralized smart contracts and blockchain technology-based platform (DAO IPCI) for trading environmental assets and liabilities, including registration and transaction data for carbon compliance units, Transferrable Mitigation Units (TMU), environmental mitigations credits eligible under IPCI goals and requirements.

The IPCI Coordinator is Non-commercial entity the Fund “Russian Carbon” (IPCI Coordinator).

Basic IPCI Requirements and Criteria for Units of Mitigation Outcomes

The IPCI ensures overall absolute emissions reduction and targeted anthropogenic increase of GHG removal by sinks in whole through individual and joint activities of the stakeholders in accordance with international agreements, principles, rules, and modalities adopted in pursue of UNFCCC. Basic Program Requirements shall include those consistent with guidance to be adopted by the UNFCCC Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement regarding the use of internationally transferred mitigation outcomes.

The Program provides for accounting of mitigation outcomes (Transferrable Mitigation Units - TMU), which comply with the principles of sustainable development, socio-environmental integrity, transparency, accuracy, completeness, comparability and consistency, and robust reporting, to guarantee, inter alia, the avoidance of double counting, and provide for responsibility of the Initial Owner of mitigation units for compliance with these principles with regards to TMU issued to his Account for the whole accounting lifecycle of the units.

IPCI supports development, expansion and global sharing of precise physical measurement and monitoring-based verified carbon products to further promote direct management of anthropogenic greenhouse impact to the climate.

Mitigation outcomes eligible under IPCI for registration and accounting should comply with the following basic requirements:

1. Cover certain set of greenhouse gases, existing sources, installations or sinks.
2. Are independently assured absolute target-based reductions of emissions relative to baseline actual emissions of the given set of existing sources and installations or for anthropogenic targeted increase of removal of greenhouse gases relative to baseline actual absorption by the established set of sinks, or provide for direct irreversible destruction of greenhouse gases, anthropogenic sources of emissions, or GHG long-term removal, conservation, capture and storage.
 - a. Baseline scenario emissions cannot exceed baseline actual emissions. Baseline actual emissions are calculated based on consecutive 12 or 24-month period immediately preceding target-based mitigation activity.
 - b. Removals should be independently assured as target-based, not otherwise achievable under natural conditions in the absence of mitigation activity.
 - c. Precise physical measurement-based monitoring, reporting and verification in real-time mode should be applied where technically and economically applicable.
 - d. Effective period before revocation (annulment) or reassurance of the units depending on the risk related to issuance of the units, sector of sources or sinks, applicable methodology of mitigation is specified as limited by certain period or unlimited and confirmed by the Independent Entity.
3. Relate to certain independently assured commitments regarding quantitative emission limitation and reduction, or quantitative balance between anthropogenic emissions and anthropogenic removals by sinks, or quantitative commitments to reduce carbon footprint of production, goods and services and to certain accounting period starting the 2013 -2020 period.
 - a. Baseline year is the year immediately preceding the effective period of quantitative commitments starting the year 2013.
 - b. Quantitative commitments-based mitigation outcome should be at least 5% of baseline quantitative level for the accounting period.

