OPEN COLLABORATION DIGITAL MRV WG REFERENCE LIST

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List of Websites, Reports, Standards, Guidance, Case Studies, Posts

Table of Standards

List of Websites, Reports, Standards, Guidance, Case Studies, Posts

Open Collaboration White Paper, November 2021

World Bank Climate Warehouse
— Digital MRV report June 2022

EBRD Protocol for Digitised MRV (D-MRV Protocol), December 2020

Climate Ledger Initiative
— Digital MRV report July 2022
— Principles for Best-Practice Digital Verification
— Several reports relating to DMRV (e.g., case studies) and other digital for climate

UNEP Blockchain for Sustainable Energy and Climate in the Global South, January 2022

WBCSD PACT
— Technical specifications for Pathfinder Network, June 2022
Several documents (e.g., guidance, vision) relating to digital and data for carbon accounting

UNEP
- Coalition for Digital Environmental Sustainability (CODES) Action Plan
- Digital Transformation: Becoming an Innovative, Agile and Collaborative Organization, Fit for Purpose in the Digital Age 2022

UN Global Digital Compact

Global e-Sustainability Initiative (GeSI)
- Using ICT to Raise Ambitions on Climate Action in Low- and Middle- Income Countries

Climate Chain Coalition
- 360+ organizations relating to digital for climate, including DMRV
- LinkedIn group

Hyperledger Climate Action and Accounting Special Interest Group (SIG)

Blockchain Digital MRV Architecture for Existing Building Energy Performance

Verra DMRV WG

IETA Digital Task Force
- Guiding Principles

InterWork Alliance
- Digital MRV Framework

Open Earth Foundation
- Open Climate White Paper

ISEAL Alliance
— **Core Metadata Set Specification**

**MRV Collective**

**OS-Climate**

— **OS-Climate Community Hub (on Github)**
— **OS-C Data Commons Architecture Blueprint**

**Carbon-ML (Markup Language)**

— **White Paper July 2022**

**Climate Collective Web3 Climate Map**

**Google Earth Engine**

**Infrastructure for Article 6 MRV and transfers – the potential of blockchain-based technologies**

**Reneum digital certification methodology**

**Green Software Foundation**

**DigitalMRV for Climate**

**Gold Standard for the Global Goals**

— **Gold Standard Site Visit and Remote Audit Requirements and Procedures**
— **Digitising MRV**

**Asian Development Bank Digital Technologies for Climate Action, Disaster Resilience, and Environmental Sustainability**

**ITU Focus Group on Environmental Efficiency for Artificial Intelligence and other Emerging Technologies (FG-AI4EE)**

— **Working Group 1: Requirements of AI and other Emerging Technologies to Ensure Environmental Efficiency**
— Working Group 2: Assessment and Measurement of the Environmental Efficiency of AI and Emerging Technologies
— Working Group 3: Implementation Guidelines of AI and Emerging Technologies for Environmental Efficiency

ITU-T, Environment, Climate Change and Circular Economy
— Green ICT Standards and Supplements

ICTFootprint.eu
— SDOs for ICT Standards
— Map of ICT Methodologies
— GHG Protocol - Software
— GHG Protocol - Hardware

Crypto Climate Accord Guidance for Accounting and Reporting Electricity Use and Carbon Emissions from Cryptocurrency

UNFCCC - The Good, The Bad and The Blockchain

The Carbon Footprint of Bitcoin

Cambridge Bitcoin Electricity Consumption Index

The Digiconomist

Energy Consumption of Cryptocurrencies Beyond Bitcoin

Ripple XRP Ledger Methodology

UCL Centre for Blockchain Technologies - DLT Environmental Impact: What is the energy consumption of the leading PoS DLTs?

Ethereum Climate Platform
Ethereum Energy Consumption

TechCrunch - Crypto and blockchain must accept they have a problem then lead in sustainability

Algorand - Sustainable Blockchain: Estimating the Carbon Footprint of Algorand’s Pure Proof-of-Stake

Tezos - An Energy-Efficient Blockchain

Polygon - The Eco-Friendly Blockchain Scaling Ethereum

IOTA - Energy Benchmarks for the IOTA network

Harvard Business Review - How much energy does Bitcoin actually consume?

Reuters - Factbox: How big is Bitcoin’s carbon footprint?

Forbes - Blockchain and Sustainability: Oxymoron or Panacea?

Fast Company - Why NFTs have such a massive carbon footprint

Investopedia - What’s the Environmental Impact of Cryptocurrency?

