Technical Cooperation Document

I. Basic Information

▪ Country/Region:	Regional
▪ TC Name:	Digital innovation (blockchain) for Asset Registries
▪ TC Number:	RG-T3046
▪ Team Leader/Members:	Sylvia Gabriela Andrade (IFD/CMF), Team Leader; Pau Puig Gabarro; Fernando de Olloqui; Gloria Lugo; Carmen Fernandez and Alison Arauz (IFD/CMF); Margie Jaime Ramirez (LEG/SGO); and Leticia Riquelme (CMF/CME).
▪ Operation type	Research and Development
▪ Date of TC Abstract authorization:	April 28, 2017
▪ Beneficiary:	IDB borrowing member countries
▪ Executing Agency and contact name	IDB through IFD/CMF
▪ Donors providing funding (amount and Fund's	Broadband Special Program (BBD) US$400,000
▪ IDB Funding Requested:	US$400,000
▪ Disbursement period	36 months
▪ Required start date:	January 1st, 2018
▪ Types of consultants:	Firms and/or individual consultants
▪ Prepared by Unit:	IFD/CMF
▪ Unit of Disbursement Responsibility:	IFD/CMF
▪ Included in Country Strategy (y/n)	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Low productivity and innovation, Institutional capacity and the rule of law

II. Objective and Justification

2.1 The financing of productive development activities and, particularly, of Small and Medium Enterprises (SMEs), is subject to problems related to the quality of information and contract execution, which hinder the tasks of selection, monitoring, and asset recovery, thus driving up financing costs or making it inviable. In Latin America and the Caribbean (LAC), there are many assets, such as moveable assets or warehouse receipts, that can be used as collateral but are largely untapped due to underperforming ownership registries, or untrusted asset registries, given the high cost or impossibility of verifying the information therein contained or if vulnerability to fraud is deemed high. As such, more transparent and efficient asset registries in terms of the ability to verify ownership of assets pledged as collateral could diminish constrains rooted in information asymmetries and thereby increase access to finance.

2.2 A potential solution to part of these problems is the use of new technologies such as Blockchain or more generally Distributed Ledger Technology (DLT). The underlying innovation of Blockchain is that it entails a peer to peer (P2P) distributed (as opposed to a centralized) ledger that maintains a list of cryptographically secured data records that are extremely difficult to tamper with. While the main applications are related to the decentralized exchange of value, there are also promising applications in terms of providing integrity, traceability and efficiency to different type of registries without relying on traditional third-parties that typically entail a single point of failure, higher coordination and certification costs; and potential vulnerability to fraud.

2.3 The objective of this TC is to support the development, testing and pilot implementation of a foundation for a new architecture for asset registries that allows for greater transparency, auditability, traceability and automation, thereby enhancing the efficiency and impact of such registries to improve access to finance in LAC. This objective will be achieved through: (i) the design and development of a foundation for an open-source, public, infrastructure for asset registries using Blockchain ("the technical foundation"); and (ii) a pilot implementation to test the technical foundation for a specific type of asset in an IDB borrowing member country. Importantly, the technical foundation will have to be designed to support several different applications for different type of assets that can be built on top, thereby making this operation the initial building-block towards the progressive construction of a regional public good considering that the basic infrastructure to be created will be public, open, and extensible.

2.4 **Justification.** There is a consensus in the financial industry that Blockchain or DLT could be instrumental in solving the current problems associated with the recording of an asset as collateral and the repossession mechanisms under financial contracts. Specifically, the main traits of DLT, namely a traceable, auditable transparent record-keeping system, reflect particularly attractive properties for collateral management, as described in detail in the Sector Framework Document "Support to SMEs and Financial Access/Supervision" (GN-2768-5). Moreover, the ability to introduce logic, and therefore automation, to transactions can also be instrumental in solving current limitations in terms of repossession mechanisms. As such, and considering that the adoption of technologies that make it possible to record collateral in a reliable way while helping the contracting parties to enforce the collateral-related clauses offer the unique opportunity to reduce the cost of access to formal credit, this TC aims to support the development and piloting of a potential solution to increase SME finance, a key development objective across the LAC region.