4. Are based on robust monitoring and reporting system. Efficiency of the system is assured by the Independent Entity.
5. Are not otherwise required by compulsory regulations or registered as carbon compliance units, project results or mitigation outcomes, commitments and pledges under other than IPCI programs and mechanisms of limitation and reduction of GHG emissions.
6. Are enforced by pledges of the Initial Owner and by reservation of certain share of the units to ensure compensation or revocation of TMU in case mitigation outcomes or mitigation outcomes-based units issued are legally recognized as void under IPCI for physical or legal reasons within one calendar year after such legal decision is confirmed.
7. Full potential of emissions from the new sources is subject to offsetting in full by absolute reductions of emissions from existing sources.
8. Indirect emissions, consumption-based emissions, and quantitative mitigation outcomes from reduced consumption of electricity, heat, fossil hydrocarbon fuels, including the outcomes of substitution of fossil hydrocarbon fuels-based power generation by power grid-connected renewable energy sources-based power generation should be calculated on the basis of factors of emissions confirmed by specific relevant producers and suppliers of electricity, heat or fuels, or on the basis of most conservative assessment of the grid emission factor and assured by the Independent Entity.
 - a. The Independent Entity has assured cross reference of indirect emissions reductions, consumption-based emissions reductions with relevant direct emissions and has assured absence of double counting of direct emission-based and indirect emissions-based mitigation outcomes.
9. Mitigation outcomes are achieved in accordance with specific project methodologies or relative to quantitative commitments compliant with IPCI requirements and criteria and confirmed by the Independent Entity.
 - a. Relevant methodologies, commitments and statements of the Independent Entity are provided to the Carbon Registry.
10. Independent Entity is an entity with sufficient relevant professional experience, expertise, competence and high international reputation in the sphere of auditing services, which accepts these Basic IPCI and Carbon Registry Requirements and Criteria for Units of Mitigation Outcomes and is accredited by IPCI Coordinator.
11. Compliance unit under the Program is Transferrable Mitigation Unit (TMU) equal to one ton of CO₂-equivalent, embracing:
 - a. *Carbon offset credits* - actual and absolute, independently assured, quantitatively measurable, irreversible, permanent or long-term, secure or insured, additional or target-oriented, not otherwise required by compulsory regulations anthropogenic GHG emission reductions or removals by sinks;
 - b. *Quantitative GHG emission limitation and reduction, carbon neutrality, carbon footprint commitment-based compliance outcomes*, eligible under the requirements of the Program.
12. Calculations and independent assurance of original data, baseline level of emission, outcomes and relevant quantity of TMU comply with existing IPCC methods and guidance under the UNFCCC, and standards and methodologies based on and derived from methods and guidance under the Convention. Applicable standards and methodologies include

- a. UNFCCC Kyoto Protocol CDM methodologies,
- b. ISO 14064 series standards,
- c. ISO TS 14067: 2013,
- d. “Gold Standard”,
- e. “Verified Carbon Standard”,
- f. “GHG Protocol”,
- g. Physical measurement-based real time mode monitoring protocols,
- h. et al

subject to calculation of baseline emissions and outcomes relative to baseline actual emissions of the given set of sources and installations and for anthropogenic removal of greenhouse gases relative to baseline actual conservation of greenhouse gases by established set of sinks, taking into account direct irreversible destruction of greenhouse gases and anthropogenic sources of emissions or GHG long-term removal, conservation, capture and storage.

13. Carbon footprint assessment for goods and services, commodities and products to be registered complies with the following requirements:
 - a. Scope, set of sources of direct and indirect GHG emissions related to specific links and activities of the product life-cycle are defined;
 - b. Calculations and assessments comply with the chosen applicable standard and methodologies according to p. 12;
 - c. Owners or operators of the sources of GHG emissions related to specific links and activities of the product life-cycle have confirmed acknowledgment of inclusion of relevant data into the goods and services, product or commodity carbon footprint assessment;
 - d. Carbon footprint assessment is assured by the Independent Entity;
 - e. Carbon footprint assessment and offsetting carbon footprint policy and offer of the supplier are disclosed, publically available and communicated to the customers, buyers of the goods and services, product or commodity.
14. The IPCI allows for registration of carbon units issued by alternative programs and accounting platforms or for conversion and exchange of such units for TMU on a case-by-case basis subject to compliance with IPCI requirements and criteria and confirmed cancelation of alternative registry entries and units turnover. In case carbon units are transferred from the IPCI Carbon Registry or Decentralized Ledger to alternative accounting systems, the IPCI Carbon Registry or Decentralized Ledger shall cancel relevant registration entries and units turnover.
15. The Program stipulates the registration of actions and outcomes in the Non-State Actor Zone for Climate Action platform (FCCC/CP/2015/10/Add.1 1/CP.21 Adoption of the Paris Agreement, 117, 134).

Decentralized platform for environmental assets and liabilities

Background

A blockchain-based platform [DAO «Integrated Program for Climate Initiatives»](#) (DAO IPCI) is developed for IPCI Coordinator and participants, for Carbon Registry users and other environmental market-based programs' operators and participants to account for the data on transferable environmental assets and liabilities, environmental mitigation units, carbon units' registration, issuance, transfer, and operations. DAO IPCI implies creation of smart contracts-based digital ecosystem (business environment) to minimize transaction costs, to make issuance and transfer of digital environmental units highly reliable, transparent and centralized manipulations-free.

Previous attempts to create carbon emissions-related blockchain systems and cryptocurrencies have failed due to the lack of high quality underlying to support them. DAO IPCI essentially excludes emission of cryptocurrency, and is based on the assured environmental mitigation outcomes, including climate mitigation in the first instance, as the underlying asset.

