OER Metadata Package

Erdpuls Müllrose Living Lab Initiative — From Seeds to Blockchain

Erdpuls Müllrose

February 2026

Center for Sustainability Literacy, Citizen Science and Reciprocal Economics

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How to Use This Document

This file contains all metadata needed to submit the Erdpuls Müllrose OER learning materials to OER portals including WirLernenOnline, Zenodo, OER Commons, and Jointly.info. It is structured as (1) a human-readable reference for the initiative, (2) a copy-paste source for platform submission forms, and (3) a structured record for future LRMI/Schema.org export.

Fields marked **[TO BE COMPLETED BY AUTHOR]** require information only the project coordinator can provide before submission. Fields marked **[POST-SUBMISSION]** will only be available after the upload is complete (e.g. DOI, accession numbers). Fields marked **[NOT SPECIFIED IN DOCUMENT]** were not found in any project file.

Part 1: Collection Metadata (All Five Guides Together)

1.1 Identification

Field	Value
Collection title (EN)	Erdpuls Müllrose Learning Materials — From Seeds to Blockchain: A Trilingual OER Collection for Sustainability Literacy, Citizen Science, and Reciprocal Economics
Collection title (DE)	Erdpuls Müllrose Lernmaterialien — Von Samen zur Blockchain: Eine dreisprachige OER-Sammlung für Nachhaltigkeitsbildung, Bürgerwissenschaft und Reziproke Wirtschaft
Collection title (PL)	Erdpuls Müllrose Materiały edukacyjne — Od nasion do łańcucha bloków: Trójjęzyczna kolekcja OER dla edukacji zrównoważonego rozwoju, nauki obywatelskiej i ekonomii wzajemnej
Creator / Publisher	Erdpuls Müllrose — Center for Sustainability Literacy, Citizen Science and Reciprocal Economics
Location	Müllrose, Brandenburg, Germany
Contact	erdpuls@ubec.network / https://erdpuls.ubec.network
Publication date	February 2026
Version	1.2 (Draft — OER Publication Ready, EN)
DOI / Persistent identifier	[TO BE COMPLETED BY AUTHOR — assigned after Zenodo upload]
Source URL / Repository URL	[TO BE COMPLETED BY AUTHOR]
License	Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0)
License SPDX identifier	CC-BY-SA-4.0
License URL	https://creativecommons.org/licenses/by-sa/4.0/
Software license	GNU Affero General Public License v3.0 (AGPL-3.0) — applies to all software components referenced
Software license URL	https://www.gnu.org/licenses/agpl-3.0.html
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1.2 Descriptions

Abstract (EN)

The Erdpuls Müllrose OER collection comprises five audience-differentiated learning guides developed at a living laboratory and makerspace garden in Müllrose, Brandenburg, Germany. The collection supports sustainability education through a phenomenological approach — "sense before interpret" — in which learners encounter soil, landscape, and economic exchange through direct sensory observation before receiving conceptual frameworks. Three student guides (Grades 1–4, 5–8, 9–12) differentiate the program by developmental stage, drawing on anthroposophical frameworks and the 4A-Pathway (Awareness, Acknowledgment, Attitude, Action). A Teachers' Guide supports classroom integration and Brandenburg curriculum alignment. A Citizen Scientist Handbook supports adult community observers in contributing to open environmental monitoring networks (openSenseMap, iNaturalist). All five guides integrate citizen science data contribution, a reciprocal token economy (UBECrc), and alignment with all 12 Brandenburg BNE Gestaltungskompetenzen. The collection is currently available in English; German and Polish translations are planned for Phase 3. All materials are freely reusable under CC BY-SA 4.0.

Abstract (DE)

Die Erdpuls Müllrose OER-Sammlung umfasst fünf zielgruppenspezifische Lernführer, die in einem Lebendlabor und Makerspace-Garten in Müllrose, Brandenburg, entwickelt wurden. Die Sammlung fördert Bildung für nachhaltige Entwicklung durch einen phänomenologischen Ansatz — „Wahrnehmen vor Interpretieren" — bei dem Lernende Boden, Landschaft und Wirtschaft durch direkte sensorische Beobachtung begegnen, bevor sie konzeptionelle Rahmungen erhalten. Drei Schülerführer (Klassen 1–4, 5–8, 9–12) differenzieren das Programm nach Entwicklungsstand auf Basis anthroposophischer Entwicklungstheorie und des 4A-Pfades (Awareness, Acknowledgment, Attitude, Action). Ein Lehrerhandbuch unterstützt die Unterrichtsintegration und Lehrplanbezüge in Brandenburg. Ein Citizen-Science-Handbuch begleitet erwachsene Bürgerbeobachter bei der Beitragsleistung zu offenen Umweltbeobachtungsnetzen (openSenseMap, iNaturalist). Alle fünf Leitfäden integrieren Citizen-Science-Datenbeiträge, eine reziproke Tokenwirtschaft (UBECrc) sowie die Ausrichtung an allen 12 brandenburgischen BNE-Gestaltungskompetenzen. Die Sammlung ist derzeit auf Englisch verfügbar; deutsche und polnische Übersetzungen sind für Phase 3 geplant. Alle Materialien sind unter CC BY-SA 4.0 frei nachnutzbar.

