karus·chain

The Karuschain Platform

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Seller

Karuschain Limited ("the Company", "we", "us" or "our")

A Gibraltar private limited liability company

Company no. 117403

Registered address: Suite 7, Hadfield House, Library Street, Gibraltar

Purchase Website & Instructions

www.karuschain.com

Purchasers must follow the instructions on the Karuschain Website to purchase KRS.

Token Sale Terms & Conditions

To be made available on the Karuschain Website. Each purchaser of KRS must ensure that they carefully read the terms and conditions and obtain any necessary legal advice before agreeing to them.

Token Name

(to be sold during Public Sale Period)

 KRS

Token Ticker

(of the Karuschain Token to be sold during Public Sale Period)

 KRS

Project Summary

Karuschain has the following elements:

The Karuschain project aims to touch on many of the key inputs and outputs of the current precious metals supply chain. The Karuschain platform is being developed to specifically mitigate the issues and challenges facing all the participants in the precious metals supply chain. The initial implementation of the Karuschain platform aims to provide the tracking and tracing capacity to limit the impact of the following global compliance burdens:

•   OECD (Organization for Economic Cooperation and Development) and LBMA (London Bullion Market Association), responsible for sourcing and due diligence;

•   Downstream companies' CSR (Corporate Social Responsibility) obligation in Electronics and Jewellery;

•   Hardening points on the supply chain to respond to UNICRI's (United Nations Interregional Crime and Justice Research Institute) finding of criminal actors within the chain;

•   Downstream product end user proof-of-ownership (bullion etc.);

The Karuschain platform will use the Hyperledger software family, our implementation of sophisticated smart contracts (chaincode), and the management of key data flows from legacy systems and innovative hardware throughout the precious metals supply chain to better manage how to unify, protect, trace, and track the precious metal data flows from the greatest number of supply chain participants on the Karuschain platform. Further details of the platform, the services we will offer and the technology powering the whole project (collectively, the "Karuschain Platform") are set out in this Whitepaper.

Token Sale Period Phases

Token Sale will be conducted on named exchanges. This initial exchange offering will be publicly announced and information will be available on www.karuschain.com

Total Token Supply

500,000,000 KRS

Availability

KRS - during Token Sale Period

300,000,000 KRS

KRS Price

US $0.10 = 1 KRS, exclusive of transaction fees or costs

Minimum Investment

No minimum investment for Public Initial Exchange Offering Sale Contributors

Accepted Methods of Payment

BTC or ETH transferred to the respective digital addresses specified on the exchanges authorised by Karuschain as detailed on the Karuschain Website, payable at the applicable BTC or ETH price determined by the market rate on the listing exchanges at the time of purchase.

Distribution of Purchased KRS Tokens (KRS)

Contributors to receive KRS upon activation via smart contracts.

Authorised Communication Channels

The only communication channels authorised by the Company for the purposes of the Token Sale are:

Website: www.karuschain.com

Email: info@karuschain.com

Press Releases from the Company and Exchanges authorised by www.karuschain.com

Abstract and Executive Summary

The global trade in precious metals touches every part of modern life. It spans the gamut of uses, from jewellery creation to being a key input in the manufacture of servers, smartphones, laptops, and electric cars.

The precious metals supply chain lacks the targeted transparency necessary to satisfy its participants, consumers, and regulators. Increasingly, consumers demand to know about the source of the precious metals in the products they consume. This desire has translated into a complex body of compliance obligations for the precious metals industry.

The Karuschain platform ecosystem is a blockchain-based system that will allow every participant in the precious metals supply chain to track and trace both inputs and outputs. Karuschain will enable true and full compliance with regulations like the OECD's responsible sourcing guidelines. It will allow companies to meet compliance regulations with full control over the data they provide while enabling real time audits. The diagram below shows the data flow into the Karuschain platform.
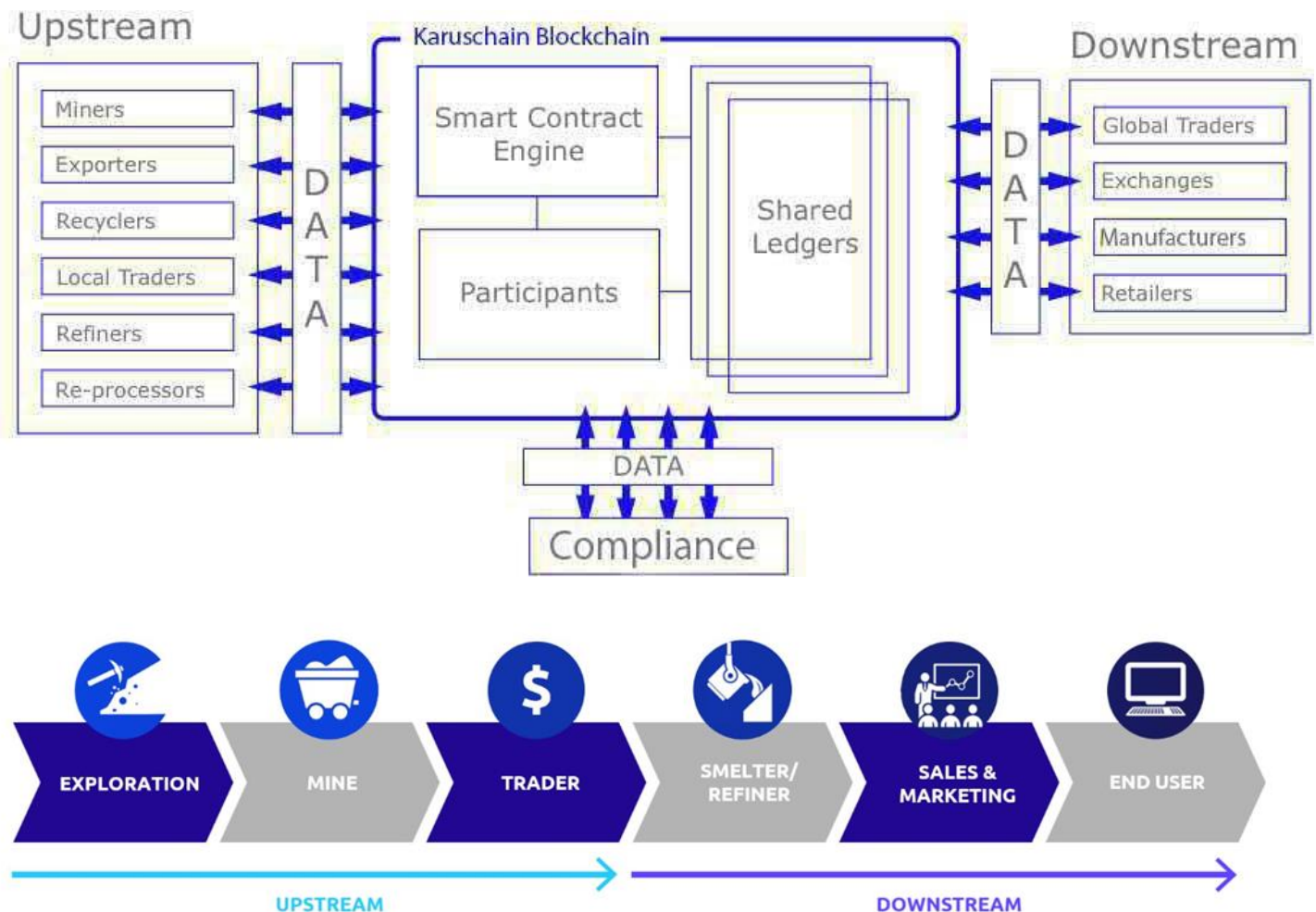
Karuschain will solve these key industry challenges:

- Compliance with OECD (Organization for Economic Cooperation and Development) and LBMA (London Bullion Market Association), responsible sourcing guidelines and due diligence (and their derivatives).
- Downstream companies' CSR (Corporate Social Responsibility) obligation in Electronics and Jewellery.
- Provision of real time audit ability for industry auditors.
- Downstream product end-user proof-of-ownership (bullion, etc.)
- Removal of industry data silos to provide improved data for traders.

The Karuschain platform uses the Ethereum and Hyperledger blockchains, our implementation of sophisticated smart contracts (chaincode), and the management of key data flows from legacy systems and innovative hardware throughout the precious metals supply chain.

Karuschain platform technology will allow supply chain participants to determine the source of the metal as it flows downstream. It will allow them to track the metal from the source onwards, and then for other participants to trace it backwards to the source. It will allow a participant's compliance department to determine what compliance data to store on its private blockchain channel and with whom to share read-only access.

The system will take data inputs and secure them with the blockchain while integrating hardware tracking modules. See the example below:
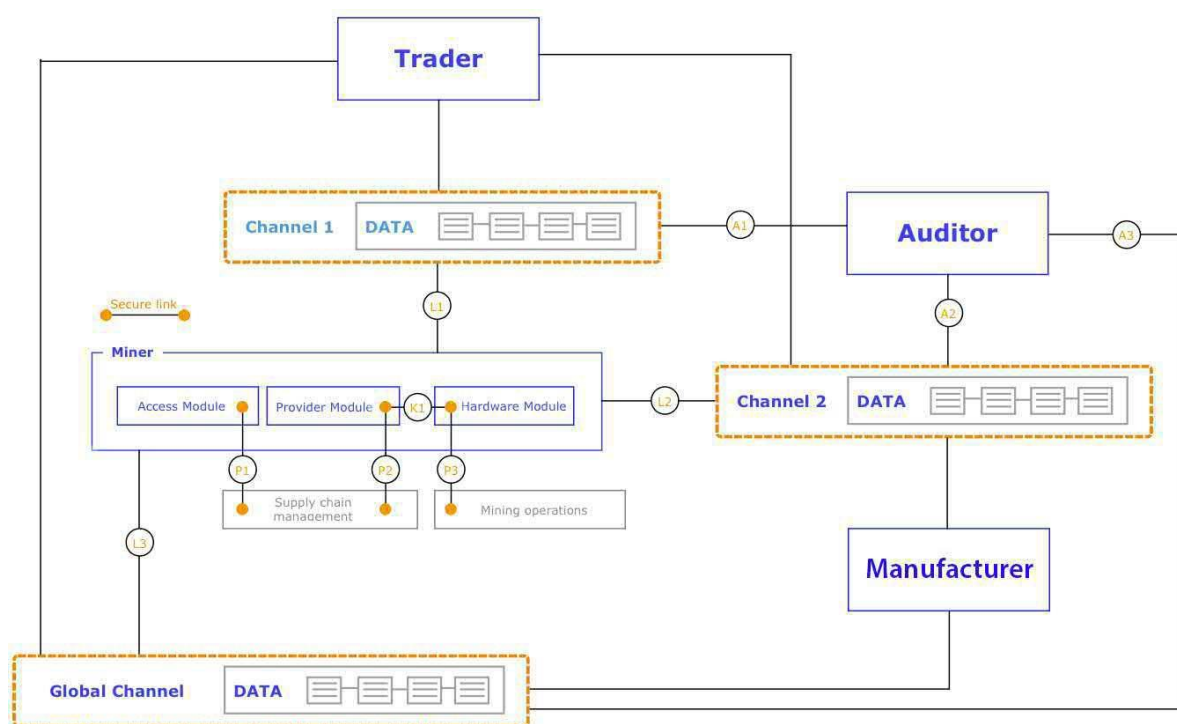
The implementation and adoption of the Karuschain platform will occur in phases. The foundation of the Karuschain project, and phase one of its implementation, is to become the compliance platform of choice for both upstream and downstream supply chain participants.

Downstream participants have a clear incentive to connect to Karuschain; to meet their compliance and CSR obligations as the available pool of data and upstream producers increases for tracing/cross-checking purposes. They will, as major buyers of the output of upstream companies, exert pressure to open data flow from upstream to facilitate source tracing. [1] The demonstrable success by both upstream and downstream participants in meeting their compliance obligations will drive data sharing, platform use, and industry end-user acquisition.

At the end of phase one, the wider industry will become comfortable with utility-based consortia data sharing for compliance. In phase two, they will begin to share production data with each other to gain a competitive advantage.

Phase three of the Karuschain platform will begin once wider industry participation hits critical mass and major players become comfortable with data-sharing. In phase three, new users will come from the metals trading/consulting sector and governments.

At this time, some industry participants will see the value in releasing real-time anonymous production data via Karuschain. They may also see the benefit of allowing real-time audits of their compliance obligations by government auditors on the platform. Real-time production data will be of great value to the global precious metals market.

It is during phase three that Karuschain has the greatest effect on the pricing of metals and the largest non-industry-centric user base. At the end of phase three, Karuschain will be close to end-to-end supply chain tracking, while also providing the data to show beneficial ownership of post refiner investment-grade products.

The Karuschain platform will be built on the foundation of a compelling use case. It will evolve into an industry-driven ecosystem supporting the greatest possible transparency in the precious metals supply chain/market.

1   Principles for responsible metals supply to electronics - Young, Steven B; Fonseca, Alberto; Dias, Goretty. Social Responsibility Journal; Bingley Vol. 6, Iss. 1, (2010): http://dx.doi.org/10.1108/17471111011024595

Mission

Our mission is to create valuable and targeted transparency for every participant in the precious metals market and supply chain. Our founder has experienced the need for a technological mechanism that promotes transparency while running businesses in the precious metal extractive industry and acquiring precious metal for investment/value storage purposes.