Independent Entity, the Auditor, assures the existence and quality of the underlying asset and preclusion of double spending. The latter is further supported by the internals of blockchain technology. Operator and Auditor ensure fundamental link of underlying assets and units issued through "two keys confirmation" proof-of-asset protocol. Previous experience of issuance of asset-based digital units has been taken into account and consideration.

IPCI and Carbon Registry Council

The IPCI Council - an advisory body comprising of highly reputable international experts - is authorized to review and evaluate basic IPCI rules, requirements and criteria to support compatibility of the Carbon Registry and DAO IPCI ledger with highest international standards.

Issuance of the Units

Digital compliance unit under the Program is Transferrable Mitigation Unit (TMU) equal to one ton of CO₂-equivalent, embracing:

- *Carbon offset credits* - actual and absolute, independently assured, quantitatively measurable, irreversible, permanent or long-term, secure or insured, additional or target-oriented, not otherwise required by compulsory regulations anthropogenic GHG emission reductions or removals by sinks;
- *Quantitative GHG emission limitation and reduction, carbon neutrality, carbon footprint commitment-based compliance outcomes*, eligible under the requirements of the Program.

The units are issued to DAO IPCI:

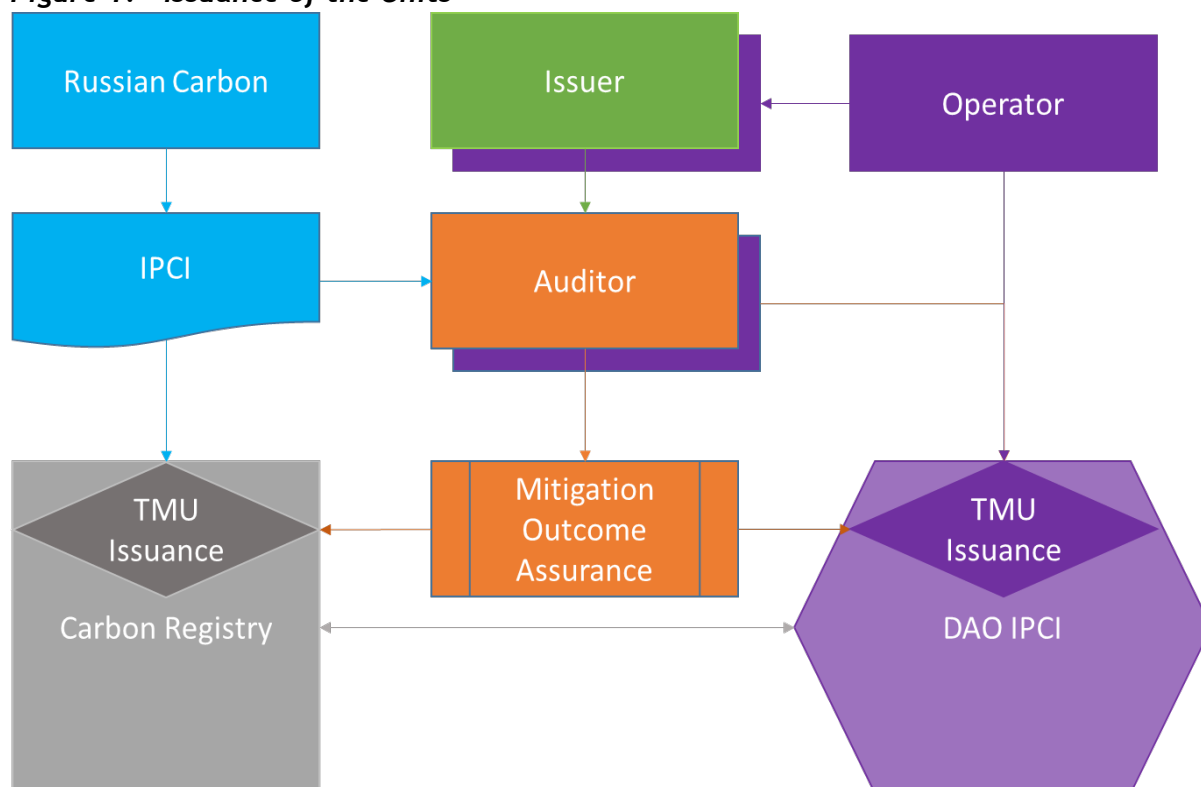
- Directly by the Issuer and the Auditor subject to the Operator's approval on the grounds of assurance by the Independent Entity of mitigation outcomes compliance with IPCI rules, requirements and criteria endorsed by the Carbon Registry,
- Through transfer of TMU from the Carbon Registry to DAO IPCI,