Abstract (PL)

Kolekcja OER Erdpuls Müllrose obejmuje pięć przewodników edukacyjnych dostosowanych do różnych grup odbiorców, opracowanych w żywym laboratorium i ogrodzie makerspace w Müllrose w Brandenburgii w Niemczech. Kolekcja wspiera edukację na rzecz zrównoważonego rozwoju poprzez podejście fenomenologiczne — „percepcja przed interpretacją" — w którym uczący się poznają glebę, krajobraz i wymianę ekonomiczną poprzez bezpośrednie doświadczenie zmysłowe, zanim otrzymają ramy pojęciowe. Trzy przewodniki uczniowskie (klasy 1–4, 5–8, 9–12) różnicują program według etapu rozwojowego, opierając się na antropozoficznej teorii rozwoju i ścieżce 4A (Awareness, Acknowledgment, Attitude, Action). Przewodnik dla nauczycieli wspiera integrację z programem nauczania i powiązania z brandenburgską podstawą programową. Podręcznik naukowca-obywatela wspiera dorosłych obserwatorów społecznościowych w wnoszeniu wkładu do otwartych sieci monitoringu środowiska (openSenseMap, iNaturalist). Wszystkie pięć przewodników integruje wkład danych citizen science, wzajemną ekonomię tokenową (UBECrc) oraz zgodność ze wszystkimi 12 brandenburskimi kompetencjami projektowymi BNE (Gestaltungskompetenzen). Kolekcja jest obecnie dostępna w języku angielskim; tłumaczenia na język niemiecki i polski są planowane w fazie 3. Wszystkie materiały są dostępne na zasadach CC BY-SA 4.0.

Table of Contents — Five Guides

File	Title (EN)	Audience
01_learning_guide_grades_1-4_EN.md	Earth Detectives: First Encounters with Living Ground	School classes, Grades 1–4 (ages 6–10)
02_learning_guide_grades_5-8_EN.md	Field Investigators: Measuring the Living World	School classes, Grades 5–8 (ages 11–14)
03_learning_guide_grades_9-12_EN.md	Place as Laboratory: Research Methods for the Living World	School classes, Grades 9–12 (ages 15–18)
04_teachers_guide_EN.md	Bringing Your Class to the Living Laboratory	Classroom teachers and educators (all grade bands)
05_citizen_scientist_handbook_EN.md	How to Monitor, Contribute, and Connect	Adult citizen scientists and community observers

1.3 Audience and Educational Levels

Guide	Intended Audience (Role)	Educational Level	Age Range	Grade Range (Klassenstufe)
Guide 01 — Earth Detectives	School students; visiting school classes	Primary (Lower Primary)	6–10 years	Klassen 1–4
Guide 02 — Field Investigators	School students; visiting school classes	Lower Secondary	11–14 years	Klassen 5–8
Guide 03 — Place as Laboratory	School students; visiting school classes	Upper Secondary	15–18 years	Klassen 9–12
Guide 04 — Teachers' Guide	Classroom teachers; Educators	Professional Development	Adults	All accompanying grades (1–12)
Guide 05 — Citizen Scientist Handbook	Adult learners; community members; citizen scientists	Adult Education	Adults (18+)	N/A

1.4 Subject Classification

Subject Areas (EN)

Soil ecology, environmental science, sustainability education, citizen science, environmental monitoring, biodiversity observation, phenomenological learning, education for sustainable development (ESD/BNE), reciprocal economics, token economy, blockchain literacy, community economics, bioregional thinking, geography, landscape ecology, soil science, data literacy, IoT (Internet of Things), open data, place-based learning, anthroposophical pedagogy, cross-border environmental education, commons theory.

Subject Areas (DE — Fachbereiche)

Bodenökologie, Umweltwissenschaften, Bildung für nachhaltige Entwicklung (BNE), Bürgerwissenschaft (Citizen Science), Umweltmonitoring, Biodiversitätsbeobachtung, phänomenologisches Lernen, Reziproke Wirtschaft, Tokenwirtschaft, Blockchain-Grundlagen, Gemeinschaftsökonomie, Bioregionales Denken, Geografie, Landschaftsökologie, Bodenkunde, Datenkompetenz, Internet der Dinge (IoT), Offene Daten, Ortsbezogenes Lernen, Waldorfpädagogik / Anthroposophische Entwicklungstheorie, Grenzüberschreitende Umweltbildung, Commonstheorie.

Subject Areas (PL — Dziedziny przedmiotowe)

Ekologia gleby, nauki o środowisku, edukacja dla zrównoważonego rozwoju (EZR/BNE), nauka obywatelska (citizen science), monitoring środowiska, obserwacja bioróżnorodności, uczenie się fenomenologiczne, ekonomia wzajemna, ekonomia tokenowa, podstawy blockchain, ekonomia społeczności, myślenie bioregionalne, geografia, ekologia krajobrazu, gleboznawstwo, kompetencje danych, Internet Rzeczy (IoT), otwarte dane, uczenie się oparte na miejscu, pedagogika antropozoficzna, transgraniczne kształcenie środowiskowe, teoria wspólnot.

BNE Gestaltungskompetenz Dimensions Addressed

All 12 sub-competencies of the Transfer 21 Gestaltungskompetenz framework are addressed across the collection:

Code	Sub-Competency	Primary Guide(s)
4.1.1	Openness to new perspectives	All guides
4.1.2	Foresight and scenario analysis	Guides 02, 03, 05
4.1.3	Interdisciplinary action	All guides
4.1.4	Risk and uncertainty recognition	Guides 02, 03
4.2.1	Collaborative planning and action	All guides
4.2.2	Recognizing goal conflicts	Guides 03, 05
4.2.3	Participation in decision-making	All guides (token economy)
4.2.4	Motivating self and others	All guides
4.3.1	Reflecting own values	All guides (4A-Pathway)

Code	Sub-Competency	Primary Guide(s)
4.3.2	Independent planning and action	Guides 03, 05
4.3.3	Showing empathy	All guides
4.3.4	Justice as a basis for action	All guides (reciprocal economy)

Compliance level: All 12 sub-competencies addressed; Brandenburg BNE Quality Catalog minimum requirements far exceeded (86% full compliance across 69/69 criteria).