2.5 Moreover, the timing is suitable for structuring an initiative that looks to create and test an open-source, public basic infrastructure that can allow for greater innovation at the edges (i.e. the application layer), while setting standards at the foundation level (i.e. the base layer), as DLT is still in early stages and the use cases and thus the standards, are just starting to be established[1]. Moreover, the trait of an extensible, open and public infrastructure is particularly important for applications that entail public interest or development objectives as the main code can be reused, improved, and adapted to the specific needs of different countries. As such, and considering that many asset registries in LAC would greatly benefit from enhanced auditability, traceability, and transparency, through this TC the Bank will contribute to the pioneer testing of DLT in registries with high development impact potential such as asset registries for collateral purposes. Importantly, this TC will generate lessons learned for other countries that are likely to adopt DLT-based applications in the medium term, a trend that seems unstoppable given the level of knowledge and investment in this new technology.

2.6 This TC is consistent with the Bank's update to the Institutional Strategy 2010-2020 (AB-3008), which considers limited access to finance to be a key factor constraining productivity and growth in the private sector in the region, and is strategically aligned with the development challenges of low productivity and innovation and the cross cutting theme of Institutional capacity and the rule of law. Specifically, it is aligned with the objectives

[1] To date, there has only been few Proof of Concepts (PoC) using DLT in the LAC region, but not pilot implementations of applications. A promising PoC that has been broadly discussed relates to the use of DLT for managing identification services in Brazil.

of: (i) financially including all segments of the population and firms; and (ii) facilitate MSME access to finance. This TC is also expected to contribute to the indicator “number of micro / small / medium enterprises financed” of the Corporate Framework 2016-2019 (GN-2727-6) and is aligned with the objective and areas of action of the Special Program and a Multidonor Fund for Broadband Services (GN-2704). Similarly, this TC is consistent and highly aligned with Support to SMEs and Financial Access/Supervision Sector Framework Document (GN-2768-7) which guides the Bank’s work in helping countries in the region build properly regulated and supervised financial systems that, inter-alia, reduce information asymmetries; and expand the financing frontier for innovation and technological adoption, with a view to boosting productivity in the region’s countries.

III. Description of activities and outputs

3.1 **Component 1. Development of the technical foundation and Pilot.** This component will include two main activities:

3.1.1 **Design and development of the technical foundation.** This activity will support the design and development of the open source code for a public infrastructure for asset registries using DLT. The key functional specification is that the foundation should be extensible to several types of assets/use-cases and, at least for the initial phase, it should define an extensible core that can be integrated with current systems or can be used to leverage functionality where it does not exist. In terms of process and functions, the design and development should include: (i) user interfaces; (ii) registration and conditions, (iii) back end; (iv) Application Programming Interface (API); (v) conditions and triggers; (vi) notifications; (vii) actions (read, store, etc); (viii) storage; (ix) data federation; (x) identification; (xi) error and exception handling; (xii) identity and authentication; (xiii) security; and (xiv) information management. The key technical specification for the foundation is that it should keep the complexity and layers to the minimum needed to facilitate different applications or use cases to take advantage of the distributed ledger capabilities. Importantly for the first phase, the initial design should include a functional specification consistent with the type of asset/use-case to be piloted. Finally, technical guidelines for the implementation of the source code will be produced and published as part of this activity.

3.1.2 **Pilot implementation.** This activity will fund the pilot implementation of the technical foundation by testing an application for a specific type of asset in one IDB borrowing member country. A consulting firm will be hired to undertake the required tasks before, during, and after the pilot implementation, including: (i) Assessment of existing technical and institutional constraints-including information systems’ architecture, functionalities, interoperability, standards, protocols, laws, regulations, interdependencies- to be considered for designing and implementing the specific application; (ii) Identification and proposal of technical requirements to be fulfilled by application and its overall integration with legacy systems, protocols and procedures involved in the pilot; (iii) executing, running and documenting the pilot implementation; (iv) Identify and recommend institutional and technical arrangements to ensure the proper maintenance and sustainability of the application; (v) develop an user manual, and (vi) provide a roadmap to move from pilot to production. The specifics for the pilot implementation will be determined once a country, and a specific type of asset, has been identified as per the selection criteria established below.