- On the grounds of the IPCI Coordinator decision to accept carbon units issued by alternative programs and accounting platforms or to convert and exchange such units for TMU on a case-by-case basis subject to compliance with IPCI requirements and criteria and confirmed cancelation of alternative registry entries and units turnover
- By other than IPCI mitigation programs' operators and issuers subject to preclusion of double-spending and assurance of integrity of digital units with underlying carbon compliance units by Independent Entity.

Participants and actions for issuance of the units (Figure 1)

- Operator – DAO IPCI Operator
- Auditor – accredited Independent Entity, which provides for creation of specific ledger and for issuance of specific units for the Issuer,
- Issuer – initial owner of the units
- User - DAO IPCI user
- Russian Carbon - “Russian Carbon” Fund, non-commercial entity, the developer and coordinator of the Integrated Program for Climate Initiatives
- IPCI - the Integrated Program for Climate Initiatives
- Mitigation Outcome Assurance - climate change mitigation outcomes assurance procedure
- TMU Issuance - issuance of the units to the Carbon Registry and of digital units to the DAO IPCI.

Figure 1. - Issuance of the Units



Issuance of the units workflow

1. The Operator provides access to DAO IPCI for the new Auditor by creating Access Control List (ACL) for each TMU ledger
2. The Issuer sends request to TMU ledger builder with name of selected Auditor ACL.
3. The Auditor included into Auditor Access Control List creates ledger for issuance of digital units by the Issuer and sets the limit for issuance within the assured amount of mitigation outcomes
4. The Operator approves:
 - a. New ledger in the DAO IPCI core
 - b. The limit for the issuance of the units by the Issuer
 - c. The share and time for reservation of the units to cover the risks
 - d. The Issuer's address to access to DAO IPCI transactions (market).
5. The Auditor issues the units to the Issuer's address (account) within the limit subject to the Operator's approval.

Only approved Issuer and approved units may access the Market.

Reservation of the units

The Issuer is required to reserve specific share of the units for a specific period of time, established by the Operator on the grounds of independent assessment of the related risks, for burning in case the units issued are legally recognized as void, so that total amount of digital units issued to the platform would in any event be equivalent to underlying mitigation outcomes.

After the reservation period is over the units are returned to the Issuer's account.

Initial modules and operations

Apart of the digital units' issuance process, the following modules and operations are undergoing testing:

- Transfer of the units between Issuers and Users
- Acquiring of the units to offset specific goods and services carbon footprint with reference to specific contract, invoice, billing details
- Reservation of the units and withdrawal of the units reserved to the Issuer
- Burning of the units for the purpose of offsetting carbon footprint and other operations
- Placing sell/buy orders.