We strongly believe that blockchain technology and its core advantages over conventional systems form the foundation of Karuschain's ability to reforge the complex, multinational precious metal supply chain.

Background

Spanning the length of recorded history, humankind has manifested an attraction to precious metals. The metals' use as a store of value, foundation of fungible money, jewellery for the masses, and regal ornamentation of heads of state/religion have persisted over time. This ancient tradition of using precious metal—gold in particular—as a means of class differentiation and signalling was a part of Asian culture for thousands of years.[1] Scholars have noted that techniques and methods for the creation of precious metal ornamentation cross- pollinated throughout the ancient world via the trade networks of China to the Roman Empire and beyond. [2]

In the modern age, humanity's affinity for precious metals is demonstrated by the vast value placed on the aggregate mineral/metal that is extracted yearly. Research by the United States Geological Survey shows that the value of nonfuel minerals extracted in the United States in 2013 was $75.3 billion.[3][4] When the United States Commodity Futures Trading Commission (CFTC) met with the World Gold Council and the Klein & Saks Group in 2014 to discuss gold, they determined that the global cash value for gold at that time was $3.5 trillion for 60,000 metric tonnes.[5]

Gold is just one of the many precious metals interwoven into our daily lives as part of a global trade and supply chain. In the first quarter of 2018, the World Gold Council found that:[6]
- The gold bar and coin demand was 254.9 tonnes;
- Gold-backed ETFs held 32.4 tonnes;
- Gold demand for use in jewellery production was 487.7 tonnes;
- Central banks added 116.5 tonnes to global official reserves and have on average added 114.9 tonnes per quarter since 2010;
- With the ever-increasing complexity in the production of smartphones and other technology that use gold for key inputs, demand for gold in technology manufacturing has risen to 65.3 tonnes [7].

Clearly, precious metals are increasingly important in myriad functions in modern life—flowing from their traditional use cases to being the conductive material that enables continuous technological innovation.

1   Demandt, Michèle H. S."Early Gold Ornaments of Southeast Asia: Production, Trade, and Consumption." Asian Perspectives, vol. 54 no. 2, 2016, pp. 305-330. Project MUSE, doi:10.1353/asi.2016.0000
2   Id. at page 306.
3   U.S. Geological Survey, 2013, Statistical Summary, in Area reports—Domestic: U.S. Geological Survey Minerals Yearbook 2014, v. II, p.2.1 https://minerals.usgs.gov/minerals/pubs/commodity/statistical_summary/myb1-2013-stati.pdf
4   See the following U.S. Geological Survey reports: https://minerals.usgs.gov/minerals/pubs/country/2014/myb3-sum-2014-europe-eurasia. pdf - https://minerals.usgs.gov/minerals/pubs/country/2014/myb3-sum-2014-africa.pdf - https://minerals.usgs.gov/minerals/pubs/country/2014/myb3-sum-2014-asia-pacific.pdf - https://minerals.usgs.gov/minerals/pubs/country/latin.html
5   https://comments.cftc.gov/PublicComments/ViewExParte.aspx?id=840
6   https://www.gold.org/research/gold-demand-trends/gold-demand-trends-q1-2018
7   https://www.gold.org/research/gold-demand-trends/gold-demand-trends-q1-2018/technology

A set of fundamental questions stemming from the enduring importance of precious metal in all facets of human experience has survived through the ages and are relevant today:

- Where, when, and how was this metal extracted?
- Where, when, and who refined this metal?
- What are its physical characteristics post refining/smelting? (purity etc.)
- After becoming an end-product, who is the owner of the metal or beneficial owner of the underlying metal post-securitisation?
- What are the key logistics, information, and details on each process of the supply chain?

The human need to answer these fundamental questions with technological solutions is as ancient as the questions themselves. In the 3rd century B.C., Archimedes devised an ingenious method to determine whether a gold crown created for King Hiero of Syracuse was indeed pure gold. He used buoyancy and the relative density of precious metals.[8] Applying his methodology, Archimedes found that the gold crown was a skilful fraud as in spite of its appearance and the maker's claim to be pure gold, in reality, the crown was an impure mix of silver and gold.[9] In 1586, Galileo was able to determine a more exact means to use the system created by Archimedes by combining the law of levers, buoyancy, and the hydrostatic balance that determines the composition of an alloy made of gold and silver.[10] Galileo was able to prove that the Archimedes' method was workable at the time of its creation, vindicating Archimedes.

The Karuschain project is part of this time-honoured tradition of applying novel technology to answer these key questions. The complete Karuschain platform uses the Ethereum and Hyperledger blockchains, our implementation of sophisticated smart contracts, key (chaincode) and the management of key data flows from legacy systems and innovative hardware throughout the precious metals supply chain.

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8   See. https://www.math.nyu.edu/~crorres/Archimedes/Crown/Vitruvius.html
9   Id.
10   See. https://www.math.nyu.edu/~crorres/Archimedes/Crown/bilancetta.html

Project, Platform and Industry Overview

The Karuschain project will have the opportunity to touch on many of the key inputs and outputs of the current precious metals supply chain. This section introduces the reader to the participants in the precious metals market and supply chain. It also highlights the challenges facing the supply chain that Karuschain will endeavour to mitigate. It focuses on and describes the many use cases, end-user opportunities, and integration points for the Karuschain blockchain system. It provides an overview of the industry-related risks and challenges facing Karuschain in the near term and future. In its closing, it lays out the framework for the expansion of Karuschain platform usage by different user groups over time as the potential and incentive for participant data-sharing on Karuschain increases across the supply chain.

The Structure of the Precious Metals Supply Chain

The precious metals supply chain is a multifaceted and multinational system. It is made up of "upstream producers", who extract the metal from the earth and process it in order to hand off to "downstream producers", who refine the metal into an end-product fit for consumption.[11] The OECD defines upstream producers or companies to be: *the mineral supply chain from the mine to smelters/refiners. "Upstream companies" include miners (artisanal and small-scale or large-scale producers), local traders or exporters from the country of mineral origin, international concentrate traders, mineral re-processors and smelters/refiners.[12]* It defines downstream producers or companies to be: the minerals supply chain from smelters/refiners to retailers. "Downstream companies" include metal traders and exchanges, component manufacturers, product manufacturers, original equipment manufacturers (OEMs) and retailers. [13]

EXPLORATION — MINE — TRADER — SMELTER/REFINER — SALES & MARKETING — END USER

UPSTREAM   DOWNSTREAM

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11   OECD (2016), OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas: Third Edition, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264252479-en p. 32-33
12   Id. at 32
13   Id. at 33

The supply chain, in turn, takes the products created by the downstream producers and distributes them to the ultimate end users. The scholars Ghosh et al. [14] break down the end users of gold into two categories: users that acquire the metal for use in jewellery-making or commercial activity ("use demand"), and governments, asset managers, and general investors that acquire the metal to use it as a store of value ("asset demand"). All precious metals either fit neatly into both categories (like platinum) or are principally used for their many commercial uses as part of an end-product or in the production process itself. Each of these broad categories of end users then further breaks down but remains along these same general lines.

How Karuschain Addresses Compliance and Regulatory Issues

The Karuschain project is being developed to specifically mitigate the many issues and challenges facing all the participants in the precious metals supply chain. The initial implementation of the Karuschain will provide the tracking and tracing capacity to limit the impact of the following global compliance burdens:

- OECD and LBMA, responsible for sourcing and due diligence;
- Downstream companies CSR obligation in Electronics and Jewellery;
- Hardening points on the supply chain to respond to UNICRI's finding of criminal actors within the chain;
- Downstream product end user proof-of-ownership (bullion etc.)

OECD Precious Metal Supply Chain Guidelines

The OECD has thoroughly studied the precious metals supply chain and has developed a set of sophisticated guidelines for responsible sourcing due diligence. Responsible sourcing, in this context, refers to the elimination of support for non-state armed forces or security forces, by sourcing precious metals from upstream and downstream companies that do not, directly or indirectly, fund these groups at any point of their supply chain.

The OECD guidance ("guidance") applies to all types of valuable precious metals, but this whitepaper will focus on the guidance specific to gold production.[15] The OECD asks that all companies within the gold supply chain establish a system of transparency, information collection, and control over the gold supply chain. [16] Section C of the guidance sets five key areas[17] where all companies can act (full quote from the guidance, bold emphasis added):

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14   GHOSH, D., LEVIN, E. J., MACMILLAN, D. & WRIGHT, R. E. 2004. Gold as an inflation hedge? Studies in Economics and Finance, 22, 1-25. https://strathprints.strath.ac.uk/6926/6/strathprints006926.pdf
15   OECD (2016) Supplement on Gold p. 61 - 120
16   Id. at p. 75
17   Id.

1. Create internal documentation and records of supply chain due diligence processes, findings, and resulting decisions. This will include Step 1 due diligence, as well as additional due diligence that may be carried out with regard to gold supply chains from conflict-affected and high-risk areas (Steps 2-5).

2. Maintain internal inventory and transaction documentation that can be retrieved and used to **retrospectively identify gold inputs and outputs and/or support a chain-of-custody system** (see Step 3.) This should include:
   a. Information regarding the form, type, and physical description of gold and gold-bearing materials, e.g. gold ore, gold concentrate, gold doré, alluvial gold, recyclable gold, gold bullion, jewellery manufacturing inputs and/or products, electronic components, gold plating solutions, etc.
   b. Information provided by the supplier regarding the weight and assay of gold and gold-bearing materials of input, and determinations of the weight and assay of gold inputs and outputs.
   c. Supplier details, including "know-your-counterparty" ("KYC") due diligence information consistent with the 40 Recommendations of the Financial Action Task Force (FATF).
   d. Unique reference numbers for each input and output.
   e. Dates of input and output, purchases, and sales.

3. Make and receive payments for gold through official banking channels, where they are reasonably available. Avoid cash purchases where possible and ensure that all unavoidable cash purchases are supported by verifiable documentation.

4. Cooperate fully and transparently with law enforcement agencies regarding gold transactions. Provide customs officials with access to complete information regarding all shipments that cross international borders, or to which they otherwise have jurisdiction.

5. Maintain the information collected above for a minimum of five years, **preferably on a computerised database.**

How Karuschain Ensures OECD Compliance

The Karuschain system will allow companies to track/trace gold inputs and outputs with a unique identifier on the blockchain and configurable data input fields meeting the requirements of Part 2, while decentralised data immutability will mitigate fraudulent data tampering.

OECD Upstream Guidance

The guidance has specific recommendations for all types of upstream companies.[18] The following list highlights parts of the recommendations where Karuschain can specifically become the platform for company compliance:

- **For medium/large gold miners and artisanal/small-scale gold miners:** *provide infrastructure to track and record, in an immutable blockchain database, all steps of the producing process for a bar of gold doré, or a container of alluvial gold.* **The Karuschain blockchain** will allow cross-identification of the output as it moves upstream.

- **For local exporters, recyclers, and international traders of mined gold/recyclable gold:** *provide infrastructure to track all inputs and outputs, by bar, ingot, and/or batch of gold accepted and produced. Preliminarily inspect all shipments for conformity to the information provided by the supplier on the types of gold, such as alluvial gold, gold doré, unprocessed recyclable gold, or melted recyclable gold. Verify weight and quality information provided by the gold producer and/or shipper and make a business record of such verification.* **The Karuschain blockchain** can be <u>the source of truth</u> where the unique reference numbers and other key data captured by other participants in the upstream supply chain can be cross-checked at the time of the preliminary inspection. Allows participants at this level to verify the true identity of the outputs they receive before commingling or export/trading occurs.

- **For refiners:** *provide infrastructure to track all input and output, by bar, ingot and/or batch of gold accepted and produced, which should correspond to all the information collected on that gold input and output and generated through due diligence, including supplier "KYC" information and the origin of gold. Preliminarily inspect all shipments for conformity to the information provided by the supplier on the types of gold, such as alluvial gold, gold doré, unprocessed recyclable gold, or melted recyclable gold. Verify weight and quality information provided by gold producer and/or shipper and make a business record of such verification. Record, and render all gold outputs identifiable (e.g. by physically imprinting gold products, and/or affixing to packing material in such a manner that its tampering or removal will be evident) with the following information: a) Name and/or stamp/logo of the refiner. b) Year of refining/production. c) A unique reference allocated to each output (e.g. serial numbers, electronic identification or other practicable means).* **Karuschain blockchain** can be <u>the source of</u>

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18   Id at p.77 -79

truth where the unique reference numbers and other key data produced by other participants in the upstream supply chain can be cross-checked at the time of the preliminary inspection. It will also be the immutable database that holds/protects all data points mandated above in its transaction record.

OECD Downstream Guidance

The Karuschain platform allows the upstream producers to meaningfully track and trace gold outputs while storing all associated data points and can be the source of truth cross-checked by each supply chain participant farther upstream. According to Young et al., "tracking" refers to the ability and practice of following material forward along the supply chain and following the flow "downstream," for example from mine to smelter to refiner to fabricator to manufacturer. "Tracing" refers to an examination of flow backward, or "upstream," through the supply chain.[19]

Once the outputs become inputs or products (bullion etc.) post-refining/smelting, the downstream producers can comply with the guidance[20] by using Karuschain to request that upstream suppliers provide the *identification of the upstream gold refiner(s) for gold-bearing material and products and all available data about each output stored on the blockchain.* Karuschain, with industry cooperation, can produce some or all of the data points captured as the outputs move downstream.