3.2 The selection of the country that will receive the assistance and the type of asset to be piloted will be determined by the meeting of the following eligibility criteria[2], mainly based on country and systems readiness considering that the pilot requires integration or leverage capabilities with several systems: (i) the commitment by the relevant authorities to implement the pilot as per the spirit of this program; (ii) evidence that all required stakeholders in the implementation (for instance, financial institution, existing registries/ warehouses) are willing and able to participate in the pilot; (iii) confirmation that there would be no legal or regulatory limitations to undertake the pilot; (iv) evidence that the minimum required systems that could be leveraged for the pilot are available and in place[3]; and (iv) consistency with the respective Bank country strategy. If there is demand from more than one country meeting the eligibility criteria, the selection would be made on a first-come first-served basis.

3.3 This component is expected to result in: (i) a DLT-based technical foundation (code) for asset registries that is extensible and expandable to several applications for different assets; and (ii) an implemented and documented pilot in one IDB borrowing member country. The resulting open-source reference architecture and code, along with the respective technical guidelines for both the foundation and the pilot application, will be published in the Bank's GitHub repository and will be freely accessible.

3.4 **Component 2. Technical and Regulatory Advisory and Recommendations.** This component includes two activities that will provide technical advisory services and regulatory/institutional recommendations for the implementation of DLT-based solutions for asset registries:

3.4.1 **Regulatory and institutional analysis and recommendations.** A study and recommendations paper will be produced for all the regulatory and institutional aspects, and changes, that would need to take place in order to implement this type of new infrastructure for asset registries. This study envisages two parts: (i) a general overview and high lever recommendations on the basis of standard financial infrastructure and regulatory frameworks; and (ii) a set of specific recommendations for the country (and type of asset) of the pilot implementation. As a result, a set of general regulatory and institutional guidelines, with an applied analysis to the specific pilot application use case, will be produced and available to any country in the region.

3.4.2 **Technical advisory and recommendations.** The nature of this program, which entails the pioneering testing of a disruptive technology on an early adoption stage requires of specialized technical advice along the different stages of the project. As such, a technical advisor will be hired as a project specific consultant with the responsibilities of, inter-alia: (i) coordinating at the technical level the main stakeholders engaged in the program; (ii) advising the project team in terms of

[2] Letters of request or non-objection from the official country counterpart will be secured once the country has been selected.

[3] The pilot requires integration or leverage capabilities with the following systems and characteristics, if existing: digital identity and authentication, end-user access to applicable digital platforms to be used, Enterprise Resource Planning (ERP) systems or similar, when applicable, system interoperability capabilities, and others depending on the participants relevant for the specific asset to be piloted. In some cases, the capability could be represented or build for the pilot, even if it exists, to achieve the execution of the hypothesis' tests, not compromising the integrity of the assumptions.

technical considerations during the process of tendering, reviewing proposals, and supervising the pilot implementation; (iii) safeguarding the technical soundness, interoperability and efficiency of the process and products; and (iv) producing all the final/consolidated documentation and technical guidelines for the project (foundation and pilot), on the basis of the documentation prepared as part of Component 1 and the overall pilot experience and lessons learned. In addition to standard advisory services, the main result of this activity is the production of the final technical guidelines, which are needed for any government or entity to be able to start building new applications on top of the foundation. These guidelines will also inform future implementations, either at the pilot or production phases.

3.5 **Component 3. Knowledge Dissemination.** This component will finance the production and dissemination of all the code/software as well as knowledge generated by this project, including technical guidelines, recommendations and learned lessons, which would also help to engage relevant stakeholders for the continued use and improvement of the technical foundation as well as the development of further applications. This component also envisages the organization and hosting of workshops with key counterparts and stakeholders both in the country where the pilot will be implemented and in other settings for dissemination purposes. The knowledge generated will also be actively presented and disseminated at key conferences and events, especially those involving policy makers and regulators, and through different digital channels, including relevant blogs (internal and external).