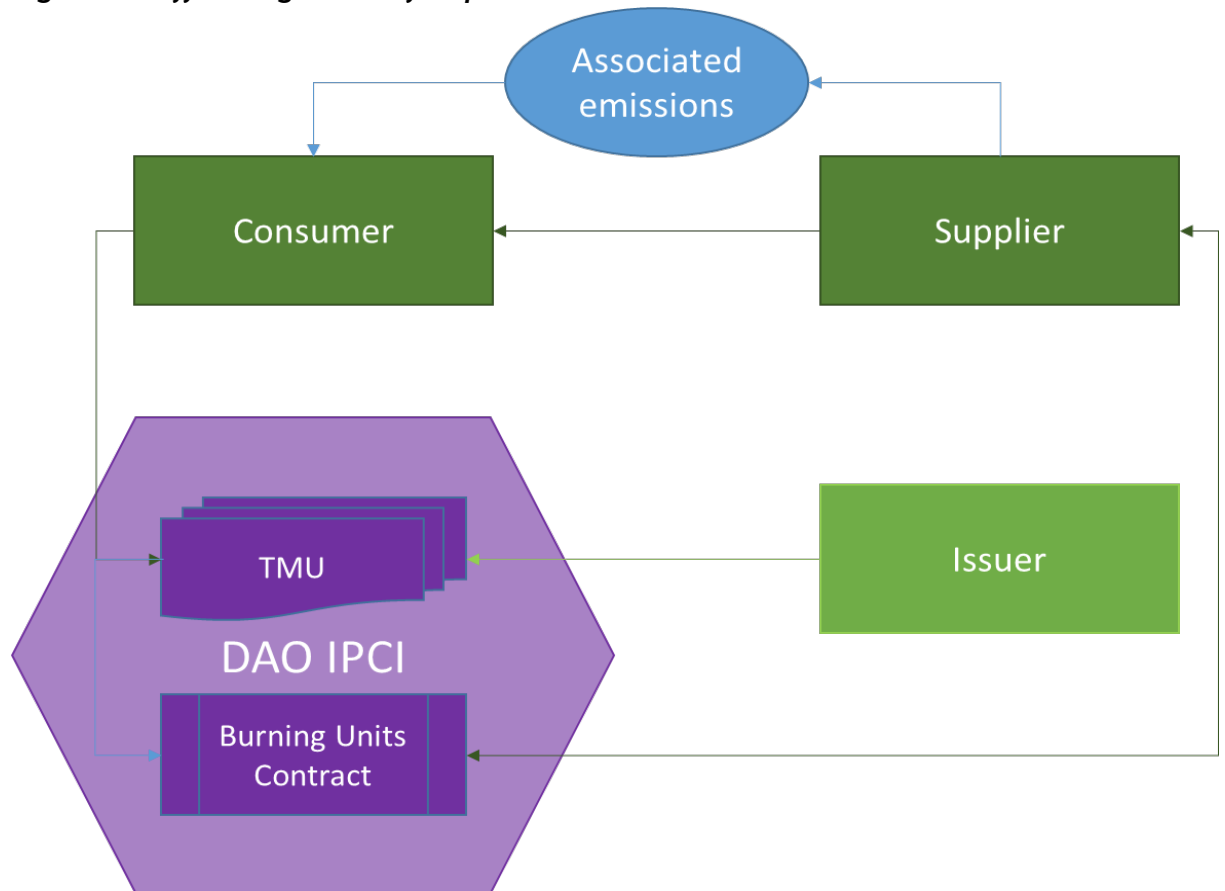
DAO IPCI offsetting carbon footprint scheme

Offsetting carbon footprint scheme (**Figure 2**):

- Supplier provides Consumer with the data on carbon footprint (amount of CO₂e) of the goods and services acquired under specific deal
- Consumer acquires the correlated amount of carbon units at DAO IPCI from Issuer or Holder of the units

- The units are transferred to the Burning Contract address
 - Supplier requests/receives reports on relevant carbon footprint offsetting operations
- Combining these steps into one contract is implied for development.

Figure 2 - Offsetting carbon footprint scheme



Prospects of development

Long-term prospects of DAO IPCI development are virtually limited only by its' functional capacity as the trends are evidently in favor of environmental markets' and specifically carbon markets' expansion both in scale and number, linkage and integration with a perspective of ultimate creation of common market space with fungible instruments. DAO IPCI is a prototype of such market space and units.

Near-term prospects rely on primary demand development at the account of large corporate and regional (subnational) climate programs, carbon footprint offsetting programs, consumer demand development.

Plans of development

Plans of development specifically include:

- Mechanism for joint offsetting of carbon footprint by Supplier and Consumer applicable at retail level as well as up to the level of supporting carbon neutral export programs
- Linking DAOIPCI with programs and systems, which are based on physical measurement and monitoring of anthropogenic climate impact in real-time mode

- Mechanism to support performance under Green Bonds' commitments
- Mechanisms and fungible instruments to support linkage of different GHG emissions limitation and reduction/removal systems, schemes, programs, and standards
- Development of OTC transactions and links with environmental, carbon, securities and commodities exchanges
- Development and introduction of TMU-based derivatives
- Mechanism to support hedging volatility of prices for different schemes, systems and programs carbon compliance units
- Upon reaching adequate level of readiness and matureness of the ledger virtual investment structure in the form of Decentralized Autonomous Organization shall be developed and launched.

Ongoing and perspective plans require design and development of collateral associated web-resources and applications: web site, trading platform, blockchain data visualization and filtering, communication channels to link with financial, banking, insurance products and systems.

DAO IPCI is developed in cooperation with Airlab within and on the basis of the "Ethereum Platform". Open source software of the "Ethereum Platform" is used and developed under the terms of [GNU Lesser General Public License](#) and [Disclaimer of Liabilities and Warranties](#).