The OECD currently envisions an industry reliant on the circulation of digital scans of official documentation from upstream to downstream companies to comply with its guidelines. This is fraught with the potential for human intervention into the validity of the data set passed to and from upstream companies. Karuschain will allow a downstream company to access key data about outputs directly from the incorruptible blockchain source while at the same time giving upstream companies complete control over the type of data-sharing with other industry-users of Karuschain.

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19 Young, S.B., Dias, G., Fonseca, A. and O'Keefe, M.S. (2008), "Social and environmental responsibility in metals supply to the electronic industry", www.gesi.org/files/20080620_ghgm_ser_metalstoelectronics.pdf

20 ECD (2016) Supplement on Gold at p. 79

London Bullion Market Association Sourcing Guidelines

Complying with the OECD guidance is critical for refiners who wish to comply with the London Bullion Market Association ("LBMA") Responsible Sourcing Programme. [21] The LBMA has incorporated the OECD guidance into its own programme. [22] The programme applies to both silver and gold refiners who wish to produce gold and silver bars that comply with the London Good Delivery List ("the list"). [23] The LBMA and its list are the standard setting gatekeepers to the vast London bullion market. Many of the world's bullion markets accept the list as their quality benchmark, which means that complying with LBMA guidelines and maintaining list accreditation is critical for many of the world's refiners. According to the LBMA, 90 percent of the world's gold production is produced by LBMA/list accredited refiners. [24]

The LBMA expects refiners to comply with its responsible sourcing guidelines[25] by broadly:

- Adopting a supply chain due diligence policy that is consistent with the OECD guidelines;
- Understanding the risk in the refiners' supply chain, beginning with the origin of the gold (including recycled gold);
- Identifying the beneficial owners of the gold supplying counterparty and cross-checking whether the owners are allowed to benefit from the gold trade (AML / KYC and anti-terrorist financing initiative);

- Monitoring transactions by receiving and cross-checking the following information from a counterparty:
  - For Mined Gold
    - Estimated weights and assay results (from counterparty);
    - Shipping/transportation documents (waybill/airway bill, pro-forma invoice, if applicable);
    - Export and import form for high-risk transactions, if applicable;
    - Reference to supply chain due diligence file.
  - For Recycled Gold:
    - Estimated weight (from counterparty);
    - Shipping/transportation documents (waybill/airway bill, pro-forma invoice, if applicable);
    - Export and import form for high-risk transactions, if applicable;
    - Reference to supply chain due diligence file.

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21   LBMA Responsible Gold Guidance - Version 7 Last updated 1st September 2017 http://www.lbma.org.uk/assets/downloads/responsible%20 sourcing/Responsible_Gold_Guidance_V7.pdf
22   Id. at p.1
23   Id.
24   LBMA Precious Metals Integrity Responsible Sourcing 2018 p. 5 http://www.lbma.org.uk/assets/aboutus/Precious%20Metals%20Integrity%20 Brochure.pdf
25   LBMA Responsible Gold Guidance - Version 7 p. 4-17

Karuschain will facilitate the acquisition and protection of key compliance data for upstream companies. The upstream participants will be able to use the platform to cross-check and pass this data upstream as the gold or other precious metal output draws closer to the nexus point at the refiner/smelter. The refiner/smelter will use the data to determine whether it should use the outputs in question to create end products for downstream consumption, allowing the upstream producers to meet their OECD guidance compliance obligation, and allowing refiners to stay on the LBMA list.

Downstream Electronics and Jewellery Manufacturers

Downstream producers also benefit from the data set protected by Karuschain and its ability to trace outputs pre-refinery/smelter and track precious metal inputs post-refinery/smelter. Companies that use precious metal inputs to create jewellery and/or electronics face increasing compliance burdens. Consumer-facing companies in the electronics manufacturing industry find that pressure to practice responsible supply chain management stems not only from regulators but also from customers, shareholders, employees, NGOs, suppliers, and industry associations.[26] The industry has responded with the creation of the Electronic Industry Citizenship Coalition (EICC) to foster industry-wide compliance systems. The EICC believes that its members should seek a total supply chain initiative. [27]

Transparency in the metals supply chain is of increasing importance as it is estimated that, of the 50 materials integral to the creation of a modern personal computer, at least 20 are metals, and that copper (at 13 percent) and iron (at 5 percent), account for a significant percentage of a cell phone's mass.[28] Organisations like MakeITfair are pushing the electronics industry to extend supply chain management to the extractive source from which the metals are then inserted into the supply chain.[29]

Consumer-facing producers of jewellery face similar pressure to create supply chain transparency. The jewellery sector has long been known to be a major driver for precious metal extraction [30], and as noted above, is perhaps one of the most ancient use cases for precious metals. The sector has responded by applying global certification requirements to the supply chain created by the Responsible Jewellery Council (RJC) and the European Commission[31] for industry participants.

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26   Principles for responsible metals supply to electronics Young, Steven B; Fonseca, Alberto; Dias, Goretty. Social Responsibility Journal; Bingley Vol. 6, Iss. 1, (2010): http://dx.doi.org/10.1108/17471111011024595 p. 4
27   Id. at 5
28   Id. at 6
29   Id. at 8
30   Id. at 6
31   The Fine Jewellery Industry: Corporate Responsibility Challenges and Institutional Forces Facing SMEs - Carrigan, Marylyn; Mceachern, Morven; Moraes, Caroline; Bosangit, Carmela. Journal of Business Ethics: JBE; Dordrecht Vol. 143, Iss. 4, (Jul 2017): 681-699. DOI:10.1007/s10551-016-3071-4 p.5
32   See. https://www.responsiblejewellery.com/chain-of-custody-certification/
33   Responsible Jewellery Council Chain-Of-Custody (COC) Standard December 2017, available at https://www.responsiblejewellery.com/files/2017-RJC-CoC-Standard.pdf p. 6 See. Section 1.1

In March 2012, the RJC launched a Chain of Custody (CoC) certification process for the precious metals supply chain focusing on gold and platinum group metals.[32] The CoC standard incorporates the OECD precious metal supply chain due diligence and know-your-counterparty guidance. [33]

The RJC CoC standard, like the standards offered by the LBMA and other industry organisations, creates a basic framework that imposes source tracking/tracing and extracted/recycled metals identification and control obligations. [34] The CoC standard depends, much like the OECD guidance standard, on issuing chain-of-custody documentation and offering the documentation as proof of compliance.[35]

Nation states are also imposing compliance obligations—the United States, via the Dodd Frank Act ("the Act"), has regulated the jewellery industry's ability to source tin, tungsten, tantalum, and gold. [36] The Act prohibits sourcing from designated conflict actors in the Democratic Republic of Congo (DRC).[37] Jewellery companies must demonstrate due diligence and third-party verification to comply with the Act when their supply chains touch the DRC.[38] The European Commission has, since 2014, been working on similar regulatory structures. [39]

True and Meaningful Compliance

The proliferation of sources of compliance burden on downstream producers continues to expand exponentially. What is also clear is that the majority of these regulatory structures place the burden on the affected industry to create the systems to produce full and actual compliance. Karuschain functions as the system and platform that industry can integrate into their compliance systems to offer a meaningful path to true compliance via tracking and tracing. A meaningful path to true compliance is crucial, as UNICRI notes that companies that are members of the LBMA, RJC CoC, and related groups are alleged to have failed to comply with their own compliance regimes in Colombia and the DRC, thereby sourcing conflict/criminal gold.[40]

Karuschain will be a key part of creating meaningful compliance and targeted transparency for participants and users of the precious metals supply chain. As Karuschain is integrated as a platform, it has the potential to assist in the coordination of the entire industry's effective[41] corporate responsibility and compliance programmes. The value of the Karuschain platform for storing of the previously opaque data locked away in the current system of company data silos will also increase with time. Nation states will be able to, with industry coordination, implement real-time auditing for regulatory bodies. Industry participants in the ideal scenario will begin to open up access to the data stored on Karuschain as the utility for compliance is proven.

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34   Responsible Jewellery Council Chain-Of-Custody (COC) Standard December 2017 p. 7-10
35   Id. at 10
36   See. Carrigan et al. at p. 14
37   Id.
38   Id.
39   Id.
40   UNICRI Strengthening the Security and Integrity of the Precious Metals Supply Chain; p. 70 available at http://files.unicri.it/PM_draft_onlinev. pdf
41   Effectiveness of these programmes is said to rise exponentially when entire industry sectors have the opportunity to coordinate. See. Carrigan et al. at p. 5

Karuschain Platform Adoption Challenges

The challenges facing Karuschain stem from the complexity of the global precious metals trade and the inertia of current industry practice. Once metals are extracted, they are treated like homogeneous commodities by the market. This fact, and the metal mixing that occurs in the supply chain, can lead to the inability to determine the metals source.[42] The market can be understood as a giant global commodity pool, fed by streams from initial extractors and recycled metal producers, which circulates freely. At the same time, buyers all over the world remove metal from the pool based on price considerations, not on the source. [43]

Furthermore, as noted above, some metals (like gold) are perpetually recycled as the capture of useable gold waste/by-product (scraps etc.) has value after the initial creation of the gold-based output, leading to the loss of identifying the source for the commingled gold and creating a key challenge to both the tracking and tracing of precious metals.

The precious metals industry currently does not share data within itself on a meaningful basis, outside of some industry associations and government-mandated disclosures. It depends on secrecy to protect its margins, including contract confidentiality and non-disclosure.[44] It is clear that the industry does not have the current incentive or the desire to open its production or supply chain data to public scrutiny. The fundamental risk to the later phases of the Karuschain project is the possibility that the industry will refuse to open its data to the greatest number of possible platform end users.

Platform Adoption Phases

The phasing of the Karuschain project reflects what the industry is today as much as what it will be in the future. The foundation of the Karuschain project, and phase one of its implementation, is to become the compliance platform of choice for both upstream and downstream supply chain participants. It is not necessary, at phase one, for the Karuschain to map the entire supply chain/global pool of available precious metal or be connected to every major market participant or source of metal—and it is not our goal to do so.

An upstream producer who wants to lessen its compliance burden may connect to the Karuschain platform and decide to track its output and store the data set it deems to meet its unique compliance obligations in flexible fields provided by the platform. As each new upstream producer connects to Karuschain, it can decide which other industry participants can use the data (and what data) it stores on-chain to trace backward on the supply chain.

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42 Young, S.B., Dias, G., Fonseca, A. and O'Keefe, M.S. (2008)
43 Id.
44 Id.

In the beginning, the platform will allow the industry to stay as confidential and siloed as it is now. The incentive to share data to meet the tracking and tracing requirements of the OECD guidance and other compliance regimes will increase, and data will begin to flow between upstream producers facilitated by Karuschain's ability to manage on-chain data sharing. Mini-consortia of upstream producers sharing trackable and traceable data that they determine is of the highest utility (as the platform itself is agnostic to what data is shared between users) will form and flourish as it will form the basis for true compliance with global regimes. Phase one will work with recyclers who follow the OECD guidelines as refiners. Downstream producers will have access to commingled gold or other metals whose source met due diligence tracking/sourcing requirements (segregation by source, with clear identification systems at a minimum).

Downstream participants have a clear incentive to connect to Karuschain to meet their compliance and CSR obligations as the available pool of data and upstream producers increases for tracing/cross-checking purposes. They will, as major buyers of the output of upstream companies, exert pressure to open up data flow from upstream in order to facilitate source tracing.[45] The demonstrable success by both upstream and downstream participants in meeting their compliance obligations will drive data sharing, platform use, and industry end-user acquisition. At the end of phase one, the wider industry will become comfortable with utility-based consortia data-sharing for compliance. In phase two, they will begin to share production data with each other in order to gain a competitive advantage.

Phase three of the Karuschain platform will begin once wider industry participation hits critical mass and participants become comfortable with data sharing. In phase three, new users will come from the metals trading/consulting sector and governments. By this time, some industry participants will see the value in releasing real-time anonymous production data via Karuschain. They may also see the benefit of allowing real- time audits of their compliance obligations by government auditors on the platform.

Real-time production data will be of great value to the global precious metals market. It is during phase three where Karuschain will have the greatest effect on the pricing of metals and the largest non-industry-centric user base. At the end of phase three, Karuschain will be close to end-to-end supply chain tracking, while also providing the data to show beneficial ownership of post refiner investment grade products.

The Karuschain platform will be built on a foundation of a compelling use case in the present and in the future will evolve into an industry driven ecosystem supporting the greatest possible transparency in the precious metals supply chain/market.

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45   Principles for responsible metals supply to electronics (2010) - Young et al.