3.6 **Budget**. The project is estimated to require a total of US$400,000, which will be financed by the Broadband Fund (BBD). Counterpart support will be determined once the country and type of asset is select, but it would only entail staff time or logistical support to the pilot implementation.

Indicative Budget

Activity/Component	Description	IDB/Fund Funding	Total Funding
Component 1 -Development of the technical foundation -Pilot implementation	 -Technical development -Design, implementation and documentation	**315,000** 100,000 215,000	**315,000**
Component 2 -Regulatory recommendations -Technical Advisor/ recommendations	 -Preparation - Advisory services, preparation of guidelines, travel	**55,000** 25,000 30,000	**55,000**
Component 3 - Dissemination	 Production, distribution, workshops	**30,000**	**30,000**
TOTAL		**400,000**	**400,000**

3.7 Monitoring will be based on the documentation generated. At least two missions to the pilot country are expected (before and while the pilot is being implemented). No formal evaluation report is envisioned for the entire project buy there will be two reports prepared: (i) an end-of pilot report; and (ii) and end-of project report, which will use as an input the information provided by the stakeholders and counterparts. These reports will summarize the execution, the results obtained, as well as the lessons learned for future projects.

IV. Executing agency and execution structure

4.1 The IDB will be the executing agency, through IFD/CMF, a division with experience executing similar types of programs and with the necessary capabilities and knowledge regarding DLT. For the pilot implementation of the first component, a public-sector entity responsible of a specific asset registry will be the counterpart and will be expected to organize and coordinate the participation of other relevant entities and stakeholders, in coordination with the Project team and the consulting firm hired to undertake the pilot. While all contracting will be conducted by the Bank, the counterpart will provide information on the execution of Bank-supported activities.

4.2 The Bank will contract individual consultants, consulting firms and other services in accordance with current Bank procurement policies and procedures. Specifically, Section AM-650 of the Administrative Manual "Complementary Workforce" will be applied in the case of individual consultants, the Policy for the Selection and Contracting of Consulting Firms for Bank-executed Operational Work (GN-2765-1) and its Operational Guidelines (OP-1155-4) for hiring consulting services of intellectual nature and the Corporate Procurement Policy (GN-2303-20) for other services.

4.3 **Technical Foundation Procurement**. Given the limited number of institutions and developers with profound blockchain/DLT knowledge and capabilities, the team has anticipated the potential need for a non-competitive process to procure the design and development of the technical foundation. Importantly, and in parallel with the project team's process of design this program, it was discovered that the Digital Currency Initiative ("DCI") of the MIT Media Lab has also been working at reimaging asset registry systems using Blockchain technology, developing a simple prototype for an asset registry system for warehoused commodities (one type of asset) in tandem with the vision for this project. The prototype, called "b_verify," aims to be a solution to securely register and track assets using blockchain. Specifically, the simple b_verify prototype uses a local server, the Bitcoin test net, and SMS to facilitate a set of basic actions for one type of asset registry, warehoused commodities, and includes: the deposit goods, withdraw goods, secure goods as collateral for a loan, auto-enforce the transfer ownership of goods to a lender upon default, etc. The completion of each of these actions is time-stamped to the test net Bitcoin blockchain, providing a publicly auditable and secure history of all activity. In such a context, the Project Team and the DCI of the MIT Media Lab have been exploring the continuation of the work under b_verify so as to use it as the base to develop the technical foundation for the open-source, extensible public asset registry that could support many forms of assets (such as commodities, accounts receivable, equipment, or land), exactly in line with the objectives of this program. As such, and considering that: (i) the DCI is considered a top research center for blockchain at the global level; and (ii) the IDB is a member of the MIT Media Lab since September 2016, which entails a strong and broad working relationship between the two institutions, this program will entail a non-competitive method of selection for the single sourcing of the DCI of the MIT Media Lab for the design and development of the technical Foundation. In consequence, the project team will liaise with the SSS Clearance Unit Chief to obtain the specific guidance to duly complete the required justifications and procurement processes. A collaboration agreement is expected to be negotiated and signed between the parties.