Counter Punch - Crypto’s Heavy Carbon Footprint

EDMCouncil

— ESG Data Management Asset Owners

Roadmap for Open ICT Ecosystems

European Commission Rolling Plan for ICT Standardization

OECD Digital
— The OECD Going Digital Measurement Roadmap
— OECD AI Policy Observatory

OECD Artificial Intelligence

— OECD Measuring the environmental impacts of artificial intelligence compute and applications
— OECD Framework for the Classification of AI Systems
— Tools for Trustworthy AI
— State of Implementation of the OECD AI Principles

EU Blockchain Observatory and Forum

— Tokenization of physical assets and the impact of IoT and AI

Linux Foundation (LF) Edge Project Alvarium

— Data Confidence Fabric

AIOTI

— AIOTI Guidance for the Integration of IoT and Edge Computing in Data Spaces

— IEEE Academy on Artificial Intelligence

IEEE Standards Association - Raising the Standards in Artificial Intelligence Systems (AIS)
IEEE CertifAIEd

IEEE Blockchain Initiative

IEEE Technology Roadmaps

Blockchain Research Institute

Global Blockchain Business Council (GBBC)

— Global Standards Mapping Initiative
— **Taxonomy**

**European Committee for Standardization (CEN CENELEC)**

— **Smart Standards**

**ISO Smart Standards**

**Smart Contract Security Alliance**

**Ethereum Smart Contract Auditor Roadmap**

**International Auditing and Assurance Standards Board (IAASB)**

— **IAASB Technology Focus Area**
— **Exploring the Growing Use of Technology in the Audit, with a Focus on Data Analytics**
— **Technology Workstream Plan (Post June 2019)**
— **Audit Planning When Using Automated Tools and Techniques**
— **Using Automated Tools and Techniques When Identifying Risks of Material Misstatement in Accordance with ISA 315 (Revised)**
— **Addressing Risk of Overreliance on Technology Arising from the use of Automated Tools and Techniques and from Information Produced by an Entity’s Systems**
— **Using Automated Tools and Techniques in Performing Audit Procedures**
— **Audit Documentation When Using Automated Tools and Techniques**
— **Technology Disruption in Audit and Assurance**

**IAASB International Standard on Assurance Engagements (ISAE) 3000 (Revised)**

**Assurance Engagements Other than Audits or Reviews of Historical Financial Information; International Framework for Assurance Engagements and Related Conforming Amendments**

**Non-Authoritative Guidance on Applying ISAE 3000 (Revised) to Sustainability and Other Extended External Reporting Assurance Engagements**

— **Non-Authoritative Guidance on Applying ISAE 3000 (Revised) to Sustainability and Other Extended External Reporting (EER) Assurance Engagements**
— Non-Authoritative Support Material: Credibility and Trust Model Relating to Sustainability and Other Extended External Reporting (EER)
— Non-Authoritative Support Material: Illustrative Examples of Selected Aspects of Sustainability and Other Extended External Reporting (EER) Assurance Engagements

International Ethics Standards Board for Accountants (IESBA)
— IESBA Technology Initiative - Technology Working Group Phase 1 Report
— IESBA Technology Working Group Phase 2 Final Report

International Accounting Education Standards Board (IAESB)
— ICT Skills Development
— The Digital Age and Opportunities for Accountants

Association of Chartered Certified Accountants (ACCA)
— ACCA Audit and Technology

Institute of Chartered Accountants in England and Wales (ICAEW)
— ICAEW Audit and Technology
— ICAEW Tech Hub

International Organization for Standardization (ISO) TC 207 SC 7 Greenhouse gas and climate change management and related activities
— ISO 14064-3 Specification with guidance for the verification and validation of greenhouse gas statements
— ISO 14065 General principles and requirements for bodies validating and verifying environmental information
— ISO 14066 Competence requirements for teams (including technical experts), and independent reviewers involved in the validation and verification of environmental information

ISO/TC 207/SC 2 Environmental auditing and related environmental investigations
— ISO/AWI PAS 14018 Guidelines for the Remote Auditing of Environmental Management Systems

ISO/IEC JTC 1/SC 39 Sustainability, IT and data centres

ISO TC 176 Quality Management and Quality Assurance (ISO 9000)
— ISO 9001:2015 Quality management systems — Requirements
— ISO 9001 Auditing Practices Group Guidance on Remote Audits

ISO/IEC JTC 1/SC 41 Internet of Things and Digital Twin
— Strategic Business Plan
— ISO/IEC 30141:2018 Internet of Things (IoT) — Reference Architecture
— ISO/IEC 30147:2021 Information technology — Internet of things — Methodology for trustworthiness of IoT system/service
— ISO/IEC 30161:2020 Internet of Things (IoT) — Requirements of IoT data exchange platform for various IoT services
— ISO/IEC 30165:2021 Internet of Things (IoT) — Real-time IoT framework
— ISO/IEC TR 30176:2021 Internet of Things (IoT) — Integration of IoT and DLT/blockchain: Use cases
— ISO/IEC 30147:2021 Information technology — Internet of things — Methodology for trustworthiness of IoT system/service
— ISO/IEC 20924:2021 Information technology — Internet of Things (IoT) — Vocabulary