Technology Overview
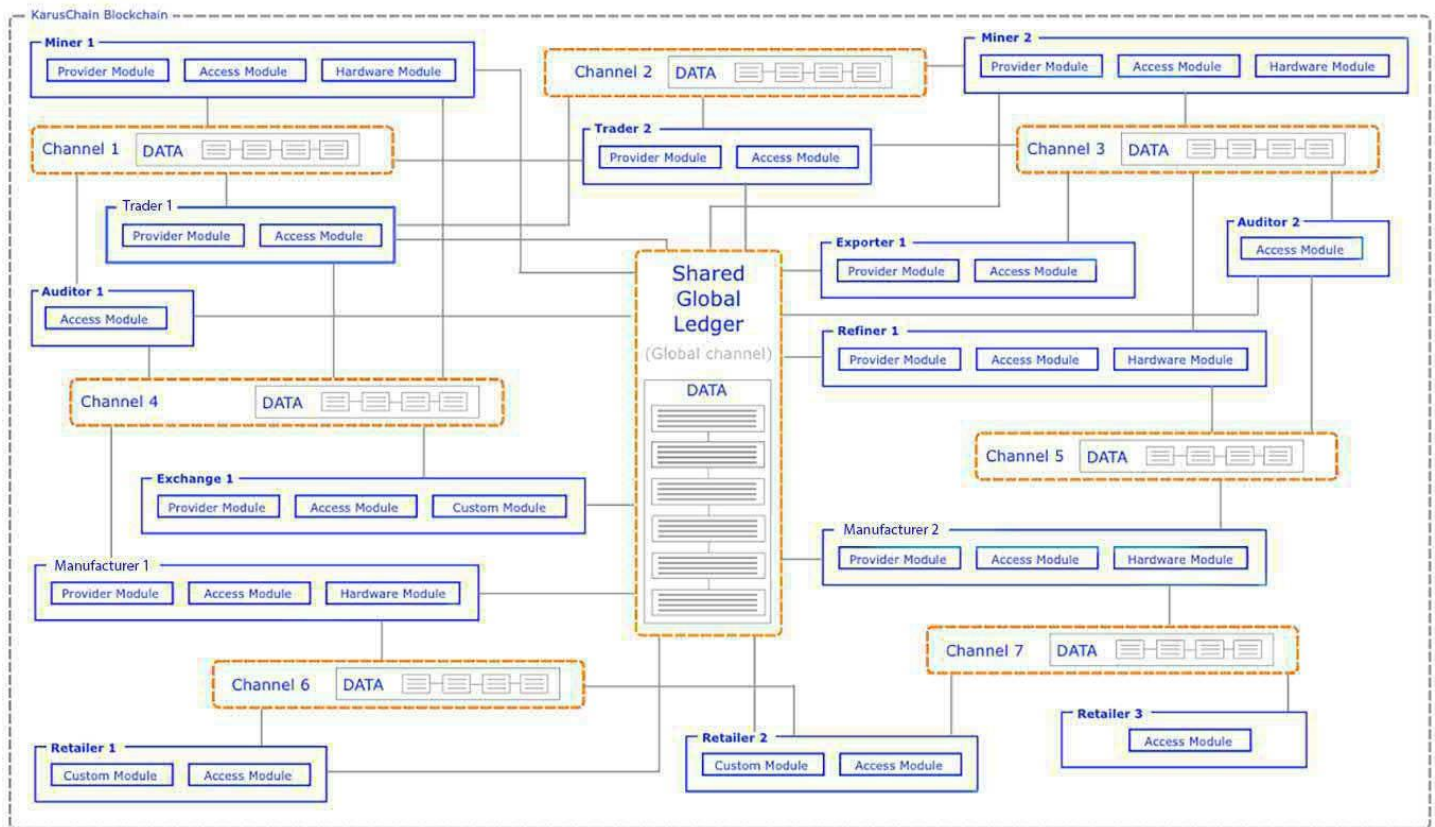
The Karuschain platform uses the Hyperledger software family, our implementation of sophisticated smart contracts (chaincode), and the management of key data flows from legacy systems and innovative hardware throughout the precious metals supply chain. This section provides a detailed breakdown of each of these systems and how they function together to unify, protect, trace, and track the precious metal data flows from the greatest number of supply chain participants on the Karuschain platform.

Hyperledger Overview

The Hyperledger project launched in 2016 with contributions from its 30 founding corporate members. [46] Hyperledger Fabric is a codebase of the combined work of IBM OpenBlockchain, Digital Asset and libconsensus created by Blockstream.[47] The Hyperledger design philosophy is fundamentally oriented around flexible implementation for the enterprise user. [48] Fabric, like all Hyperledger projects/frameworks, is modular, highly secure, interoperable, cryptocurrency-agnostic, and complete with APIs. [49]

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46   https://www.hyperledger.org/about
47   Id.
48   Hyperledger White Paper V1.1 published August 2018, pg. 10 available at https://www.hyperledger.org/wp-content/uploads/2018/08/
      HL_Whitepaper_IntroductiontoHyperledger.pdf
49   Id.

This design philosophy and its technical implementation are essential to Karuschain's ability to attract and retain a broad group of users across the precious metal supply chain. It also allows for the elimination of integration friction, a critical component to integrating the diverse systems in use in all parts of the supply chain into a cohesive foundation of the Karuschain platform. This section gives an overview of how each of the above Hyperledger technical philosophies enables the Karuschain platform. [50]

- **Modular**—The core Hyperledger system is based on common, reusable, modular components. This enables the Karuschain developers to upgrade or change components without disrupting the operation of the system as a whole. Furthermore, as Karuschain's functionality and user base increase over time, the modular components can be combined to meet emergent friction points and/or the implementation of innovative platform solutions.

- **Interoperable**—The smart contracts and applications created for the Karuschain Hyperledger system are portable. This means that Karuschain could migrate to a competing protocol that is a better fit for platform performance.

- **Cryptocurrency-agnostic**—Hyperledger is not built around a native token or coin. It is built to facilitate the use of a specific custom token for Karuschain—the Karus utility token (KRS).

- **Complete with APIs**—Hyperledger APIs are capable and robust to a degree that allows Karuschain to support interoperability and integration across a wide swath of systems. This is essential to promoting the Karuschain platform because the APIs drive ease of adoption. The smart contract chaincode API is especially beneficial as it facilitates the integration of third parties.

The Hyperledger Fabric[51] system allows for its components to be plug-and-play, including consensus and membership services. The business rules/logic of the system are in smart contracts called chaincode.

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[50] Id. at Pg. 10 and 11 for all the core concepts mentioned.
[51] Id. at 23

The Fabric Ledger Overview[52] :

> *...the ledger is the sequenced, tamper-resistant record of all state transitions in the fabric. State transitions are a result of chaincode invocations ('transactions') submitted by participating parties. Each transaction results in a set of asset key-value pairs that are committed to the ledger as creates, updates, or deletes.*

> *The ledger is comprised of a blockchain ('chain') to store the immutable, sequenced record in blocks, as well as a state database to maintain current fabric state. There is one ledger per channel. Each peer maintains a copy of the ledger for each channel of which they are a member.*

The Karuschain platform smart contract layer will be built on the following architecture:

Source[53]
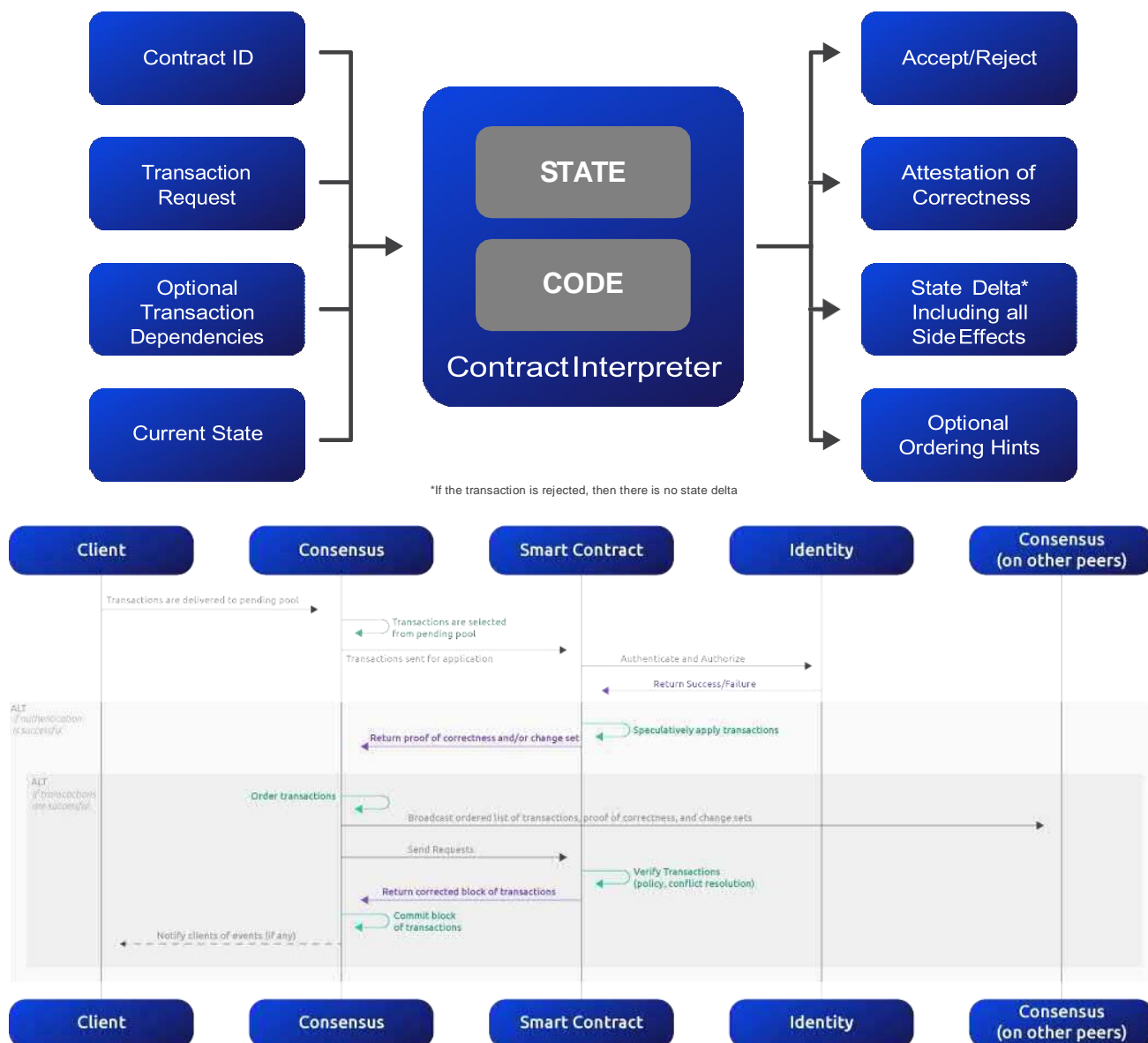
*If the transaction is rejected, then there is no state delta

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The smart contract layer in Hyperledger is programmed in chaincode. Chaincode is a set of instructions for interacting and operating with an immutable or persistent database. It can be written in any language (with a preference for GO). Chaincode is deployed to a specific node that allows it to have a certain role in the Karuschain platform.

A key factor in the decision to use Hyperledger Fabric ("Fabric") for the Karuschain platform is Fabric's robust privacy features that protect confidential information, which allows users to protect the key data that enables regulatory compliance. Fabric employs an immutable ledger on a per channel basis along with chaincode that can modify the state of assets as they currently exist. [54] This means that each ledger and its information can be shared on a system-wide basis, shared with a designated set of participants in a common channel (mini consortia), or kept private in a separate channel. If the participants wish to share data in the future, then chaincode can be installed on a peer to allow it to interact with a ledger. [55]

Furthermore, a supply chain participant, a group of participants, or entities within a corporate family (parent, subsidiary etc.) can use a private data collection to segregate this information to a database logically separate from the channel ledger and, therefore, private. The option exists to encrypt values within the chaincode thereby, write encrypted data to the ledger.[56]

Another key advantage of Hyperledger Fabric is its mechanisms to ensure the integrity of its smart contracts versus malicious attackers.[57] A common attack vector is a denial-of-service attack (DoS). The Fabric-based system relies on its strong identity management and its access controls which allow it to quickly identify an unknown actor as malicious. If a malicious actor is able to gain access to the network via spoofing and launches a DoS attack, then the source of the attack can be easily identified, quarantined, and removed. [58]

Fabric protects its smart contracts by allowing the developer to isolate the execution environment by applying partitions and containers to the smart contract layer. This safeguard helps mitigate the risk associated with malicious or erroneous smart contract codes. Fabric has mechanisms that ensure that no smart contract can overwhelm network resources.

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54   See. https://hyperledger-fabric.readthedocs.io/en/release-1.2/fabric_model.html#ledger-features "Section on Privacy"
55   Id.
56   Id.
57   Hyperledger Architecture, Volume II Smart Contracts pg. 7
58   Id.

Karuschain Platform Blockchain and Smart Contract Implementation

The following is an in-depth technical description of the Karuschain specific implementation of the Hyperledger Fabric blockchain. It describes how the participants on the Karuschain platform will use the system, share/protect supply chain data, and facilitate compliance.

Karuschain Core Concepts

Blockchain Participant Organisation (Supply Chain Participant)

Each participant on the Karuschain blockchain will be a functional entity in the blockchain ecosystem.