4.4 **Procurement for the pilot implementation and other consultancies**. For the second activity of component 1, a simplified competitive selection method will be pursued for the

firm to be hired to undertake the pilot implementation. For the activities in component 2, individual project specific consultants are contemplated.

V. Main issues

5.1 As part of project design, and considering its relative complexity, the Project Team commissioned a risk and feasibility assessment of the of the pilot implementation of the technical foundation to evaluate the readiness of both the technology and the environment to adopt it, validating that the project could accomplish its goals if a proper risk management strategy in place. This assessment also proposes a risk mitigation strategy with identified and assigned responsibilities for each stakeholder, and represents a tool that helps the project team to determine and monitor the way risks can impact, positively or negatively the expected cost, schedule, and quality of the pilot implementation. The analysis also presents some general recommendations to be considered before, during, and after the project and pilot execution.

5.2 A key risk relates to the government counterparts' sustained interest and ability for piloting a new architecture/infrastructure. As mitigation, this TC contemplates strict selection criteria and an extensive dialogue and analysis of preconditions will be performed before selecting the application to be piloted. The TC also includes dissemination and engagement activities with all stakeholders and counterparts. A related risk relates to the readiness of the existing institutional, legal, and regulatory frameworks for enabling the piloting and eventual adoption of DLT-based solutions for asset registries. Such risk, which is relevant at the regional level and in particular at the pilot country, will also be mitigated through a careful country and asset selection, and activities contemplated in the second component of this program.

5.3 Finally, there is a risk that the different stakeholders (e.g., government, financial institutions, intermediaries, users) engaged in the pilot implementation do not have the required level of interest, technical awareness, skills and knowledge to use the system. Such risk will be addressed under Component 3 through the organization and hosting of workshops and events with government counterparts and international experts, and the production and dissemination of knowledge materials.

5.4 **Sustainability.** The main driver of the sustainability of this project is the open-source nature of all the code/software generated, which will be accompanied by detailed guidelines to allow for further innovation in terms of new applications/implementations. Moreover, if merited by demand across the region, the technical foundation can represent the initial building lock towards the creation of a Regional Public Good to maintain, update and improve the new infrastructure for asset registries. Nonetheless, the main risk to the sustainability of the project is rooted on the possibility of the pilot implementation concludes that a DLT architecture is not optimally suitable for asset registries in LAC. Such risk is inherent to technology innovations that are at the early stages of the adoption curve, but is mitigated by: (i) the fact that a similar pilot was positively completed and is in production in Georgia for a land registry; and (ii) the reputation of the academic institution (MIT Media Lab) to be procured for the technical development of the foundation.

VI. Exceptions to Bank Policy

6.1 None.

VII. Environmental and Social Classification

7.1 This TC will not finance any physical infrastructure. There are no environmental or social risks associated with the activities outlined in this TC. Therefore, its environmental classification according to the Environment and Safeguards Compliance Policy (OP-703) is “C”. See Safeguard Policy Filter Report (SPF), and Safeguard Screening Form (SSF).

Required Annexes:

- Results Matrix
- Terms of Reference for activities/components to be procured
- Procurement Plan

DIGITAL INNOVATION (BLOCKCHAIN) FOR ASSET REGISTRIES

RG-T3046

CERTIFICATION

I hereby certify that this operation was approved for financing under **Broadband Special Program (BBD)** through a communication dated October 20, 2017 and signed by Su Kim (ORP/GCM). Also, I certify that resources from said fund are available for up to **US$400,000** in order to finance the activities described and budgeted in this document. This certification reserves resource for the referenced project for a period of four (4) calendar months counted from the date of eligibility from the funding source. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this operation. Amounts greater than the certified amount may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, represent a risk that will not be absorbed by the Fund.

SMR

CERTIFIED BY: _____ 11/29/17

Sonia M. Rivera
Division Chief
Grants and Co-Financing Management Unit
ORP/GCM

Date

APPROVED BY: _____ 11/29/17

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Date