SDG Alignment

Status: Confirmed — derived by systematic evidence review across all nine project documents (February 2026). Evidence citations refer to specific passages; document abbreviations defined below. Author should review Tier 3 entries before finalizing platform submissions.

Document abbreviations used in evidence column: - **[A]** `pattern_discovery_toolkit_appendices.md` (Appendices A–D) - **[BQ]** `bne_quality_living_guides.md` - **[BI]** `bioregion_mapping_living_guides.md` - **[TE]** `token_economy_living_guides.md` - **[QS]** `questions_to_the_soil_living_guides.md` - **[G01–G05]** OER Layer guides 01–05 - **[MI]** `erdpuls_master_index_v1_2.md`

Tier 1 — Primary SDGs (core program purpose; deeply and repeatedly documented)

SDG	Title	Integration level	Specific evidence
SDG 4	Quality Education	**Primary**	Core purpose of all five OER guides. Full alignment to Brandenburg BNE Quality Catalog (86% of 69/69 criteria fully met). All 12 Transfer 21 Gestaltungskompetenzen explicitly mapped. Brandenburg Rahmenlehrplan alignment tables for primary, secondary, and upper secondary documented in full. 4A-Pathway (Awareness⟶Acknowledgment⟶Attitude⟶Action) serves as the overarching pedagogical framework across all five guides. [G01–G05; A, Appendix D; BQ]
SDG 13	Climate Action	**Primary**	Continuous measurement of air temperature, humidity, CO_2, UV radiation via senseBox MCU, uploaded to openSenseMap at 60-second intervals. Citizen Scientist Handbook explicitly states spring phenological events have shifted "approximately 6–8 days per decade since the mid-20th century" and instructs participants to track first bloom/arrival dates as direct climate signal. Soil temperature time-series as climate proxy. Longitudinal soil observation record (monthly protocol, multi-year accumulation intended) documented as contribution to climate change monitoring. senseBox also supports CO_2 concentration monitoring via SCD30 sensor. [G05 Ch.3, Ch.7; G02 Phase 2; G03 Track A Phase 2; A Appendix A Q8]

SDG	Title	Integration level	Specific evidence
SDG 15	Life on Land	**Primary**	Thirteen-question soil observation protocol centers on soil as living system — with direct biodiversity counting (Life Count: 2-minute timed observation, organisms recorded individually), root architecture analysis, soil layer (horizon) investigation, and soil history reading. All species observations uploaded to iNaturalist/GBIF. Naturpark Schlaubetal explicitly described as a "reference site" and "relatively intact glacial landscape with high biodiversity value" for comparative monitoring. Monthly home observation protocol (G05 Ch.2) generates long-term phenological records. Bioregion mapping track includes walking transects with vegetation and soil transition documentation. [G01 Phase 1; G02 Phase 1; G03 Track A; G05 Ch.1–2; A Appendix A Q4, Q7; BI]
SDG 17	Partnerships for the Goals	**Primary**	Collection licensed CC BY-SA 4.0 (open, remixable, trilingual). All sensor data published to openSenseMap (open, permanent, globally accessible). All species observations contributed to iNaturalist / GBIF. Open-source hardware (senseBox), open-source software (AGPL-3.0), open GIS tools (QGIS, OpenStreetMap, Copernicus). Explicit cross-border DE/PL participant group documented across all four appendix guide sets. Cross-border workshop format ("Eine Landschaft, Zwei Länder") specifically designed. Citizen science contribution described as joining "a network that 1,000+ German users connect to." [G05 Ch.1; G03 Track B; MI; BI cross-border guide; A Appendix C]

Tier 2 — Secondary SDGs (explicitly documented in project materials; not the primary focus but substantively addressed)

SDG	Title	Integration level	Specific evidence
SDG 3	Good Health and Well-Being	**Secondary**	Citizen Scientist Handbook Chapter 3 explicitly explains PM2.5 and PM10 fine particulate matter with the WHO air quality guideline (24-hour average below 15 µg/m³ for PM2.5) and describes health implications of particles that "can penetrate deep into lungs." senseBox outdoor stations measure PM2.5, PM10, CO_2, and UV radiation index as standard outputs. Air quality monitoring is positioned as a direct community health contribution. Outdoor embodied learning in all three student guides supports physical wellbeing and nature contact. [G05 Ch.3, Ch.6; G02 Phase 2]
SDG 6	Clean Water and Sanitation	**Secondary**	Question 8 (Water Infiltration) of the soil protocol explicitly connects water infiltration time to "flood risk, erosion, drought resilience, and groundwater recharge" (Appendix A). Students measure water infiltration rate as a functional soil health indicator in all three school guides. Bioregion elder guide (Water Memory exercise) documents vanished streams, drained wetlands, and changed flood patterns as historical landscape change evidence. senseBox supports water temperature probes for stream and pond monitoring. [A Appendix A Q8; G02 Phase 1; BI elder guide; G05 Ch.6]