Participants will include and enable:

- Secure network environment
- Membership Service Provider (MSP)
- Nodes

Participants will be able to manage and deploy smart contracts (chaincode) provisioned by Karuschain to their nodes. The system will allow for custom smart contract integrations which will allow custom business logic to be implemented in the Karuschain platform ecosystem.

Channels

Hyperledger Channels (Channels) are the core of the Distributed Ledger Technology (DLT) implementation. The Channels represent an immutable store of information on a blockchain ledger where data is captured in the form of persistent transactions (irreversible transactions). Karuschain will allow participants to create their own channels between each other to enable data transfer and data storage capabilities in private ledgers. Private ledgers are key to Karuschain's ability to facilitate transparency, compliance, and audits while maintaining data confidentiality.

In parallel with the use of private ledgers for participants, Karuschain will have a centralised global ledger where the platform ecosystem will host important operational platform data. This will allow the core of the Karuschain platform to function without storing on its global ledger any of the key/confidential industry data stored in the private ledgers of blockchain participants.

Amending / Correcting Transaction Data

One of the principal values of blockchain technology is data persistence and the immutability of actions taken on the chain recorded over time. However, the Karuschain platform understands the business necessity of amending previous data points that are erroneous.

A participant may amend the data point/transaction record it controls to reflect the correct data subject to proof/consensus. The value of data persistence, in this case, is that all the states of the data will be recorded and stored on the blockchain.

The previous erroneous state will be available for review and it will be clear that an approved change has been made. Participants with the access rights to the data will be able to follow the chain of amendments back to the original transaction. This is accomplished by adding another transaction which will be structurally placed in the blocks after the initial transaction. The data structure will highlight the amendment and all future amendments or state changes will be stored in the blockchain.

Chaincode (Smart Contracts)

In the Karuschain ecosystem, each transaction is committed to a shared or private channel via instances of chaincode. Karuschain will allow deployment of the following generic chaincode modules to participants nodes:

- Access Module
- Provider Module
- Hardware Module

In the diagrams below, the Custom Module is used by some participants in the platform ecosystem. The complete technical process of the integration of custom modules is outside of the scope of this paper. However, it is important to note that the flexibility of Hyperledger chaincode is limitless and Karuschain can implement or provision implementations of custom logic for participants to extend existing ecosystem functionality to benefit other participants and the data exchange between them.

Access Module

Each participant will have access to a set of private channels and a global channel. In order to read information from channels, participants will have an access module deployed to one of their nodes. Data access process will be provisioned by Hyperledger Certificate Authority (CA) in combination with the Membership Service Provider (MSP) engine. The Access Module will not be able to commit any transactions to channels but rather only read the recent channel state.

Provider Module

The Provider Module will have access to committing transactions to the set of channels that a specific participant has access to.

Hardware Module

To ensure that mining hardware operates in alignment with the blockchain data flow, a hardware module forms a bridge between installed hardware on-site and the blockchain ecosystem. It will automatically commit transactions to the channel via the Provider Module.

Participation Fees

To participate in the Karuschain, permissioned blockchain participants will have to pay ecosystem fees in the form of Karus tokens (KRS). The proceeds will be used for infrastructure maintenance, platform development, and business administration. For this purpose, Karuschain will distribute an ERC20 token (KRS) in proportion to contributions made during the offering period.

KRS tokens are required for every participant organisation's initial onboarding / setup into the platform ecosystem. KRS tokens will also be charged as a monthly fee to operate on the platform on a tiered basis determined by an organisation's channel volume.

Karuschain Channels

Procedure to Establish Channels

As channels serve as the core communication mechanism inside the Karuschain blockchain there is a method to establish communication links between organisations while keeping a high level of privacy between connected parties.

Channel state and transaction history are available only to organisations that were allowed to join the channel by the mutual agreement of all pre-existing members.

Any organisation can request a unique channel creation between itself and any number of organisations present in the Karuschain ecosystem. A unique restriction applies to the channel creation procedure where channel creation is restricted to prevent the creation of a non-unique channel that already exists in the ecosystem. This prevents an innocent or malicious attempt to duplicate a channel (a point on the supply chain or set of organisations etc.).

For example, if channel ORG1-ORG2 already exists, neither ORG2 or ORG1 can create a new channel ORG1- ORG2. The same restriction applies to channels with more than two participants.
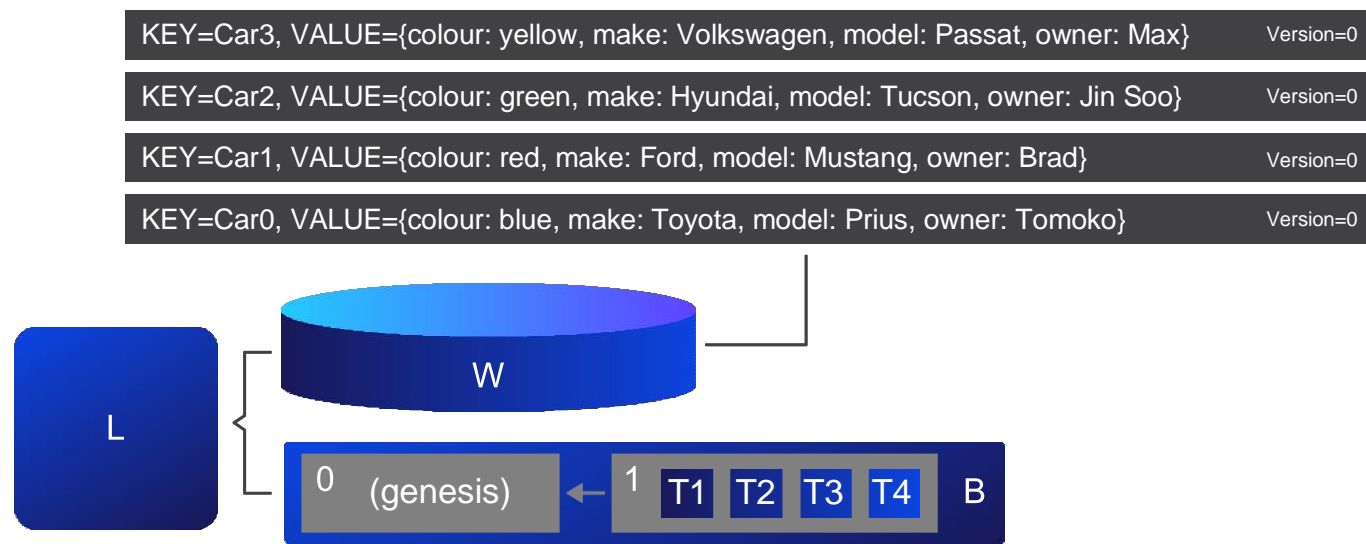
Channel Transaction Format

KEY=Car3, VALUE={colour: yellow, make: Volkswagen, model: Passat, owner: Max}	Version=0
KEY=Car2, VALUE={colour: green, make: Hyundai, model: Tucson, owner: Jin Soo}	Version=0
KEY=Car1, VALUE={colour: red, make: Ford, model: Mustang, owner: Brad}	Version=0
KEY=Car0, VALUE={colour: blue, make: Toyota, model: Prius, owner: Tomoko}	Version=0

Diagram Reference[59]

The visual vocabulary expressed in facts is as follows: The ledger, L, comprises a world state, W and a blockchain, B. W contains four states with keys: CAR0, CAR1, CAR2 and CAR3. B contains two blocks, 0 and 1. Block 1 contains four transactions: T1, T2, T3, T4. [60]

The example diagram focuses on a Hyperledger Fabric ledger in a Channel focused on car ownership. In the Karuschain, an organisation's Channel Ledger Transactions would reference precious metals, but the transaction format would be the same. The Ledger contains a world state and blockchain. The world state contains states with keys. The B blockchain contains two blocks. The Block 1 transactions refer to key value data about a specific precious metal output or input. The version number zero indicates to a reader of the data that the transaction data has not been updated since creation.

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59   https://hyperledger-fabric.readthedocs.io/en/latest/ledger/ledger.html#transactions Example Fabric Ledger
60   See reference above Example Fabric Ledger

Basic Implementation Examples & Organisation Lifecycle

Custom Data Fields for Compliance User Base

A flexible transaction structure will allow ecosystem participants to create custom fields for compliance data and input them into immutable transaction records. Although there is no limit on data types, the platform will suggest the format that inherits the original transaction structure.

In the long term Karuschain will provide a compliance standard data type for custom fields that will be available on the platform.
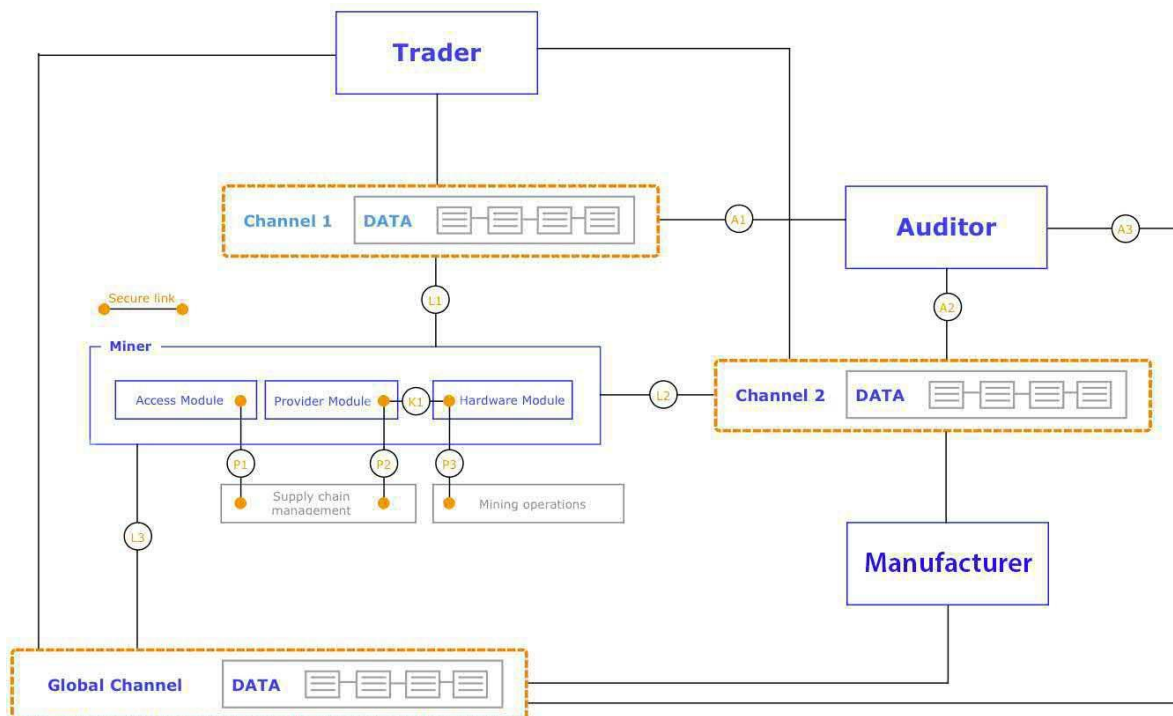
Integration points

- P3—Mining operations connecting mining hardware to store mining proceeds on a blockchain using Hardware Module

- K1—Hardware Module sends data to Provider Module to store on selected Channels. Data is being captured and stored in immutable storage.

- P2—Supply chain management is providing blockchain with data related to operations with inputs/outputs of mining proceeds. For example, when raw material is sent to the refiner supply chain, this data is sent to channels that contain related raw material as input. The receiving party, by connecting to a specific channel, can rely on the immutability of the data. This is also where legacy software/database integration takes place.

- P1—Supply chain management is accessing data on the blockchain via an Access Module. When new transactions appear on the blockchain, the logistic department will be notified via the Access Module.

Access Points

- L3—Miner's metadata, its modules metadata and channel relations are stored on the Global channel
- L1—Miner is connected to shared channel with Trader Organisation, where it is committing transactions related to operations where materials are traded between Miner and Trader Organisation.
- L2—Miner is connected to shared channel with Manufacturer, where it is committing transactions related to operations where materials are sent to Manufacturer.

Audit Points

- A3—Auditor learns about existing channels between Miner and other organisations. By request Auditor is granted access to channels.
- A1, A2—Auditor has read-only access to transaction data present in selected channels to verify its contents.

Dataflow from Partners and Participants

At the beginning of phase one of Karuschain, most of the data from supply chain participants will flow from legacy systems. Key partners at the refiner/smelter level will use innovative hardware systems to scan upstream outputs before they head downstream. As the participant/user base increases over time data flow integration is a crucial part of the development of the platform.

