BioBlock
2nd Call for Proposals

Call Guidelines
Annex 1. Challenges Description

1 | BIOBLOCK COMMUNITY KNOWLEDGE BASE

Aim: Development of a structured knowledge base for digitally connecting community members, expertise, projects, datasets, resources, and digital assets.

Contribution: For the BioBlock Community to become an open, transparent and trusted digital ecosystem for trading digital objects comprising datasets, models and bioprocessing knowledge, a dynamic knowledge graph is needed to create a repository where partners and end-users can discover who offers or needs what, identify available datasets, models and technical services, and digitally connect with other partners. The knowledge base should support the promotion and discovery of knowledge, data and services and strengthen interaction between community members. It should be designed as an evolving and adaptive resource that robustly bridges technical metadata with human-centric collaboration dynamics within the growing BioBlock ecosystem. Hereby ensuring that community members can effectively discover, share, and build upon collective expertise that.supports both community building and data market activity.

Expected Deliverables:

- One operational graph database based on a BioBlock-specific schema.
- Integration of at least 50 community entities such as members, projects, datasets, models, services or other digital assets.
- Representation of at least three entity types and three relationship types in the graph.
- One functional natural-language search/query interface.
- Documented interfaces or import mechanisms that allow future expansion of the knowledge base.

Project requirements: The proposed solution must build upon and actively extend the existing concepts, metadata structures, and asset discovery mechanisms developed within CP3, rather than creating an isolated parallel system. Furthermore, the project must demonstrate a steadfast commitment to decentralization, continuously reinforcing and expanding its core principles across both the technical architecture and the collaborative workflows of the ecosystem.

Available budget per project: up to 200.000 €.

2 | AI TOOL FOR FAIR DATA GENERATION

Aim: Development of an AI-based tool supporting researchers and data generators in producing FAIR, machine-readable and interoperable experimental data.

Contribution: The challenge should support the operationalization of the FAIR principles in biotechnology by enabling users to structure experimental data and metadata already during experimental planning and execution. The AI tool should guide users in selecting appropriate metadata, controlled vocabulary, ontologies and data structures and thereby improve the understandability, interoperability and reuse of experimental datasets. The tool should also serve as an educational and self-training resource for community members and support the generation of datasets that are semantically enriched, machine-actionable and suitable for downstream AI and data-sharing applications.

Expected Deliverables:

- One functional AI-based application or assistant for FAIR data generation.
- Integration of at least two relevant ontologies, controlled vocabularies or metadata standards.
- Validation using at least three representative experimental or bioprocessing workflows.
- Generation of machine-readable metadata and FAIR-compliant dataset descriptions for each use case.
- Usability testing with at least 10 users from the BioBlock community or relevant external stakeholder groups.
- Documented guidelines and interactive training modules demonstrating how the AI assistant is integrated into collaborative routines.

Project requirements: No additional challenge-specific restrictions.

Available budget per project: up to 300.000 €.

3 | ENABLING AGENTIC-AI AUTOMATED NEGOTIATION, DISPUTE RESOLUTION AND COPYRIGHT PROTECTION FOR DATA TRADING VIA SMART CONTRACT DEVELOPMENT

Aim: Development of agentic-AI and smart-contract-based mechanisms for automated negotiation, licensing, dispute resolution and protection of ownership and intellectual property rights in data trading.

Contribution: The challenge should investigate how AI agents can support or automate interactions between data providers and consumers within the BioBlock marketplace. This may include negotiation of pricing, access conditions, licensing terms, permitted uses, attribution requirements or other transaction conditions. Smart contracts should be used to formalize and execute agreed conditions in a transparent and auditable manner. Particular attention should be given to human oversight, traceability of decisions, protection of ownership and authorship, and mechanisms for handling disputes or violations of agreed usage conditions.

Expected Deliverables:

- One functional demonstrator integrating AI-agent-based negotiation with smart contracts.
- Implementation of at least three negotiable transaction parameters, such as price, licensing conditions, redistribution rights or model-training rights.
- At least two successfully executed end-to-end data-trading scenarios.
- A documented concept for decentralized auditing, human oversight, and fair community-driven parameter control including one demonstrative dispute-resolution or escalation workflow.
- Blockchain-based recording of agreed terms, asset provenance and ownership or authorship information for each transaction.

Project requirements: The project must build upon the existing BioBlock marketplace, smart-contract, role and governance processes. Proposed agentic-AI functionalities should extend these established workflows and interfaces rather than introduce a separate transaction or governance architecture.

Available budget per project: up to 150.000 €.

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4 | COMMUNITY-DRIVEN METADATA AND DATA STANDARDS FOR BIOPROCESS ENGINEERING

Aim: Development of community-based metadata models and data standards to improve interoperability, reproducibility and reuse of bioprocess data.

Contribution: The challenge should address the heterogeneity of experimental data generated across laboratories, instruments, software systems and organizations. Community-driven metadata structures should provide sufficient contextual information to make datasets understandable and reusable across different environments. Existing standards, ontologies and controlled vocabularies should be reused and connected wherever appropriate. The resulting structures should support FAIR-by-design data generation and provide a semantic foundation for other BioBlock components such as knowledge graphs, AI tools, data discovery and blockchain-based provenance.

Expected Deliverables:

- One documented and machine-readable metadata schema or data model for bioprocess engineering.
- Coverage of at least three representative bioprocess use cases or workflow types.
- Mappings to at least two existing standards, ontologies or controlled vocabularies.
- Validation of the proposed model with at least three organizations or stakeholder groups.
- Provision of at least one reusable technical artifact, such as a JSON schema, RDF/OWL model, template, API specification or reference implementation.

Project requirements: No additional challenge-specific restrictions.

Available budget per project: up to 250.000 €.

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5 | LEGAL, REGULATORY AND CYBERSECURITY FRAMEWORK FOR TRUSTED DATA EXCHANGE

Aim: Development of an integrated legal, regulatory, data-protection and cybersecurity framework supporting trusted data exchange within the BioBlock ecosystem.

Contribution: The challenge should clarify the conditions under which datasets, models and other digital knowledge assets can be shared, traded and reused across institutional boundaries. Relevant aspects include intellectual property, authorship, licensing, contractual obligations, data protection, confidentiality, cybersecurity, identity management and access control. The challenge should translate these requirements into practical guidance for BioBlock users and platform developers and distinguish between rules that can be technically enforced, requirements that depend on organizational governance and those requiring legal or human decision-making.

Expected Deliverables:

- One integrated legal, regulatory, data-protection and cybersecurity framework for BioBlock data exchange.
- Analysis of at least five representative data-sharing or data-trading scenarios.
- A documented risk classification covering at least legal, privacy, cybersecurity, IP and governance risks.
- At least three reusable templates or decision tools, such as model clauses, policy templates, checklists or decision trees.
- Validation of the framework with at least three different stakeholder groups, including technical and legal/regulatory expertise.

Project requirements: The project must be developed in close coordination with the BioBlock Management Team and should complement and build upon the existing marketplace, smart contract, role and governance processes. The resulting framework should address gaps and operational requirements without duplicating existing BioBlock governance or platform concepts.

Available budget per project: up to 250.000 €.