Digital Twin Consortium
— Digital Twin Capabilities Periodic Table User Guide

International Telecommunications Union (ITU) Standards Landscape
— IoT Standards
— IoT and Smart Sustainable Cities Standards
— ICT Security Standards

**ISO/IEC JTC 1/SC 42 Artificial intelligence**

— ISO/IEC 22989:2022 Information technology — Artificial intelligence — Artificial intelligence concepts and terminology
— ISO/IEC 20546:2019 Information technology — Big data — Overview and vocabulary
— ISO/IEC DIS 42001 Information technology — Artificial intelligence — Management system
— ISO/IEC 38507:2022 Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations
— ISO/IEC DIS 25059 Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality model for AI systems
— ISO/IEC AWI TS 25058 Software and systems engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Guidance for quality evaluation of AI systems
— ISO/IEC TR 24028:2020 Information technology — Artificial intelligence — Overview of trustworthiness in artificial intelligence
— ISO/IEC DIS 5392 Information technology — Artificial intelligence — Reference architecture of knowledge engineering
— ISO/IEC DIS 5338 Information technology — Artificial intelligence — AI system life cycle processes
— ISO/IEC DIS 8183 Information technology — Artificial intelligence — Data life cycle framework
— ISO/IEC AWI 12792 Information technology — Artificial intelligence — Transparency taxonomy of AI systems
— ISO/IEC AWI TS 17847 Information technology — Artificial intelligence — Verification and validation analysis of AI systems
— ISO/IEC AWI TR 20226 Information technology — Artificial intelligence — Environmental sustainability aspects of AI systems

ISO TC 307 Blockchain and Distributed Ledger Technologies
— Strategic Business Plan
— ISO/TR 23455:2019 Blockchain and distributed ledger technologies — Overview of and interactions between smart contracts in blockchain and distributed ledger technology systems
— ISO/TS 23635:2022 Blockchain and distributed ledger technologies — Guidelines for governance
— ISO/DIS 22739 Blockchain and distributed ledger technologies — Vocabulary
— ISO/TR 23249:2022 Blockchain and distributed ledger technologies — Reference architecture
— ISO/TR 23258:2021 Blockchain and distributed ledger technologies — Taxonomy and Ontology

ISO/IEC JTC 1/SC 27 Information Security Management
— ISO/IEC 27001:2022 Information security, cybersecurity and privacy protection — Information security management systems - Requirements
— ISO/IEC 27006:2015 Information technology — Security techniques — Requirements for bodies providing audit and certification of information security management systems
— ISO/IEC 27007:2020 Information security, cybersecurity and privacy protection — Guidelines for information security management systems auditing
International Accreditation Forum

— IAF MD 4:2022 IAF Mandatory Document for the Use of Information and Communication Technology (ICT) for Auditing/Assessment Purposes
— IAF ID 12:2015 Principles on Remote Assessment

European Union Emission Trading System (EU ETS)

EU ETS Monitoring, Reporting and Verification (MRV)

— Monitoring and Reporting Regulation
— Verification and Accreditation Regulation
— Quick Guide for Verifiers
— Quick Guide for National Accreditation Bodies
— EU ETS Accreditation and Verification Regulation - Explanatory Guidance
— EU ETS compilation on the monitoring and reporting of greenhouse gas emissions
— EU ETS compilation on the verification of data and on the accreditation of verifiers
— Overview of the EU ETS Reporting Language (XETL)

UNFCCC CDM Standards

— CDM accreditation standard Version 07.0
— CDM validation and verification standard for project activities Version 03.0
— CDM validation and verification standard for programmes of activities Version 03.0
— CDM methodology for determining coverage of data and validity of standardized baselines Version 03.0
— CDM methodology for establishment of sector-specific standardized baselines Version 01.0
— CDM project standard for project activities Version 03.0
— CDM project standard for programmes of activities Version 03.0

Intergovernmental Panel on Climate Change

— IPCC Guidelines for National GHG Inventories

WRI WBCSD GHG Protocol
Examples / Case Studies of Audit Software:

- IBM OnePages with Watson
- SAP Audit Management
- Deloitte Omnia (ESG Module)
- EY Digital Audit
- EY Canvas
- PwC Audit Revolution
- KPMG Global IT internal audit outlook
- Forbes KPMG Future-Proofed
- Accenture Internal Audit
- Bureau Veritas Clarity
- DNV GL Boost My Audit
- SGS Digital Trust Label Certification
- SCS Global Services Flexible Auditing Solutions
- LRQA Remote
- Q-Aud
- Intelex
- Auditboard
- SustainCERT
- MRV DCS opsealog
- Upstream Tech DMRV for Forest Carbon Projects
- DigitalMRV (ClimateCHECK IOTA)
- Hummingbird Technologies
- Ucrop.it
- Fix6
# Standards, Frameworks and Guidance for Digital Technologies

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