Karuschain Data Flow Diagram v1.0
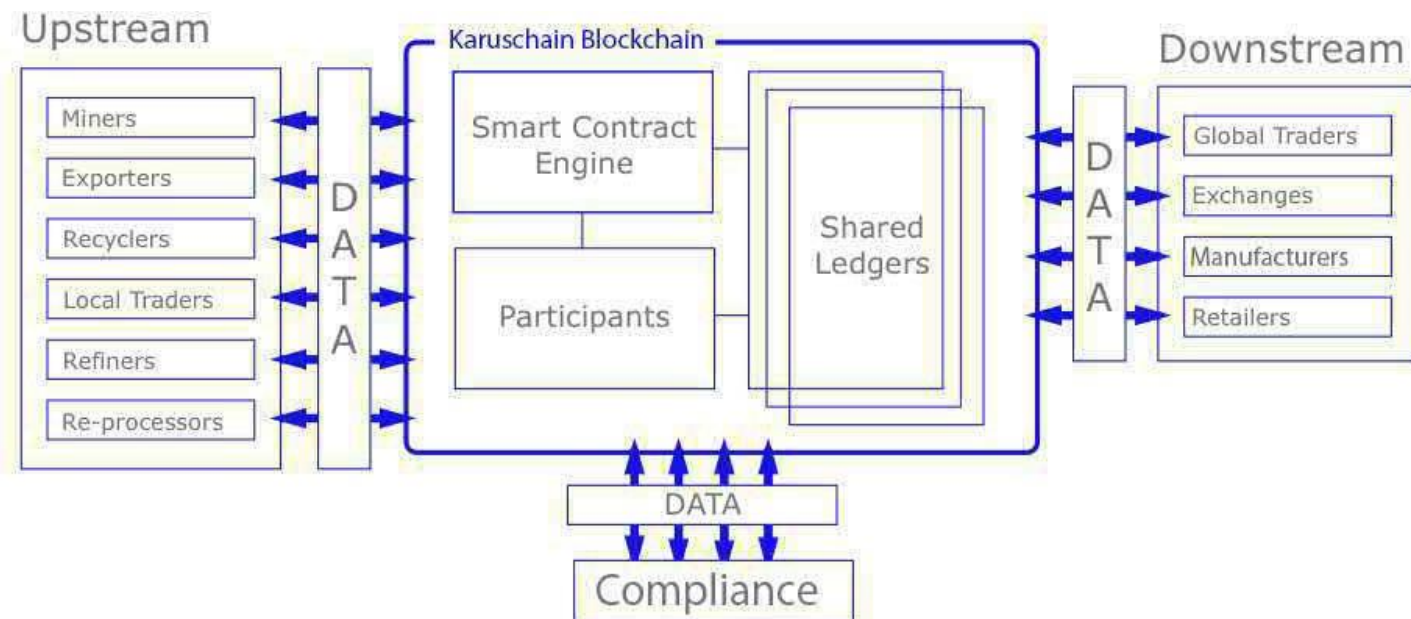
Tokenomics

Defining Tokenomics

Tokenomics, also referred to less frequently as "token economics" is the application of economic theory to the tokenization of a blockchain-based micro-economy. Given the new nature of the underlying technologies involved, many crypto projects have substituted simple accounting information in place of proper tokenomics. The purpose of this section of the Karuschain whitepaper is to provide one such example of a robust tokenomic analysis by explaining the modelling method used, key assumptions, details about the macro precious metals market, and the predicted micro effects all of this has on the KRS token.
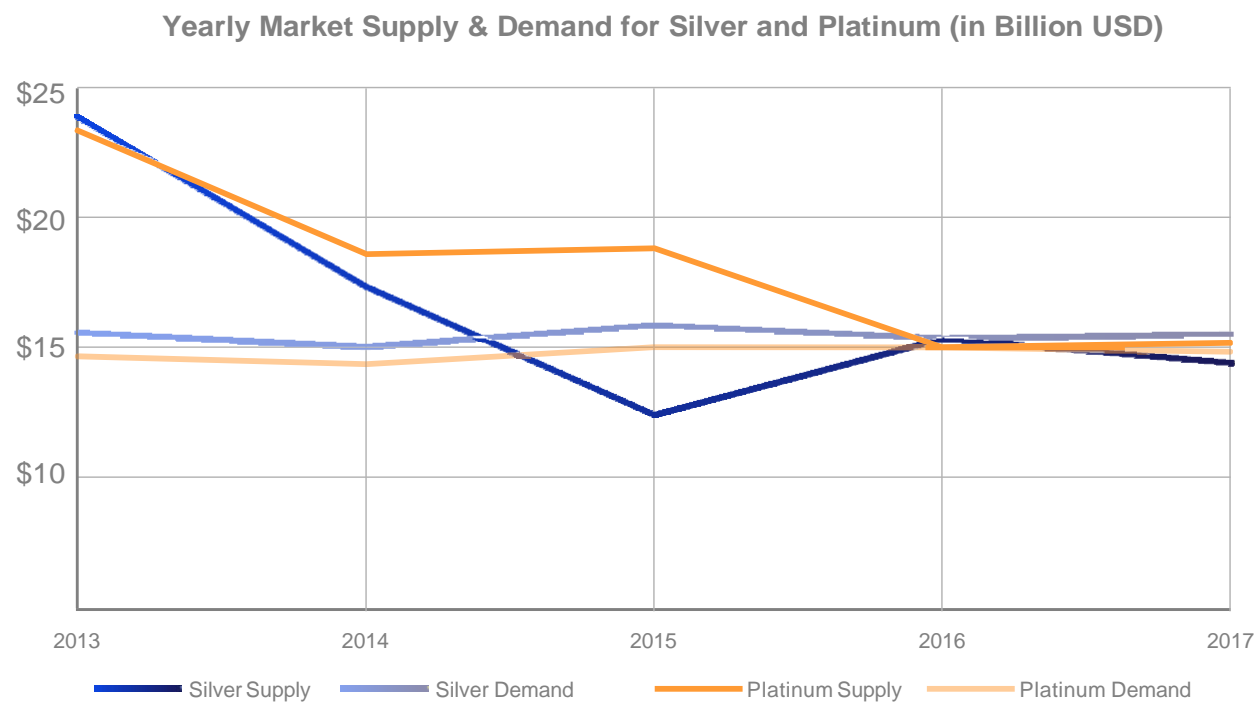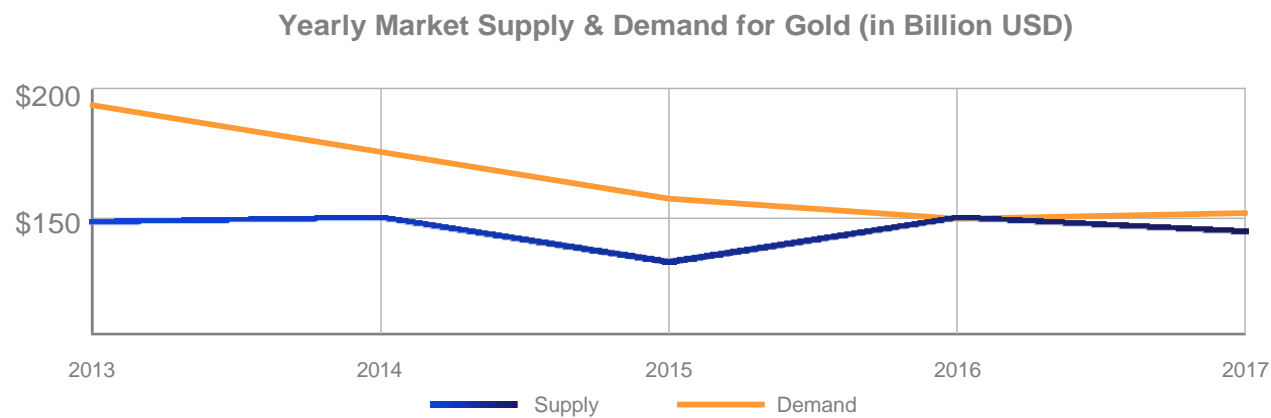
Unchartered Valuation Waters

Early attempts at valuing tokens, regardless of their type, failed because they almost unanimously used traditional valuation methods from the world of finance. Some clear examples of this were the Capital Asset Pricing Model (CAPM) and the use of Discounted Cash Flow (DCF) approaches, neither of which make sense for pre-revenue ventures early in their product lifecycle. The tendency of approaching token valuation like a financial instrument can be further seen in the first successful valuation standard adopted for tokenomics, namely the INET approach pioneered by Chris Burniske.

INET was the name Burniske gave to his fictional crypto project serving as the worked example and as a proof of concept. The reason for the INET's success is that it moved beyond viewing tokens strictly as a financial instrument and added the additional insight of the token as the money supply of a micro-economy. The INET's inclusion of the equation of exchange, generally accepted accounting principles (GAAP), and the *Pro Forma* reality of Karuschain's future revenue streams are why INET was selected as the modelling method for the KRS token.

Market Snapshots & Comparative Statics

As a modelling approach, INET is full of "subjective" assumptions. However, many of the things that are assumed for the model are knowable through agile market research methods such as secondary research, competitive intelligence, expert interviews, and public data audits. Each of these methods was used to find as much existing information as possible for setting any of the parameter values tied to subjective assumptions in the tokenomics model of KRS.

Global Supply and Demand for Precious Metal

Yearly Market Supply & Demand for Gold (in Billion USD)

Yearly Market Supply & Demand for Silver and Platinum (in Billion USD)

Among the most critical model parameters to estimate was the total addressable market (TAM) and its subsets: the serviceable available market (SAM) and the serviceable obtainable market (SOM). Using global supply and demand data for the precious metals markets these were found to be $180BN for the total addressable market, $72BN for the serviceable available market, and $21.6BN for the Karuschain's serviceable obtainable market as of 2018. While the precious metals market has reached a clear steady-state, there is still year-over-year growth so using the trend in markets over the last 5 years as a model for the next 5 years, Karuschain's serviceable obtainable market will grow to $24.8BN by 2023.

TAM: $207 Billion

SAM: $82.8 Billion

SOM: $24.8 Billion
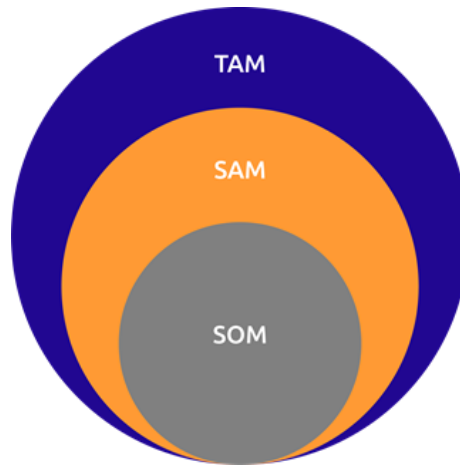
Some of the other assumptions built into the tokenomics model are related to the operation of the platform and team behind the KRS token. To quantify this data the Karuschain business model was put through both a strengths, weaknesses, opportunities, and threats (SWOT) analysis as well as the Business Model Canvas generation process. From these formalized outputs, the operationally-driven subjective parameters were set within the KRS tokenomics model.

Important Modelling Assumptions

Reducing subjective uncertainty through research has diminishing returns, so parts of the KRS tokenomics model are based on working hypotheses that will be tested with real data over time. Until then, understanding each of the simplifying assumptions is necessary for correctly interpreting the KRS tokenomics model and its predicted values.

Assumption #1 (Steady-State) the supply and demand of the precious metals market have converged to their general equilibrium.

Assumption #2 (Past As Future) the last 5 years of the precious metals market data is a good predictor of the future 5 years of growth.

Assumption #3 (Sans Shocks) there are no major shocks to the precious metals market within the window being considered (asteroid mining would be one such possible shock for example).

Assumption #4 (Regulatory Rates) regulation costs are a fraction of the global market value of precious metals and can be approximated at 12%.

Assumption #5 (HODLogic) holding KRS only makes sense if users believe the future value of the token will significantly increase, and this should be discouraged.

Assumption #6 (Velocity) the number of transactions in the upstream to downstream flow per year is approximated by 5.

Assumption #7 (Discounting) the discount rate reflects the risk of any new crypto venture balanced against the solid business model Karuschain has and the mature (mandatory) compliance market they service.

KRS Tokenomics Valuation
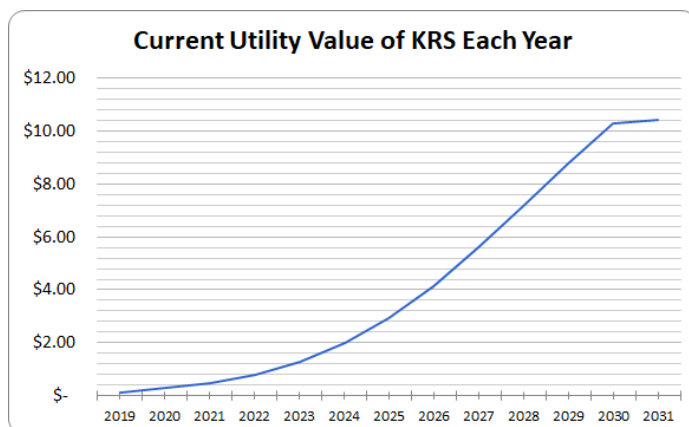
An obvious part of any tokenomics model is its clock, and for KRS there are actually two: the next 5 years (when rapid predicted growth in customer acquisition kicks in) and until 2031 when the platform has matured in its product lifecycle. The true "cost" of KRS is this long-term steady-state, which assumes Karuschain captures all the regulatory compliance costs currently paid within the precious metals market. This gives a long-term cost of $19 per KRS. However, cost is not the same things as the current utility value or the current market value, both of which have specific definitions and important differences. The current utility value (in 2019) of the KRS token is $0.12 and the discounted expected utility value is $0.52. This means the IEO price for KRS of $0.10 offers an early adopter premium of 20% relative to its current utility value as predicted by the tokenomics model.