SDG	Title	Integration level	Specific evidence
SDG 10	Reduced Inequalities	**Secondary**	The Collective Threshold Model is a four-pathway access system explicitly designed so "the people who know the most about this place can always come": (1) Full Rate, (2) Supported Rate, (3) Skills Exchange, (4) Token Pathway. Token Economy adult guide states directly: "The elder with no spare euros but forty years of soil knowledge enters through Skills Exchange or Token Pathway." Multilingual OER publication (EN/DE/PL) reduces language-based access barriers. Cross-border DE/PL participation group explicitly addresses national inequality in access to environmental education resources. [TE adult guide; G05 Ch.4; MI cross-border group]
SDG 11	Sustainable Cities and Communities	**Secondary**	Bioregional mapping workshops produce community-held knowledge of local landscape boundaries, heritage sites, and ecological features. Token economy is explicitly framed as "commons governance" — a mechanism for making non-monetary community contributions visible and valued. Pattern language produces a place-specific collective knowledge resource. Müllrose campus operates as a community heritage hub (Zone E: Heritage & Community Hub). Repair Café documented as community infrastructure. Place attachment as sustainability literacy foundation across all guides. [BI; TE; MI; G01–G05 (place-based learning frame)]

Tier 3 — Tertiary SDGs (documented in supporting documents; present but less central in the five OER guides specifically — author should confirm before citing on platform submissions)

SDG	Title	Integration level	Specific evidence	Author action
SDG 8	Decent Work and Economic Growth	**Tertiary**	Token Economy adult guide states: "No GDP calculation includes the neighbor who fixed your fence. No tax record captures the grandmother who taught her grandson to cook… But all of these are economic acts. They create real value." Repair Café is documented as a token-generating economic activity. Skills Exchange pathway recognizes non-wage labor. Elder knowledge treated as capital. Primarily documented in Token Economy Living Guides (supporting layer), less prominently in the five OER guides.	Confirm if SDG 8 should be cited for OER Layer submissions specifically
SDG 9	Industry, Innovation and Infrastructure	**Tertiary**	senseBox MCU is open-source hardware/software; Makerspace workshops build citizen-operated IoT monitoring infrastructure. Guide 03 and Citizen Scientist Handbook Ch.6 teach IoT concepts, sensor deployment, and open data infrastructure. Informatik curriculum alignment (Upper Secondary) includes IoT systems and data ethics. AGPL-3.0 software license applies to all referenced software. Primarily a tool dimension rather than a dedicated learning objective.	Confirm if SDG 9 should be cited for OER Layer submissions specifically

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Confirmed SDG list for platform submissions (Tier 1 + Tier 2):
SDG 3, SDG 4, SDG 6, SDG 10, SDG 11, SDG 13, SDG 15, SDG 17

Pending author confirmation (Tier 3):
SDG 8, SDG 9

1.5 Keywords

Keywords (EN)

sustainability education, citizen science, soil ecology, place-based learning, phenomenological learning, education for sustainable development, ESD, BNE, Brandenburg, Müllrose, Naturpark Schlaubetal, senseBox, openSenseMap, iNaturalist, token economy, reciprocal economics, UBECrc, blockchain, open data, 4A-Pathway, bioregional mapping, pattern language, environmental monitoring, makerspace

Keywords (DE — Schlagwörter)

Bildung für nachhaltige Entwicklung, Bürgerwissenschaft, Bodenökologie, ortsbezogenes Lernen, phänomenologisches Lernen, BNE, Brandenburg, Müllrose, Naturpark Schlaubetal, senseBox, openSenseMap, iNaturalist, Tokenwirtschaft, Reziproke Wirtschaft, UBECrc, Blockchain, Offene Daten, 4A-Pfad, Bioregionale Kartierung, Mustersprache, Umweltmonitoring, Makerspace, Nachhaltigkeitsbildung, Schulgarten

Keywords (PL — Słowa kluczowe)

edukacja dla zrównoważonego rozwoju, nauka obywatelska, ekologia gleby, uczenie się oparte na miejscu, uczenie się fenomenologiczne, EZR, BNE, Brandenburgia, Müllrose, Naturpark Schlaubetal, senseBox, openSenseMap, iNaturalist, ekonomia tokenowa, ekonomia wzajemna, UBECrc, blockchain, otwarte dane, ścieżka 4A, kartografia bioregionalna, język wzorców, monitoring środowiska, makerspace, zrównoważony rozwój

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1.6 Technical Details

File Formats

Format	MIME Type	Notes
Markdown (.md)	text/markdown	Current format of all five OER guides
PDF (.pdf)	application/pdf	Planned for publication-ready distribution
DOCX (.docx)	application/vnd.openxmlformats-officedocument.wordprocessingml.document	Planned for editable distribution

Format	MIME Type	Notes
Printed supplements	—	Earth Detective Cards (A5), Field Sheets (A4), Token Cards — referenced in guides but not yet distributed as digital files

File Naming Convention

```
[two-digit-number]_[type]_[scope]_[LANG].md
01_learning_guide_grades_1-4_EN.md
02_learning_guide_grades_5-8_EN.md
03_learning_guide_grades_9-12_EN.md
04_teachers_guide_EN.md
05_citizen_scientist_handbook_EN.md
```

Leading numbers (01–05) ensure alphabetical sort order matches pedagogical sequence.

Accessibility Notes

Derived from Teacher's Guide (operational information section) and Guide 01 (risk and safety section):

- The Erdpuls program "can be adapted significantly" for participants with mobility, sensory, or other access requirements. Advance contact with Erdpuls is required (erdpuls@ubec.network).
- Children with sensory sensitivities who cannot touch soil are fully accommodated; soil contact is never compelled.
- Indoor adaptations of the full outdoor protocol are possible using soil samples brought in containers (documented in Guide 01 Facilitator Notes).
- The senseBox Blockly programming environment requires no prior programming knowledge (Chapter 6, Citizen Scientist Handbook).
- All five guides are currently in plain Markdown format, which is screen-reader compatible.
- **Gap:** No formal WCAG compliance statement or accessibility audit has been conducted on the current documents. This is flagged as a pre-submission requirement.

