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List of EPICS for National Minerals Data System

Epic 1: System Architecture Definition and Validation

Covered components

Within the Pilot Phase:

- National Minerals Database (NMDB)
 - Web Interface
 - Backend
- National Chain-of- Custody system
 - Web Interface
 - Backend
- Data connector
 - Backend

Within the Full-Scale Implementation (Option 1)

- Online Public Portal (One Stop Shop website)
 - Web Interface
 - Backend

Scope and Business Background

This epic encompasses reviewing DGSM processes, validating the system's architectural framework by conducting tests using the existing low-code National Minerals Database (NMDB) template prototype (**Annex 5: National Minerals Database Template**). The goal is to validate the proposed solution using the existing functional NMDB prototype and also ensure the proposed system architecture meets the requirements and objectives, and gets stakeholder's buy-in.

The aim is to ensure a technical solution that is in line with the guidelines provided by the Government of Uganda. Due to the limited capacity for maintenance and further development at DGSM, it is also crucial to choose a technical solution that can be maintained by the Ugandan ecosystem, either by NITA-U or by external entities. NITA-U has started working on a national e-services development framework" to standardise and simplify government system e.g., government workflows.

Part of this epic includes assessing this development framework and its current state, as well as whether it fits with the requirements of the proposed NMDB scope. Additionally, part of this epic is also to check certain capabilities of the NMDB must. Competence on implementation, support and maintenance of the given framework should also be carefully assessed before deciding.

Secondly, NITA-U is mandated to host government applications and services on its data centre.

The scope of this epic covers the following activities:

- Validate the high-level architectural components, including infrastructure, user types, data flows, integration points, and system interactions, to establish a solid foundation for development.
- Using the existing NMDB template prototype to explore different architecture

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approaches and gather early feedback from all relevant stakeholders/users.

- Assess the readiness and functionality of the Ugandan “development framework” and its suitability for this system, as well as the available capacity for support and maintenance within and outside of the government. Compare with the prototype framework and potentially other frameworks and make a recommendation of the best solution to use.
- Assess and discuss feasible hosting solutions with DGSM and NITA-U, including potential costs of third-party hosting.
- Compile all findings, including architectural and hosting decisions
- Assess Single Sign On with external System
- The architecture shall integrate the usage of standardised building blocks and software solutions for standard capabilities such as User roles and Access management, Chain of Custody Solutions, Financial Payment and Tracking Systems, Content Management Systems and Reporting and Analysis
- Conducting and validating several Process Mapping workshop with the DGSM for identification and validation of prioritised use cases and user groups for the implementation of the Pilot

Epic 2: Implementation of the UI and Backend for the Digital Registry for the National Minerals Database

Covered components

Within the Pilot Phase

- National Minerals Database (NMDB)
 - Web Interface
 - Backend

Within the Full-Scale Implementation (Option 1):

- Reporting and Analytics System

Scope and Business Background

This epic focuses on the implementation of the Digital Registry for the National Minerals Database following the digital registry building block specifications of GovStack found in (**Annex 2: [GovStack Digital Registries building block specifications](#)**). The Epic will implement a National Mineral Database containing all mine site, CoC, and exporter data, with public access functionality, reporting capabilities, and data transmission to the ICGLR Regional Mineral Database (RMD).

The scope of this epic covers the following activities. The database shall:

- be designed to efficiently store and manage all entities and their attributes for minerals data, ensuring that each mineral data record is uniquely identifiable with the ability to create entities which are easily accessible within the system.
- shall follow RCM standardised data formats and structures to enable effective communication and collaboration with the ICGLR data sharing solution.
- shall implement data quality management requirements in compliance with the ICGLR Regional Certification Mechanism

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- shall implement information security and privacy in compliance with Uganda's Access to Information Act, 2005 and Data protection Act 2019
- shall implement data encryption at rest and in transit
- shall maintain comprehensive access logs
- shall support data retention policies (minimum 5 years for most data)
- shall implement data backup and disaster recovery procedures

Within the extended scope the Database shall:

- provide public web portal with search and filter functionality for public information access (mine site status, exporters status, ICGLR certificate verification and public reports)

Epic 3: User roles and Access management

Covered components

Within the Pilot Phase

- National Minerals Database
 - Web interface
 - Backend
- Identity and Access Management System
- National Chain-of- Custody system (Developed Modules)
 - Web interface
 - Backend

Within the Full-Scale Implementation (Option 1):

- National Chain-of- Custody system (Developed Modules)
 - Web interface
 - Backend
- Reporting and Analytics System
- Online Public Portal (One Stop Shop website)
 - Web Interface

Scope and Business Background

This epic covers the implementation of a user management system that handles authentication, authorisation, and role-based access control for all stakeholders in the mineral supply chain, including DGSM, mine operators, traders, exporters, CoC system operators, and auditors.

The scope of this epic covers the following objectives:

- The system shall be able to implement Authorisation and Authentication workflows according to the latest OAuth standard.
- System shall support registration for multiple user types: DGSM, Mine Site Operators, Traders, Exporters, CoC System Operators, Third-Party Auditors, and ICGLR Officials
- System shall implement secure authentication with multi-factor authentication (MFA) for sensitive operations

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- System shall control the access and permissions of users
- System shall support role-based access controls (RBAC) to assign specific roles and permissions to different user groups based on their responsibilities and authority levels
- System shall have the capability to create, modify, deactivate user accounts as needed, ensuring secure and efficient user management processes.
- System shall support password recovery and account reactivation workflows
- System shall maintain audit logs to track user activities related to user management, including account creations, modifications and access permission changes. System events shall also be logged.
- System shall obtain organisational profiles for supply chain actors from MCRS and link users to their respective organisation profile.
- System shall prevent unauthorised access to sensitive data
- The system shall implement standardised Authentication and Authorisation Workflows.
- The system shall be able to be integrated with the different modules of the NMDB and traceability solution as a Single Sign On Provider.

Epic 4: Chain of Custody Mine site Management & Inspection

Covered components

Within the Pilot Phase

- National Minerals Database
 - Web Interface
 - Backend
- National Chain-of- Custody system
 - Web Interface
 - Messaging System
 - Document Management System
 - Backend
- Responsive Application
- External Integrations:
 - MCRS

Within the Full-Scale Solution (Option 1):

- Reporting and Analytics System
- Responsive Application

Scope and Business Background

This epic involves developing functionality for mine site registration, inspection, and status management system that enables the DGSM to maintain a registry of all mine sites, conduct inspections against RCM criteria, assign status classifications (Green/Yellow/Red/Blue), and track compliance over time. The scope of this epic covers the following objectives. The System shall:

- automatically obtain mine site information and mineral licensing information for the mine site from MCRS
- allow extension of mine sites with unique identification numbers
- record mining activity status (Active, Non-active, Abandoned)

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- provide a digital inspection checklist based on the RCM mine site inspection checklist including scheduled and follow-up inspections
- allow attachment of photographic evidence and supporting documents
- support offline data collection with synchronization capabilities
- assign and track mine site status: Valid (Green), Provisionally Valid (Yellow), Not Valid (Red), Not Inspected (Blue)
- automatically compute status based on inspection criteria evaluation
- enforce mine site status transition rules and alert the mine site operators and DGSM of the status changes within the system and with a mail notification
- prevent data collection and further data processing from Not Valid (Red) status mine sites
- track follow-up inspection requests and deadlines
- allow exporters to record and upload risk assessment reports for Not Inspected (Blue) status mine sites

Within the extended Scope of the Implementation the Mine Site Management & Inspection Module will be extended that the System shall:

- generate mine site inspection and risk assessment reports and make the reports publicly accessible via the NMDB
- provide functionality to schedule, allocate resources, and record mine site inspection details
- prevent certified export from Not Inspected (Blue) status sites without valid risk assessments
- mobile-responsive inspection interface enabling data capture, photographic evidence collection, and structured observation documentation during mine site inspections (e.g., RCM checklist)
- Implement non-compliance recording capabilities that categorise regulatory and license condition violations with severity classifications
- enable licensees to submit mandatory periodic operational and environmental compliance reports
- provide an incident reporting interface supporting submissions from licensees, inspection teams, and external stakeholders for environmental, safety, and community incidents