Finally, one of the unique attributes of being a completely quantified micro-economy, like the Karuschain platform, is that the blockchain ledger contains the collective memory of the system. In real-world terms this means that over time many of the subjective assumptions built into the KRS tokenomics will become well-known parameters. Through continued application of agile market research and cutting-edge data science, KRS will be forecasted to bring stability to the token price as it increases over time with the increasing global demand for precious metals and the regulatory costs of complying when participating in these markets. Modelling the value of cryptocurrencies is a relatively new process. When considering the Karus token (KRS), it was clear that INET, one of the most developed asset pricing methodologies that blends traditional valuation approaches with the new realities of the cryptocurrency market, offered the most insight.

Karuschain Initial Exchange Offering (IEO)

The Karuschain team is launching a token offering in order to fund the continual development and administration of the Karuschain platform. The price, volume, price index, tariffs and market caps show correlation between BTC price both in and outside of the US and can be used (with initial caution) to forecast potential revenue. The token offering will be the ERC20 based Karus token or (KRS). KRS, as a utility token, will drive the platform ecosystem forward and will be the non-fiat fee settlement mechanism.

## KRS Token Offering Terms

- The total supply of KRS tokens will be 500,000,000.

- Only Bitcoin and Ether will be accepted in exchange for KRS tokens.

- Phase one of the offering the Private sale has been completed and KRS tokens valued at USD 1.9 Million, the equivalent of 37,603,240 KRS tokens have been sold to the first contributors at a 50% discount.

- Phase 2 of the offering the Public sale will commence on officially announced exchanges.

- The Hard Cap for the offering is USD $10 million.

- All unsold tokens will be returned to the token reserve at the end of the offering.

- The tokens will not be available to citizens and permanent residents of the United States, Japan, and Canada.

Token Economy (KRS Utility Token)

The KRS token will be the sole means of paying for services on the Karuschain platform. KRS will be used by platform participants to settle fees related to the onboarding of new organisations. KRS will also be used by all participants to settle the monthly Karuschain platform access fee. The platform access fee will be set at a minimum monthly fee that will increase on a progressive basis based on an organisation's amount of channel volume.

IEO Proceeds

The Karuschain platform is an ambitious project. The team welcomes the contributor support needed to launch and maintain the platform. The proceeds of the offering will be essential to platform development and maintenance. The following infographic shows the allocation of proceeds to ensure that the Karuschain platform is able to thrive.
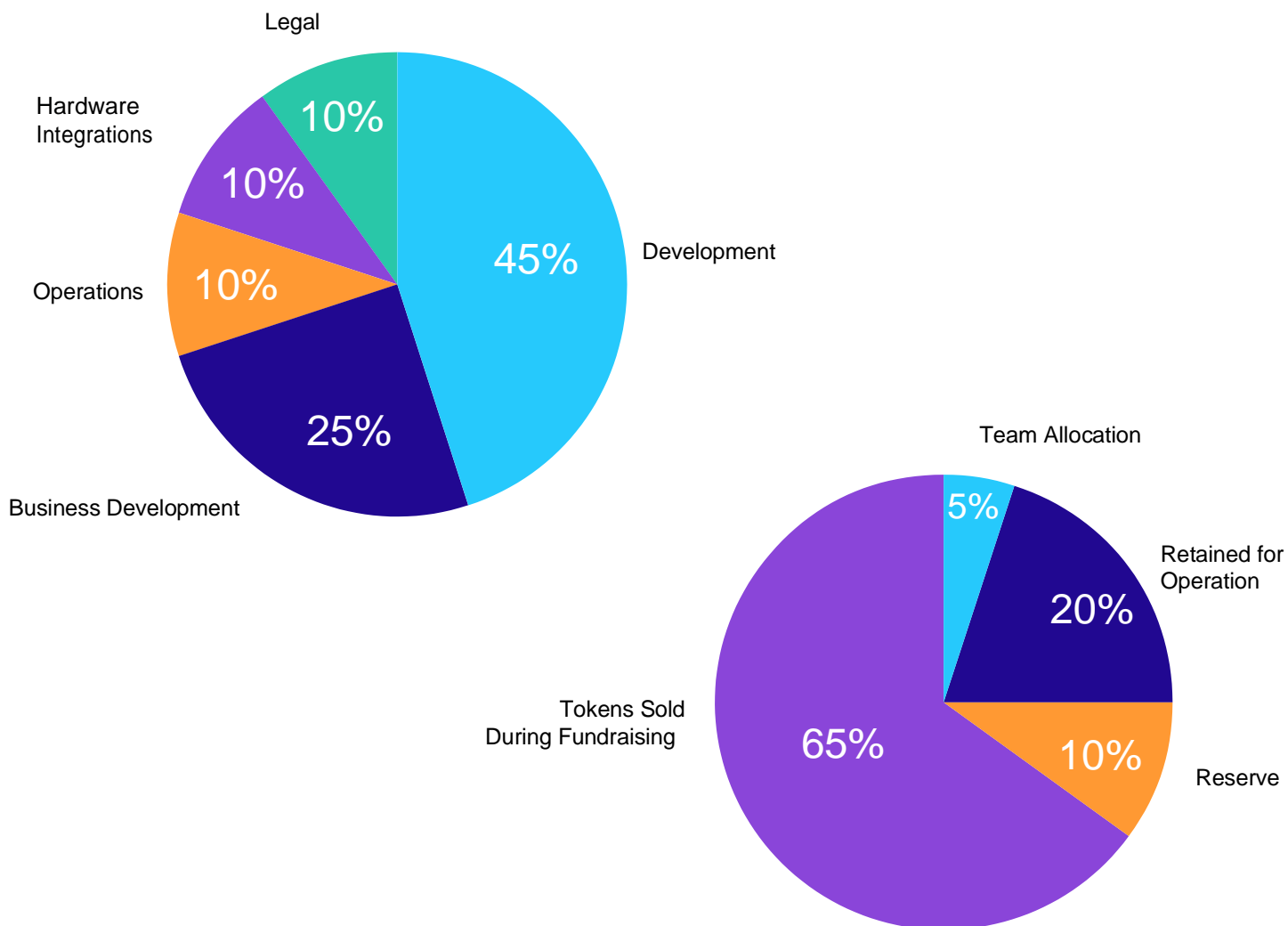
Development 45 percent

The largest allocation of proceeds will ensure that the Karuschain platform is developed at the highest standard on a timeline that facilitates launch and coordination / collaboration with key industry partners. Karuschain will engage a full team of experienced expert blockchain developers who specialise in integration with legacy systems and building Hyperledger-based systems.

Business Development and Partnership 25 percent

The lifeblood of the Karuschain platform is its potential extensive user base. The platform is designed to be used by every participant in a global supply chain. A large part of the proceeds of the offering must go to building and maintaining a dynamic group of user acquisition specialists. This team will be responsible for bringing the core value proposition of the Karuschain platform to the widest possible audience. They will evangelise, educate, and on-board users.

Karuschain will seek to build this team with members with technology backgrounds alongside those with industry experience in precious metals extraction, trading, and utilisation (electronics, jewellery etc.). Our executive team comes from these industries and has the connections to recruit the best and brightest to this crucial team.

Legal 10 percent

The Karuschain platform will work with and facilitate a heavily regulated industry. A portion of the proceeds are set aside for ongoing legal engagements and costs.

Operations 10 percent

The executive and administrative teams that will ensure the smooth running of the back office of Karuschain are allocated this portion of the proceeds.

Hardware Integration 10 percent

It will be essential for the Karuschain platform to allocate proceeds for the continual research and development of the hardware module and its integration with upstream producers at key points in the supply chain.

General Token Reserve 10 percent

The token offering is comprised of sixty five percent of the total supply of KRS tokens. The bulk of the remaining thirty-five percent of KRS tokens that are not part of the offering is split between the general token reserve at ten percent and strategic growth token reserve at twenty percent of remaining tokens.

The general token reserve will be used to ensure that the Karuschain company has sufficient operating capital in the event of foreseeable and unforeseen operational challenges. Market conditions can and do shift rapidly and the token reserve will function as a means to mitigate this macro risk. The reserve will be accessed only in situations where the executive team determines that the company faces an existential threat.

Strategic Growth Token Reserve 20 percent

The strategic growth token reserve will be used exclusively to respond to market opportunities to grow the company and drive value creation. This reserve will allow the executive and management teams to respond to positive macro opportunities. For example, if the current allocated proceeds to build the business development team is inadequate to respond to skyrocketing demand, a portion of the growth reserve will be allocated to fund this expansion. Another example is the funds allocated to R&D may be too conservative. In this case the hardware module development needs an infusion of funding. An appropriate allocation from the growth reserve will be made. The Karuschain project uses the growth reserve to smooth emergent funding needs for critical expansion. Token holders can rest assured that the business acumen of the Karus executive team will lead to smart, proactive funding decisions using the growth reserve with the sole aim of extending or galvanizing growth.

Karuschain Development Roadmap

Milestones

1. **Infrastructure**
   a. Secure cloud infrastructure for Hyperledger 1.2
   b. Development infrastructure
   c. Documenting development flow & dev guidelines
   d. Health monitoring systems and automated checks
   e. Backup process & automation
2. **Hyperledger customisation & setup**
   a. Membership service provider & certificate authority setup
   b. Nodes configuration automation
   c. Global Channel setup
3. **Smart Contracts**
   a. Access Module
   b. Provider Module
4. **User interface**
   a. Karuschain management user interface
   b. User interface for organisation management
   c. UI for organisation departments
5. **API Integrations**
   a. Opening up API for legacy integrations
   b. API for 3rd party integrations
6. **Custom smart contracts**
   a. Hardware Module
   b. Custom Modules
7. **Scaling, Support, custom integrations**
   a. Scaling infrastructure
   b. Supporting clients
   c. Custom on-site integrations

Phases

Phase 1 - 12 weeks
- Infrastructure
- Hyperledger setup

Phase 2 - 24 weeks
- Smart Contracts
- User interface

Phase 3 - 24 weeks
- API Integrations
- Custom smart contracts

Phase 4 - ongoing
- Scaling
- Support
- Custom on-site integrations

Team

The Karuschain team is anchored by a core group with combined industry experience of over 270 years and who are passionate, expert, and fascinated by the way novel technology can shape the precious metal supply chain.

Richard Verkley
CEO and Chairman

Richard is Chairman and founder of Karuschain. As a serial entrepreneur and businessman, Richard has decades of experience in bringing large scale commercial ventures to market. His experience includes building international franchise organisations, implementing unique growth strategies, and successfully bringing new concepts to life in a multitude of industries. Richard has an ability to generate strong business plans with market opportunity in mind and he builds expert teams to support his vision. He is focused on applying technology to solve the environmental challenges in the mining and precious metals industries. Leveraging his experience of running a mining concern in South America, Richard has produced thought leadership in the industry, highlighting the use of technology in the sector. Some examples include: "The Transformative Potential of Blockchain in Mining" and "How Blockchain Can Ensure the Security of Gold Investments." One of Richard's current projects involve bringing a patent pending transformational technology to precious metals mining. The technology is designed to increase mining yields and integrate AI into the mining process for increased transparency. In his free time, Richard travels the world with his family and engages with his charitable organisation, Hearts of Gold

James McDowell
COO

James has over 13 years operations and finance experience working for major investment banks, such as JP Morgan, and most recently spent the last 7 years working at one of the world's largest exchanges, Intercontinental Exchange (ICE) which owns NYSE and Bakkt. He has significant new business development and operational experience working alongside technology and fintech startups and was involved in the first ever successful test of blockchain technology and smart contracts to manage the entire trade life cycle for credit default swap (CDS) trades back in early 2016. Has been an avid supporter of this game changing technology ever since.

Robert van der Zalm
CFO

Robert is the CFO of Karuschain. He has 28 years' finance management experience in Consumer Products, Speciality Chemicals, Agricultural, Downstream Oil and Gas as well as Metals Sectors. Prior to joining Karuschain, Robert was Group CFO of Noble Group, a Singaporean listed commodity trading company. Prior to that Robert was CFO of BHP Billiton's Global Aluminium business. Robert started his career at Unilever. He held a number of finance positions in Europe, Russia and SE Asia. He then joined Shell, holding several senior management positions in Finance and M&A in the Downstream business, before becoming CFO of its Gas and Power Trading business. Robert holds a Chemistry degree from Oxford University.

Bruce Wilkinson
VP of Program Management and Chief of Staff

Bruce, MBA, PMP is an experienced Business Strategist/Project Manager who specialises in leading technology-focused enterprise initiatives and project teams from inception through to completion. Bruce brings a
wealth of expertise in a range of industries to bear on each project he tackles. Experience includes complete life-cycle project management in business software engineering, business intelligence projects, implementing enterprise- level Electronic Health Records and Practice Management Systems, and projects involving large plant operations. Bruce has specialised expertise in corporate productivity, time management, and in the facilitation of positive team dynamics.