1.7 Quality and Standards

Quality Assurance Statement

The Erdpuls educational program has been evaluated against the Brandenburg BNE Quality Catalog (*Qualitätskatalog für BNE außerschulischer Anbieterinnen und Anbieter*, MLUK Brandenburg, April 2023) — the official quality framework for non-formal sustainability education providers in Brandenburg. The evaluation covered all 69 quality criteria across seven quality areas (Goals and Target Groups; Approach; Methods; Design Competencies; Quality Development; Facilitator Qualification; Organizational Conditions). Of the 69 criteria, 86% are fully met; all minimum requirements are satisfied across all seven areas. All 12 Gestaltungskompetenzen (Transfer 21 framework) are addressed. The five OER guides in this collection are the publication layer derived from this quality-evaluated program.

Curriculum Alignment

The following Brandenburg subject frameworks are explicitly referenced and aligned in the Teacher's Guide (Guide 04):

Primary (Klassen 1–4): Sachunterricht, Kunst, Deutsch, Mathematik

Lower Secondary (Klassen 5–8): Biologie (Klassen 5–6: soil organisms, ecology; Klassen 7–8: ecosystems, interdependence), Geografie (local landscape, land use), Chemie (Klassen 7–8: pH, chemical properties), Mathematik (data collection and graphing), Ethik/Gesellschaftskunde (value beyond money)

Upper Secondary (Klassen 9–12): Biologie (Oberstufe: ecosystem analysis, biodiversity, soil science), Geografie (Oberstufe: landscape systems, climate change), Chemie (Klassen 9–10: pH), Informatik (IoT systems, open data, data ethics), Wirtschaft/Soziales (alternative economics, commons theory), Ethik/Philosophie (environmental ethics, intergenerational responsibility), Projekttage/Facharbeit (independent research design)

Pedagogical Approach

The Erdpuls program employs a phenomenological learning method in which sensory encounter with the living environment precedes conceptual interpretation — the principle of "sense first, interpret later." Learning is structured through the 4A-Pathway (Awareness → Acknowledgment → Attitude → Action), a four-stage developmental arc calibrated to the anthroposophical developmental theory of Rudolf Steiner: Guide 01 targets the will-forces of early childhood through embodied, movement-rich discovery; Guide 02 meets the awakening of causal reasoning in middle school through systematic investigation; Guide 03 engages individual judgment in upper secondary through genuine open research. Citizen science integration (openSenseMap, iNaturalist) connects local observation to global open datasets, making learners active contributors to environmental science. The reciprocal token economy (UBECrc) makes non-monetary contributions — cooperation, reciprocity, mutualism, regeneration — visible and valued. The pedagogical design is grounded in nine named intellectual traditions including Christopher Alexander (Pattern Language), Edward T. Hall (Proxemics), Goethean Science, and Ubuntu Philosophy.

Part 2: Per-Document Metadata Records

2.1 Young Learners Guide (01)

Field	Value
Filename	01_learning_guide_grades_1-4_EN.md
Title (EN)	Earth Detectives: First Encounters with Living Ground
Title (DE)	Erddetektive: Erste Begegnungen mit lebendigem Boden
Title (PL)	[TO BE COMPLETED BY AUTHOR — pending Phase 3 translation]
Audience role	School students; visiting school classes with accompanying teachers
Educational level	Primary (Lower Primary)
Age range	6–10 years

Field	Value
Grade range	Klassen 1–4 (Lower Primary School)
Language(s)	EN (current); DE, PL (pending Phase 3)
Version	1.2
Date	February 2026
License	CC BY-SA 4.0

Learning Objectives (derived from competency cluster and session structure): - Direct sensory encounter with soil, insects, roots, and water; naming living things by observation, not by label - First experience of scientific observation: "What do you notice?" as the first scientific question - Drawing as data recording; comparison between observation patches - Introduction to the senseBox as a "conversation partner" — comparing body senses with sensor readings - Understanding that sharing a discovery creates value for the group (Token Seed ceremony) - Contributing first observations to iNaturalist (global biodiversity database)

Key Topics Covered: - Phenomenological observation (Ring 0–2): soil touch, smell, visual observation - The Smell Jar comparison (three soil/substrate types) - Body Calibration Sequence (sensory grounding ritual) - senseBox conversation — temperature, humidity, soil moisture - Token Seed ceremony and class Community Observation Board - Class Soil Portrait (collaborative drawing, above/at/below ground layers) - Seasonal variations (spring, summer, autumn, winter adaptations) - Pre-visit and post-visit classroom activities

Teaching Methods: - Phenomenological outdoor observation - Story-based pedagogical framing ("narrative invitation" before each phase) - Hands-on sensory exploration (touch, smell, sight, hearing, water tests) - Collaborative drawing and documentation - Ritual ceremony (stone circle opening/closing; Token Seed ceremony) - Small group observation with shared reporting

Assessment Methods: - Portfolio of Earth Detective Cards (individual observation drawings) - Class Soil Portrait (collaborative output artifact) - Community Observation Board (class-level record) - iNaturalist observation IDs assigned at session close - Pre-visit mental model drawing compared to post-visit observations (portfolio assessment described in Teacher's Guide)

Prerequisites: None explicitly stated.