Epic 5: Chain of Custody Traceability Module

Covered components

Within the Pilot Phase

- National Chain-of- Custody system (Traceability Module)
 - Web interface
 - Backend
- Data connector
 - Backend

Within the Full-Scale Implementation (Option 1):

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- National Chain-of- Custody system (Traceability Module)
 - Web Interface
 - Backend
- Reporting and Analytics System

Scope and Business Background

This epic captures the core CoC tracking functionality that records the complete sequence of custody for designated minerals from mine site through to export, capturing all transactions, transformations, and movements while ensuring full traceability and compliance with RCM information requirements.

The chain of custody data management and verification epic should meet several standards including but not limited to:

- Validation and error checking by incorporating validation checks to ensure integrity and accuracy of collected data. This includes validation of numeric inputs (e.g.: weight), format validation for date and times, and validation of miner information against predefined criteria.
- Ability to track minerals from extraction to export through an agreed logical flow of data.
- Maintain a log of user actions, data modification and system events from initiation to completion.

Within the Pilot Phase the foundation for a limited traceability use case from mine site through to export shall be implemented. It shall include a web traceability system that creates unique lot numbers for mineral lots at each stage of the chain of custody:

- Mine Site Lot Numbers (for production at mine sites)
- Trader Lot Numbers (for trading centre transactions)
- Processor Lot Numbers (for processing facilities)
- Exporter Lot Numbers (for export shipments)

This use case can have the following scope of functionality the system shall:

- record lot information as per the RCM information requirements:
 - Lot identification and numbering
 - Source mine site identification and status
 - Material description (ore type, weight, grade)
 - Date sealed and date shipped
 - Responsible person verification
- record mine operators' actions for:
 - Logging weight and document package details.
 - Record date, time, weight-in, weight-out, miner information and other relevant details
 - Enable data sharing functionalities for tracking and delivery purposes.
- record transaction information at every level of the mineral supply chain (mine site operator, trader, processor/smelter and exporter) as required by RCM
- record of lots sourced from other mines (external purchases)
- record exporter purchases with unique purchase order numbers

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- record trader sales with trading centre (buying Center / Mineral market) lot number
- System shall support recording of processing activities (discarded material, weight changes)
- record transportation details for all lot movements
- track mixed lots with constituent lot details and proportions
- track processing outputs with new processor lot numbers
- track lot transformations (mixing, processing, splitting)
- track seal integrity throughout transportation.
- track lot splitting into component lots
- track all upstream lots that comprise export shipments
- maintain parent-child relationships for mixed and component lots
- maintain lot integrity or properly document lot separation
- maintain traceability from output lots back to all input lots
- maintain export lot composition details showing contribution from each upstream lot
- validate that all required information is provided before lot registration
- validate package information against documentation, cross-check weight-in and weight-out data for accuracy and approve transactions.
- validate completeness of CoC information at each transaction and prevent transactions with incomplete or invalid CoC documentation
- validate that incoming lot information matches accompanying CoC data
- support attachment of supporting documents (invoices, receipts, transport documents)

It is expected that the Traceability is flexible in extension regarding the above requirements. Implementation of specific requirements are up to the defined use-cases.

Extended Functionality within the Full-Scope Implementation covers:

- Ability to streamline communication and coordination among team members responsible for traceability activities through task assignment, notifications and progress tracking.
- Implement verification and approval stages across different stakeholder levels involved in the mineral supply chain, including miners, DGSM employees, local mining operators, mineral processors, smelters, exporters and manufacturers
- System shall share the information with the NMDB through the Data Connector according to the Data Format of RCM
- Generate digital seals/tags for physical lot identification
- System shall enforce that lots from red status mine sites cannot enter the CoC
- prevent progression of lots through CoC with outstanding payment issues
- Dashboards for DGSM to monitor submission and generate national production statistics

Epic 6: Chain of Custody Export Management & Third-Party Audits

Covered components

Within the Full-Scale Implementation (Option 1):

- National Minerals Database

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- Web Interface
 - Backend
- National Chain-of- Custody system (Traceability Module)
 - Web interface
 - Backend
- Reporting and Analytics System
- External Integrations:
 - MCRS

Scope and Business Background

This epic involves implementing functionalities for the management of exporter registration, status tracking based on third-party audits, and support for the ICGLR third-party audit program, including audit scheduling, report management, and status determination (Green/Yellow/Red/Blue).