Ian Bessarabia
Country Manager South Africa

Former Head of South African Operations for ConsenSys, and a 20 year veteran of financial markets, Ian founded On the Edge, Blox for Business in 2019 as an advisory and strategic partner to financial market players, central banks and regional bodies with the purpose of improving business processes through the adoption of new gen technologies such as blockchain and smart contract solutions. Ian's keynotes and workshops combine thought-provoking content, down to earth anecdotes and practical strategies leaving participants feeling uplifted and inspired. Ian was previously a senior executive at Thomson Reuters and Business Development Manager for Sub Sahara Africa, at SWIFT. He holds a B.Com from the University of South Africa and recently obtained his Blockchain Corda Developer certification from R3. A sought-after international blockchain and crypto speaker, Ian has spoken and participated in conferences around the world. Recently invited to become a partner at Effect.Ai where Ian performs the role of South African based representative for a team of individuals who are working on creating a 'marketplace' which is committed to being an open, accessible and affordable platform for smart algorithms to operate.

Nicky Lawlor

Account Manager

Nicky's career to date spans organisations from start-up to SMEs, a European Institution and a FTSE 100 multinational. She has extensive experience in a corporate environment with a global remit. At Compass Group plc, she established and drove implementation of leading-edge Global HR projects into geographically dispersed businesses including Asia Pacific and Latin America. She played a key role in the development and global roll out of their Vision and Values, Employer Brand, Employee satisfaction measurement and Frontline training programmes. She was also involved in the implementation of Corporate Social Responsibility projects through a CSR awards programme. At the European Commission in Brussels, she spent 5 years as a contracts administrator on pan-European telecommunications projects. Other roles have included design and facilitation of business simulation training programmes in a multitude of sectors and for all levels of management for Creating Value Ltd, a niche training company. She is also a co-founder of cyberfen, a cyber risk awareness training company. Nicky is a Chartered member of CIPD and holds a MSc in Business Leadership.

Advisors

Stanislav Synko
Blockchain Technology

Stan began his career in information technology advising startup and enterprise clients on the best possible technical implementation of complex systems and building software products. Stan is an early believer in both public and private blockchain systems. His work in the area includes: helping companies integrate smart contracts on the Ethereum blockchain; architecting award-winning public and private blockchain systems with a focus on Hyperledger; expertise in secure multiple signature solutions and bitcoin wallet development; and thought leadership (Stan conducted workshops and seminars about blockchain at Harvard, Rutgers Business School, AIS Educator Conference, and dozens of events in New York and California.)

David Pierini
Blockchain Technology

David began his legal practice in Silicon Valley focusing on advising early-stage startups. He transitioned to the role of global compliance project counsel for OnRamp Systems, a financial tech startup affiliated with Cisco Systems and IBM Watson. OnRamp specialised in using machine learning to solve complex regulatory issues such as implementing Dodd-Frank and its RRP provisions for one of the world's largest banks and preparing for the transition to ASC 606 Revenue Recognition for Fortune 500 customers. He has spent time with McGuire Woods LLP and the legal department of Freddie Mac. David focuses on the intersection of legal and regulatory systems with the development of blockchain systems and smart contracts. He earned his J.D. from William & Mary and his LL.M. in Taxation from the Georgetown University Law Center.

Marc X. Ellul
Legal and Compliance

Marc has 25 years' experience as a Gibraltar lawyer. He is the Managing Partner of Ellul & Co. and heads the firm's fintech team. He is Chairman of the Gibraltar Finance Centre Council. Its objective is to promote the economic interests of Gibraltar by developing the finance center. The Council meets regularly with the Minister for Commerce, Government officials and the FSC and has an important role in shaping finance center policy and legislation. He was also Chairman of the Company Law Reform Committee which updated the Companies Act in 2014 and he formed a part of the team which drew up the AML guidance notes for Gibraltar lawyers. He now mainly practices as a corporate, funds, tax and fintech lawyer. He is actively involved in blockchain work in Gibraltar advising on the set-up of regulated cryptocurrency exchanges, and token sales (ICOs), and on the establishment of digital asset investment funds.

Luciano Pesci PhD
Economic Advisor

Luciano is an economist, data scientist, and futurist. In addition to being a highly loved professor at multiple higher education institutions, he is the founder and CEO of Emperitas, a business intelligence solution that combines data science with agile research and economic modelling.

Carl "Hank" Amon

General Counsel

Hank was a long-time partner of the international law firm, White & Case LLP, which is headquartered in New York. During his career at White & Case, he served considerable time in the firm's overseas offices. These postings took him to London, where for five years he took a leading role in the development of the Eurodollar and Eurobond markets, Brussels, where he was involved in many continental financial transactions, Prague, where he lead the firm's development of its Eastern European practice in the early 1990's, and Hong Kong, where in the 1980's he helped launch the firm's Asian markets practice. Mr. Amon has considerable experience of many different types of commercial and financial transactions, including those involving bank and project finance, mergers and acquisitions and infrastructure development. Among other projects, Mr. Amon has been extensively involved since 2000 in airport development transactions in Jordan, Saudi Arabia, Croatia, Ecuador and Kosovo.

Per Jirstrand
Blockchain Advisor

Per Jirstrand is an experienced entrepreneur, having recently built Block5 Ventures which is a blockchain advisory company based in New York. Prior to that, he built two mobile tech companies and have 12 years management consulting experience from Deloitte. Per is passionate about working closely with founders and teams in developing and launching breakthrough ideas and new business models. Many of Per's clients improve lives and change industries and push the edge of what's possible in their fields. He is experienced working with distributed teams for organisations ranging from pre-funding startups to large Fortune 500 organisations to create inspired and innovative strategies and products

Professor Jim Porter

Consulting Engineer

Jim is a Consulting Engineer with 39 years' operational, project Management and consulting experience. He holds a BSc Hons Mining (Leeds University) and completed the Management Development Pro- gram (UNISA) and an Advanced Management Programme (INSEAD, France). Jim commenced his career at AngloGold Ashanti, where he held a number of senior management positions including Production Manager, Senior Project Manager and Mine Manager. During his time with AngloGold Ashanti, Jim ran several large shaft sinking projects, oversaw numerous technology and mechanisation initiatives as well as establishing a sound safety and production record. In 1997 Jim started a mining technology focused services company MineRP Solutions (GMSI) as Managing Director. He led corporate outsourcing contracts and developed the strategy for the internationalisation and growth of the Group mining business. After a spell heading the Consulting group at TWP Projects, in 2011 Jim started his own consulting company; Jim Porter Mining Consulting (Pty) Ltd (JPMC). He is also a Visiting Adjunct Professor for the Centre of Mechanised Mining Systems at Wits University, Chairman of Tarrill Trading (a gold exploration and mining company in Zimbabwe), COO of Auroch Minerals NL (An Australian listed company) as well as a Past President of the Southern African Institute of Mining and Metallurgy, and previously the Chairman of both the Johannesburg branch of the Southern African Institute of Mining and Metallurgy as well as the Technical Programme Committee (TPC). He is also an Honorary Life Fellow of The Southern African Institute of Mining and Metallurgy.

Proof of Concept

The Karuschain project is currently in talks with upstream and downstream supply chain participants to participate in different types of proof of concept implementations. The Karuschain team is constantly learning about the challenges posed by the precious metals supply chain and discovering innovations to overcome these challenges. Our proof of concept partners will ensure that we gather real-world data during every phase of the Karuschain project.

Risks and Regulatory Information Disclosures

Internal corporate governance controls, policies & procedures

The above key principles serve as a good governance guide to the Management Team. In addition, the Company has a range of policies that assist it in adhering to the highest standards. These include:

- Corporate Governance Policy—This sets out how we implement internal controls to manage our business in accordance with high corporate governance standards. It includes board and other operating procedures that we will follow, and clearly specifies the responsibilities of the Board of Directors and also of each other member of the Management Team. Amongst other things, it specifies a reporting methodology (to the Board of Directors), conflicts of interest policy, and a series of other internal controls.

- Anti-Financial Crime Policy—This includes a methodology, in full compliance with Gibraltar law (EU standard) to prevent money laundering, terrorist financing, bribery and corruption, and to report suspicious transaction to the Gibraltar authorities.

- Customer Due Diligence Measures Policy—This includes a methodology (to EU standards) to risk assess our clients including an approach for individuals and all types of legal entities.

- Risk Management Policy—This sets out a methodology for us to identify, assess, manage and mitigate the risks of our business.

- GDPR-compliant Data Protection Policy—We take data protection very seriously and have implemented a policy to handle customer data that complies with the EU General Data Protection Regulation, which came into effect on the 25th May 2018.

- Policies on the protection of digital assets and ICT/Cybersecurity—We have thorough policies and procedures in this regard that we have developed with the assistance of specialised professionals.

Disclosures & Legal

Contents of this whitepaper

You must read the contents of this whitepaper carefully before participating in the KRS token sale. The contents of this whitepaper are not used for financial promotions. No entity other than the Company can engage in issuing KRS tokens which are intended to operate and function in accordance with the plans described in the whitepaper (subject to development changes).

Sale of KRS

This whitepaper and any other documents published in association therewith relate to a token offering for the sale of KRS in respect of the intended development and use of the Karuschain Platform as more particularly set out herein.

No offer of regulated products

This whitepaper does not constitute an offer or solicitation of securities or any other regulated product, nor a promotion, invitation or solicitation for investment purposes. The terms of the purchase of KRS are not intended to be a financial service offering document or a prospectus.

The sole purpose of KRS tokens is to access the Karuschain Platform and the related products and services as described in this whitepaper.

KRS does not represent equity, shares, units, royalties or rights to capital, profit, returns or income in the platform or software or in the Company or in any other company or intellectual property associated with the Karuschain Platform or any other public or private enterprise, corporation, foundation or other entity in any jurisdiction. KRS tokens are not intended to represent a security or similar legal interest and are not an investment product.

No advice

This whitepaper does not constitute advice to purchase KRS and must not be relied upon in connection with any contract or purchasing decision.

Risk warnings

The purchase of KRS carries significant risks. You should carefully assess this whitepaper and all risks related thereto before purchasing any KRS tokens.

Obtain all necessary professional advice

You should consult a lawyer and/or accountant and/or tax professional (as required) before deciding to purchase any KRS tokens.

This whitepaper describes a future project

This whitepaper contains forward-looking statements that are based on the beliefs of the Company, certain assumptions made by us and information available to us. The projects described in this whitepaper are under development and are constantly being updated, including but not limited to, its technical features. Accordingly, if and when the Karuschain Platform is completed, it may differ significantly from the project set out in this whitepaper. No representation or warranty is given as to the achievement or reasonableness of any plans, future projections or prospects and nothing in this document is or should be relied upon as a promise or representation as to the future.

KRS and the Karuschain Platform relate to the development and use of experimental software and technologies that may not come to fruition or achieve the objectives specified in this whitepaper.

Licences and approvals are not assured in all jurisdictions

The Company intends to operate in full compliance with applicable laws and regulations and obtain the necessary licences and approvals in key markets. Therefore, the development and rollout of all the features of the Karuschain Platform described in this whitepaper are not guaranteed. Regulatory licences and/or approvals are likely to be required in Gibraltar and, potentially, in a number of relevant jurisdictions in which relevant activities may take place. It is not possible to guarantee and we, and no member of its Management Team nor its Advisers, makes any assurances that any such licences or approvals will be obtained within a particular timeframe or at all. It is, therefore, possible that some features of the proposed Karuschain Platform may not be available in certain markets, or at all. This could require restructuring of particular aspects of the Ecosystem and/or may result in its unavailability in whole or in part.

Views of the Company only

The views and opinions expressed in this whitepaper are those of the Company and do not reflect the official policy or position of any government, quasi-government, authority or public body in any jurisdiction (including but not limited to any regulatory body of any jurisdiction). Information contained in this whitepaper is based on sources considered reliable by us but there is no assurance as to their accuracy or completeness.

Risk Factors

The following are risk factors you should consider relating to the KRS token sale, the Karuschain Platform and the projects to be undertaken in this regard.

- The Company may not raise sufficient funds to execute and deliver the Karuschain Platform.
- KRS may be significantly influenced by digital currency market trends and their value may be seriously depreciated due to events in the digital currency markets not related to the Company's actions.
- The Karuschain Platform will comprise a complex software platform. Its launch may be significantly delayed due to unforeseen development barriers.
- Competition may introduce the same or better solutions to the Karuschain Platform as a whole and may cause KRS tokens to lose market share and eventually fail to deliver on its business goals and on those of the Karuschain Platform.
- Digital currencies are extremely volatile. KRS may suffer from such volatility.
- International laws and regulations may render the trading of KRS impossible.
- The use of KRS may come under the scrutiny of governmental institutions and regulatory authorities.
- The ownership of KRS may fall under new and unpredicted taxation laws that may erode their benefits.
- As the precious metals industry currently does not share data within itself on a meaningful basis, outside of some industry associations and government-mandated disclosures and depends on secrecy to protect its margins, including contract confidentiality and non-disclosure. It is clear that the industry does not have the current incentive or the desire to open its production or supply chain data to public scrutiny. The fundamental risk to the later phases of the Karuschain project is it is possible that the industry will refuse to open its data to the greatest number of possible platform end users and therefore the Company faces a stern challenge of adoption of the Karuschain Platform.
- The Company may not succeed in creating the necessary momentum and acceptance for KRS or the Karuschain Platform which may result in low liquidity and depletion of trades.

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