Estimated learning time: 90–120 minutes (half-day preferred); plus 1 pre-visit lesson and 1–2 post-visit lessons (teacher-led)

2.2 Middle Students Workbook (02)

Field	Value
Filename	02_learning_guide_grades_5-8_EN.md
Title (EN)	Field Investigators: Measuring the Living World
Title (DE)	Feldforscher: Die lebendige Welt messen
Title (PL)	[TO BE COMPLETED BY AUTHOR — pending Phase 3 translation]
Audience role	School students; visiting school classes with accompanying teacher
Educational level	Lower Secondary (Middle School)

Field	Value
Age range	11–14 years
Grade range	Klassen 5–8
Language(s)	EN (current); DE, PL (pending Phase 3)
Version	1.2
Date	February 2026
License	CC BY-SA 4.0

Learning Objectives: - Full 13-Question soil protocol: observation, measurement, interpretation, and ethical positioning from direct data - Systematic data recording with instruments (pH strips, thermometer, moisture probe) - Operating the senseBox MCU with guidance; understanding the "Sensor Dialogue" (body sensing vs. instrumental measurement as complementary data streams) - Formulating a "Why?" question from observed data differences (scientific inquiry) - Contributing data to openSenseMap and iNaturalist - Understanding non-monetary value through introduction to all four UBECrc token elements

Key Topics Covered: - The 4A-Pathway (Awareness, Acknowledgment, Attitude, Action) — full introduction - *Questions to the Soil* protocol (13-question observation sequence) - Sensor Dialogue methodology (body vs. instrument; complementary not competitive) - pH measurement, water infiltration test, Life Count - Comparative Data Board (multi-team data synthesis) - Four token elements: Cooperation (Green), Reciprocity (Blue), Mutualism (Orange), Regeneration (Gold) - My One Question (closing inquiry activity) - Brandenburg curriculum connections (Biology, Geography, Chemistry, Mathematics, Ethics) - Seasonal variations

Teaching Methods: - Team-based investigation (4–5 students per patch) - Systematic measurement with instruments - Comparative data analysis (cross-patch, cross-team) - Sensor-body dialogue (structured comparison exercise) - Token economy engagement (earning and reflecting on token categories) - Socratic discussion of data patterns

Assessment Methods: - Field Sheet (A4, double-sided — individual record) - Comparative Data Board (class-level data aggregation, photographed) - "My One Question" — closing inquiry seed (per student) - openSenseMap station ID (permanent contribution record) - Post-visit data analysis (graphing correlations — link to Mathematics curriculum)

Prerequisites: None explicitly stated; benefits from prior discussion of "what is science?" (suggested pre-visit activity in Teacher's Guide)

Estimated learning time: 3–3.5 hours (half-day); plus 1 pre-visit lesson and 2–3 post-visit lessons

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2.3 Advanced Students Manual (03)

Field	Value
Filename	03_learning_guide_grades_9-12_EN.md
Title (EN)	Place as Laboratory: Research Methods for the Living World
Title (DE)	Ort als Labor: Forschungsmethoden für die lebendige Welt
Title (PL)	[TO BE COMPLETED BY AUTHOR — pending Phase 3 translation]

Field	Value
Audience role	School students (Gymnasium / Oberschule); Projekttage; Facharbeit research groups
Educational level	Upper Secondary
Age range	15–18 years
Grade range	Klassen 9–12
Language(s)	EN (current); DE, PL (pending Phase 3)
Version	1.2
Date	February 2026
License	CC BY-SA 4.0

Learning Objectives: - Independent research question design from direct observation data - Multi-variable environmental analysis; distinguishing correlation from causation - Independent senseBox MCU deployment and configuration; openSenseMap station management - Basic QGIS orientation for GIS-supported bioregional mapping - Full UBECrc token economy engagement; optional: design exercise for alternative economic system - Understanding open data ethics and open science principles - Systemic thinking about personal agency and intergenerational responsibility (Action stage of 4A-Pathway)

Key Topics Covered: - Track A: Full Research Protocol (full 13-question soil protocol + independent research question design) - Track B: GIS and Bioregion Mapping (walking transect + QGIS data overlay + bioregional boundary proposal) - Track C: Quality Framework Reflection (student evaluation of session against Brandenburg BNE criteria) - Research Question Design Sheet methodology - UBECrc system design exercise (token economy design for their own community context) - Open science and data contribution principles - Brandenburg curriculum connections (Biology Oberstufe, Geography Oberstufe, Informatik, Wirtschaft, Ethik, Projekttage/Facharbeit)

Teaching Methods: - Maximum-independence, minimum-instruction facilitation - Three modular tracks (combinable for half- or full-day) - Independent instrument operation - GIS spatial analysis (QGIS workstation) - System design exercise (token economy design) - Peer presentation of research questions

Assessment Methods: - Research Question Design Sheet (specificity of observation, clarity of question, method feasibility, connection to open data sources) - Bioregional boundary proposal with annotated rationale - Open science contributions (iNaturalist uploads, openSenseMap annotations) - Student evaluation of Erdpuls session against BNE Quality Catalog (Track C — dual output: student learning + Erdpuls quality evidence) - Potential Facharbeit development from research questions generated

Prerequisites: None formally stated; benefits from prior science experience; Track B requires students to be physically able to complete a walking transect.