The scope of this epic covers the following objectives. The System shall:

- automatically obtain mine exporters with unique identification and obtain exporter's licence and profile information from MCRS
- track exporter status: Valid (Green), Provisionally Valid (Yellow), Not Valid (Red), Not Audited (Blue)
- enforce exporters status rules as per RCM Manual and alert exporters in advance of impending status expiration.
- automatically update exporter status based on audit outcomes
- prevent issuance of ICGLR Certificates to Red status exporters
- schedule third-party audits and track the audit request submissions by exporters.
- validate that audit requests are submitted with set lead time
- support third party audits reports management
- System shall evaluate exporters against the audit evaluation criteria in the regulations and RCM manual
- System shall calculate the overall conformance level of the exporters
- System shall support follow-up audit management for Provisionally Valid (Yellow) and Not Valid (Red) status exporters
- System shall monitor exporter compliance with due diligence obligations

Epic 7: Chain of Custody ICGLR Certificate Management

Covered components

Within the Full-scale Solution (Option 1):

- National Minerals Database
 - Web Interface
 - Backend
- National Chain-of- Custody system (ICGLR Certificate Management Module)
 - Web interface
 - Backend
- Document Management System

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Scope and Business Background

This epic involves management of ICGLR Certificate applications, evaluation, issuance, and lifecycle tracking to certify export shipments of designated minerals, ensuring compliance with all RCM requirements before certification.

The scope of this epic covers the following objectives. The system shall

- enable exporters to submit applications for ICGLR certification by providing a digital application form
- link export lots to ICGLR Certificate applications
- support the application evaluation process by DGSM
- provide functionality to generate ICGLR certificates for eligible mineral exporters as per RCM specifications
- record certificate issuance in the NMDB
- track the validity period of the certificate and alert exporters of expiring certificates.
- support the certificate revocation process as per the ICGLR regulations
- maintain complete certificate history (issuance, revocation, expiration)

Epic 8: Financial Payments and Tracking Management

Covered components

Within the Full-scale Solution (Option 1):

- System of Payment Provider
- National Chain-of- Custody system (Financial Module)
 - Web interface
 - Backend
- Data Connector
 - Backend
- One Stop Center Website
- Document Management System
- Messaging System

Scope and Business Background

This epic involves tracking of all government payments, taxes, fees, and royalties paid throughout the mineral chain, ensuring transparency and compliance with EITI principles and enabling verification of financial flows for due diligence purposes.

The scope of this epic covers the following objectives. The system shall:

- shall provide functionality for the payment of taxes, fees and royalties
- record all payments at each CoC transaction point
- support upload of payment receipts and supporting documents
- validate payment amounts against prescribed rates
- flag missing or incomplete payment information
- check compliance with tax obligations before certificate issuance
- flag transactions with missing payment information
- identify underpayment or non-payment of required fees

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- shall alert DGSM of payment compliance issues
- prevent progression of lots through CoC with outstanding payment s

Epic 9: Compliance and Penalty Management

Covered components

Within the Full-scale Solution (Option 1):

- Chain-of- Custody system
 - Web interface
 - Backend
- Document Management System

Scope and Business Background

This epic involves developing workflows to support DGSM to track confiscated illicit minerals, and penalty administration for violations of the regulations.