Estimated learning time: 3.5–5 hours (half-day to full-day depending on tracks selected); plus 3–5 post-visit lessons or ongoing inquiry project

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2.4 Teachers' Comprehensive Guide (04)

Field	Value
Filename	04_teachers_guide_EN.md

Field	Value
Title (EN)	Bringing Your Class to the Living Laboratory
Title (DE)	Mit der Klasse ins Lebendige Labor
Title (PL)	[TO BE COMPLETED BY AUTHOR — pending Phase 3 translation]
Audience role	Classroom teachers; accompanying educators; school coordinators
Educational level	Professional Development
Age range	Adults
Grade range	Applicable to all accompanying grade bands (Klassen 1–12)
Language(s)	EN (current); DE (pending Phase 3 — highest priority for German OER platforms); PL (pending Phase 3)
Version	1.2
Date	February 2026
License	CC BY-SA 4.0

Learning Objectives: - Understand the phenomenological method and "sense before interpret" pedagogical sequence - Apply the 4A-Pathway framework to classroom planning before and after visits - Use the anthroposophical developmental stage framework to calibrate expectations by grade band - Align Erdpuls visit content to specific Brandenburg Rahmenlehrplan subjects and grade levels - Design appropriate portfolio-based and observation-based assessment for place-based learning - Communicate the Erdpuls program to parents/guardians using the provided template

Key Topics Covered: - The phenomenological method in plain terms; teacher role during sessions - The 4A-Pathway explained for teachers - Anthroposophical developmental framework practical implications by grade band - Five competency clusters with BNE Gestaltungskompetenz alignment table - Brandenburg curriculum alignment by grade band and subject - Pre-visit classroom preparation activities (all grade levels) - Post-visit classroom integration activities (differentiated by grade level) - Portfolio assessment, observation journal, research question quality rubrics - Parent/Guardian communication template - Repeat visits and seasonal learning cycle - Operational information (booking, location, cost, accessibility, cancellation)

Teaching Methods described: Portfolio-based assessment; observation journals; inquiry-based post-visit activities; peer discussion structures; pre-visit prediction activities.

Assessment Methods described: Portfolio assessment (pre-visit mental model → field observation → post-visit deepening); Observation Journal (Grades 5–12); Research Question Quality rubric (Grades 9–12).

Prerequisites: No prerequisites stated; written for teachers with no prior knowledge of Erdpuls or phenomenological education.

Estimated learning time: [NOT SPECIFIED IN DOCUMENT] — reference/professional development document, not a timed session guide.

2.5 Citizen Scientist Handbook (05)

Field	Value
Filename	05_citizen_scientist_handbook_EN.md
Title (EN)	How to Monitor, Contribute, and Connect
Title (DE)	Beobachten, Beitragen und Vernetzen
Title (PL)	[TO BE COMPLETED BY AUTHOR — pending Phase 3 translation]
Audience role	Adult citizen scientists; community members; home gardeners; environmental observers
Educational level	Adult Education
Age range	18+ (adults)
Grade range	N/A
Language(s)	EN (current); DE, PL (pending Phase 3)
Version	1.2
Date	February 2026
License	CC BY-SA 4.0

Learning Objectives: - Understand the role of citizen scientists in global environmental monitoring networks - Make scientifically meaningful observations (consistency, completeness, honesty about uncertainty) - Contribute effectively to openSenseMap and iNaturalist - Conduct monthly soil observations at a permanent home patch using the Erdpuls protocol - Build and operate a senseBox MCU outdoor monitoring station (no prior engineering knowledge required) - Read and interpret time-series sensor data - Understand blockchain basics as applied to the UBECrc token economy (non-technical) - Apply ethical principles of community science (attribution, non-disturbance, privacy) - Connect local observations to global climate and biodiversity patterns (phenology)

Key Topics Covered: - Chapter 1: Global environmental monitoring network (openSenseMap, iNaturalist, eBird, DWD Phänologie, Bürger schaffen Wissen) - Chapter 2: Making meaningful observations (three rules; home observation protocol) - Chapter 3: Reading and interpreting environmental data (sensor parameters explained; time-series analysis) - Chapter 4: Blockchain basics for non-technical users (what UBECrc uses and why) - Chapter 5: Community science best practices (science of showing up; data quality; Open Makerspace Days) - Chapter 6: Creating your own monitoring station (senseBox assembly, placement, maintenance) - Chapter 7: Connecting local observations to global patterns (phenology; Schlaubetal as reference site; Erdpuls Pattern Language connection) - Quick Reference platform table

Teaching Methods described: Self-guided handbook format; home observation protocol with monthly schedule; community practice at Open Makerspace Days; peer learning at Repair Café.

Assessment Methods described: None formally stated — self-directed adult learning context. Openness of contribution records (openSenseMap station page; iNaturalist observation history) serves as informal progress tracking.

Prerequisites: None. Designed for adults with no prior scientific training.

Estimated learning time: [NOT SPECIFIED IN DOCUMENT] — reference handbook for ongoing use; individual chapters are self-contained.

Part 3: Platform-Specific Submission Checklists

3.1 Zenodo Submission Checklist

Zenodo Field	Value to Enter
Upload type	Educational resource
Title	Erdpuls Müllrose Learning Materials — From Seeds to Blockchain: A Trilingual OER Collection for Sustainability Literacy, Citizen Science, and Reciprocal Economics
Authors	Erdpuls Müllrose — Center for Sustainability Literacy, Citizen Science and Reciprocal Economics
Affiliation	Erdpuls Müllrose, Müllrose, Brandenburg, Germany
Description	Paste English Abstract from Section 1.2 above
License	Creative Commons Attribution Share Alike 4.0 International
Keywords	(paste EN keyword list from Section 1.5, comma-separated)
Language	English (primary); German (pending); Polish (pending)
Communities	Suggest: `oer`, `citizen-science`, `education-for-sustainability`, `zenodo-community-germany` — [TO BE COMPLETED BY AUTHOR: verify community slugs before submission]
Related identifiers	openSenseMap station URL: [TO BE COMPLETED BY AUTHOR]; Erdpuls website: https://erdpuls.ubec.network
References	Brandenburg BNE Quality Catalog (MLUK Brandenburg, April 2023); Pattern Discovery Toolkit v1.1 (Erdpuls, February 2026)
DOI	[POST-SUBMISSION — assigned by Zenodo after upload]
Access rights	Open Access
Publication date	2026-02-01 (use first day of February 2026)
Version	1.2