The scope of this epic covers the following objectives. The system shall:

- flag illicit minerals based on criteria in the regulations
- generate digital Notice of Seizure
- track seized material storage location
- maintain custody chain for seized materials
- track confiscated materials inventory
- record storage location (DGSM-approved premises)
- calculate storage costs
- monitor mine site status of confiscated materials' origin
- alert when origin mine site becomes certified (allowing release)
- record violation incidents
- track penalty assessment and collection
- track forfeiture of illicit minerals per court orders

Epic 10: Document Management System

Covered components

Within the Pilot Phase and the Full-scale Solution (Option 1):

- National Minerals Database
 - Web Interface
 - Backend
- Chain-of- Custody system
 - Web interface
 - Backend
- Document Management Systems

Scope and Business Background

This epic involves implementing document management functionality that enables the efficient storage, organisation, retrieving and access control of CoC documents (reports, supporting documents, certificates, etc.) throughout their lifecycle.

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The scope of this epic covers the following objectives. The system shall:

- maintain different types of documents for a configurable period (usually minimum 5 years). This includes but is not limited to:
 - copies of all issued certificates
 - application documentation
 - store risk assessment reports
 - attachments of photographic evidence
- provide archiving functionality for documents that have reached the end of their active lifecycle while maintaining full accessibility for audit or inspection purposes
- enable audit trails for all document events, including who performed the action, when it occurred (timestamp), and what operation was carried out
- explicitly implement granular role-based access control on both the file and structural (folder/container) level
- support segregation of duties (e.g. separation between document submitters, reviewers, and auditors)
- explicitly implement encryption of documents
- ensure that documents cannot be permanently deleted by end users once stored.
- Ensure retention or deletion shall only occur through controlled and auditable processes in compliance with defined retention policies.
- logical separation between workspaces, allowing differentiated handling, access levels, and retention rules per workspace.

Epic 11: Reporting and Analytics

Covered components

Within the Full-scale Solution (Option 1)

- National Minerals Database (NMDB)
 - Web Interface
 - Backend
- Data connector
 - Backend

Backend Scope and Business Background

This epic focuses on developing functionality for generating standard and ad-hoc reports for stakeholders and providing analytical capabilities to support decision-making.

The scope of this epic covers the following objectives. The system shall:

- integrate a standard open-source analytics tool, e.g. Apache Superset, Metabase or comparable
- have the capability to schedule report generation
- have export functionality supporting multiple formats (PDF, Excel, CSV) while maintaining data integrity and formatting.
- allow users to visualise reports through interactive dashboards and charts for key performance indicators
- support real-time data synchronisation, automatically refreshing reports and analytics

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- as new data enters the database
- include dashboards for DGSM to monitor submission and generate national production statistics

Epic 12: Online Public Portal (One Stop Center website)

Covered components

Full-scale Solution (Option 1)

- One Stop Shop website
 - Web Interface
- Financial Module
- Content Management System

Scope and Business Background

This epic should cover implementation of a user-friendly and publicly accessible website for DGSM that consolidate investment promotion information and services on one website. The services and information include but not limited to: Online MCRS portal and Cadastre Map, Investment Promotion information, CoC Online portal, Geoportal, real-time analytics dashboards, Touch point (interactive communication portal), payment platforms.

The scope of this epic covers the following objectives. The Website shall:

- outline all relevant information and links on the current DGSM website to the One Stop Centre website
- be implemented by a standard content management system (CMS), e.g. Drupal, Wordpress or comparable, that can integrate DGSM services and define user roles from content creation to publishing
- provide public web portals as per ICGLR regulations allowing access to:
 - Mine site status information
 - Mine site inspection reports
 - Risk assessment reports
 - Exporter status information
 - Summary third-party audit reports
 - ICGLR Certificate verification
 - CoC system registry and status
- provide information on payment conditions (aggregated, non-sensitive)
- Website shall charge prescribed fees for copies of downloaded documents
- Website shall provide online payment gateway for fee collection
- Websites shall generate public access receipts
- Website shall provide interactive communication portal for incident and grievances reporting
- Website shall provide links to relevant government online services (NEMA, URSB, etc.)
- Website shall be implemented in accordance with the NITA-U guidelines for development and management of the government websites.

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Epic 13: Integration of internal and external systems

Covered components

Within the Full-scale Solution (Option 1)

- National Minerals Database (NMDB)
 - Backend
- Integration Module
- Key Vault
- Identity and Access Management
- Data connector
 - Backend

Scope and Business Background

This epic should cover implementation of a data connectors within the following domains:

- Integration of external CoC Systems
- Integration of internal DGSM Systems
- Inter-agency System Integration

Integration of external CoC Systems

The planned data connector should integrate external private CoC systems with the CoC System and NMDB via an API based on the data sharing protocols of the ICGLR. (**Annex 8: ICGLR Data Management Sharing Policy 2025**)

Integration of internal DGSM Systems

The epic shall cover implementation of a data connector that will facilitate exchange of relevant data between the NMDB and other DGSM internal systems

The scope of this epic covers the following objectives. The system shall:

- integrate MCRS with the NMDB via an API
- integrate weighbridge information system with the NMDB via an API
- integrate with Geodatabase solution (ArcGIS) - collects, manages, analyses, and visualises cadastral and geological via an API
- Weighbridge information system – CoC transport routes

Inter-agency System Integration

The epic should cover implementation of a data connector that will facilitate exchange of relevant data between the NMDB and government systems through the NITA-U data and systems integration platform (UGhub)

The scope of this epic covers the following objectives:

- System shall integrate with government systems (URA and NIRA) through UGhub
- System shall verify Tax Clearance Certificate validity for exporters
- System shall integrate with Uganda Revenue Authority (URA) systems for TIN validation
- System shall check compliance with tax obligations before certificate issuance

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- System shall integrate with National Identification and Registration Authority of Uganda (NIRA) to verify identity of supply chain actors

System for Maintaining Integrations

The integration of systems shall be maintainable for a dedicated user group (Administrators) through a User Interface that ensures:

- allow configuration of each integration (e.g. endpoints, authentication, environment, timeouts, retry parameters, mapping settings)
- allow planned schedules for time-controlled integrations (e.g. cron or interval-based jobs) including last run, next run and execution result
- store credentials and keys in a secure manner (Key Vault)
- prevent plain text display of secrets after initial entry
- provide a “test connection” function per integration to verify basic connectivity and authentication
- provide a “test message” function per integration to send a sample request and display the technical result
- display a health status per integration
- display for each integration at least: last successful call, last failed call, error rate, and average response time over a selectable period
- provide a consolidated overview of the current status of all integrations
- log all relevant integration events (e.g. requests, responses, errors, retries, timeouts)
- provide a filterable event log (e.g. time period, integration, status, correlation ID, error type)
- allow drill-down to single events, including technical details
- support tracking of a single business message across multiple processing steps and integrations (end-to-end trace)
- display the status of background jobs and queues relevant for integrations (e.g. pending, running, failed, retry count)
- shall provide at least one dashboard with key metrics per integration (e.g. throughput, error rate, latency, number of messages)
- allow basic visualization of trends over time

Epic 14: Knowledge Transfer

Covered components

All Components

Scope and Business Background

The Contractor shall conduct technical trainings for DGSM and NITA-U to build up the knowledge and capacities for sustainable operation.

Training shall include end-user and maintenance team trainings. As this is a pilot implementation, feedback must be collected from pilot users to inform further implementation.

Capacity development will be continuous and entail three main blocks:

- concrete tasks necessary to operate the platform via frequent exchange, alignment, and demonstrations.

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- best practices and principles in managing a digital product/service and steering the respective implementation and delivery via workshops based on expressed needs and current capacities.
- guidance in setting up and implementing the necessary information security best practices via workshops and formal trainings sessions based on existing processes.

Respective activities shall be oriented towards the target group and be documented. Materials to be used here, shall be made available to DGSM. The use of publicly available resources is encouraged. Concerning the knowledge transfer, the following services must be provided by the contractor to the concerned DGSM and NITA-U staff through workshops and trainings on:

- Providing required technical knowledge and skills on the pilot of the NMDB management and/or administration.
- Providing required knowledge and skills on usage of the pilot of the NMDB to the selected users.