Zenodo-required fields not yet available: - DOI [POST-SUBMISSION] - Zenodo record URL [POST-SUBMISSION]

3.2 WirLernenOnline (WLO) Submission Checklist

WLO / LRMI Field	Value to Enter
Titel (Title)	Erdpuls Müllrose Lernmaterialien — Von Samen zur Blockchain
Beschreibung (Description)	Paste German Abstract from Section 1.2 above
Schlagwörter (Keywords)	Paste DE keyword list from Section 1.5
Sprache (inLanguage)	de (primary for WLO), en, pl
Lizenz (license)	CC BY-SA 4.0 — https://creativecommons.org/licenses/by-sa/4.0/
Urheber / Herausgeber	Erdpuls Müllrose — Center for Sustainability Literacy, Citizen Science and Reciprocal Economics
educationalLevel	Primarstufe (Guide 01); Sekundarstufe I (Guides 02); Sekundarstufe II (Guide 03); Berufliche Bildung / Erwachsenenbildung (Guide 04 and 05)
typicalAgeRange	6–10 (Guide 01); 11–14 (Guide 02); 15–18 (Guide 03); adult (Guides 04–05)
learningResourceType	Unterrichtsplanung; Arbeitsblatt; Handbuch; Leitfaden

WLO / LRMI Field	Value to Enter
interactivityType	Active (Guides 01–03, 05); Expositive (Guide 04)
about (Fachbereich)	Biologie; Geografie; Sachunterricht; Chemie; Mathematik; Informatik; Ethik; Wirtschaft; Umweltbildung; BNE
educationalAlignment (BNE)	BNE Gestaltungskompetenzen 4.1.1–4.3.4 (all 12)
educationalAlignment (SDG)	SDG 3, SDG 4, SDG 6, SDG 10, SDG 11, SDG 13, SDG 15, SDG 17 (Tier 1+2 confirmed; see Section 1.4 SDG table for evidence)
isPartOf	Erdpuls Document Ecosystem v1.2 (https://erdpuls.ubec.network)
Quelle / URL	[TO BE COMPLETED BY AUTHOR — Zenodo DOI after upload]

Note: WLO prefers German-language content. The Teacher's Guide DE translation is highest priority before WLO submission.

3.3 OER Commons Submission Checklist

OER Commons Field	Value to Enter
Title	Erdpuls Müllrose Learning Materials: Sustainability Literacy, Citizen Science, and Reciprocal Economics
Description	Paste English Abstract from Section 1.2 above
Subject area(s)	Science and Technology; Environmental Education; Social Studies; Mathematics; Language Arts
Education level(s)	Lower Primary; Upper Primary; Middle School; High School; Vocational / Professional Education; Adult and Continuing Education
Material type	Lesson Plan; Activity/Lab; Reference Material; Module
Primary user	Student; Teacher; Other (Citizen Scientists)
Language	English
License	Creative Commons Attribution-ShareAlike
License version	4.0
Standards alignment	ESD for 2030 (UNESCO); Brandenburg BNE Quality Catalog; GreenComp (EU Sustainability Competence Framework)
Author / Publisher	Erdpuls Müllrose — Center for Sustainability Literacy, Citizen Science and Reciprocal Economics
Date published	February 2026

3.4 EU-Citizen.Science Listing Checklist

To register Erdpuls Müllrose on eu-citizen.science as both a project and a resource provider:

Field	Value
Project name	Erdpuls Müllrose — Living Laboratory for Sustainability Literacy and Citizen Science
Project description	Erdpuls Müllrose is a living laboratory and makerspace garden in Müllrose, Brandenburg, Germany. It combines phenomenological place-based education, open environmental monitoring (openSenseMap, iNaturalist), and a reciprocal token economy to engage school groups, families, elders, and adult citizen scientists in understanding their local ecosystem. Citizen scientists contribute soil, biodiversity, and atmospheric data to global open platforms; the accumulated dataset builds a longitudinal record of the Naturpark Schlaubetal sub-bioregion.
Start date	October 2025
Keywords	citizen science, soil monitoring, biodiversity, environmental monitoring, sustainability education, senseBox, openSenseMap, iNaturalist, token economy, Brandenburg, Germany, cross-border, Germany-Poland
Participation tasks	Environmental monitoring (soil, atmosphere, biodiversity); species observation and upload to iNaturalist; sensor station deployment and operation; open data contribution; community workshop participation
Geographic scope	Local / Regional — Müllrose, Brandenburg, Germany; cross-border with Poland (Naturpark Schlaubetal area)
Contact	erdpuls@ubec.network / https://erdpuls.ubec.network
Resource type	Educational materials; Monitoring protocol; Toolkit
Resource URL	[TO BE COMPLETED BY AUTHOR — Zenodo DOI after upload]

Part 4: License and Attribution Block

The following attribution block is provided for copy-paste into any document, submission form, or derivative work, in all three languages.

Attribution Block (EN)

Contact: erdpuls@ubec.network | https://erdpuls.ubec.network

Attribution Block (DE)

Kontakt: erdpuls@ubec.network | https://erdpuls.ubec.network

Attribution Block (PL)

Kontakt: erdpuls@ubec.network | https://erdpuls.ubec.network

Changelog

Version	Date	Changes
1.2	February 2026	Section 1.4 SDG Alignment: replaced placeholder with full evidence-based three-tier SDG table (8 confirmed SDGs, 2 pending author review). WLO checklist SDG field updated to confirmed list (SDG 3, 4, 6, 10, 11, 13, 15, 17). Evidence citations added to all SDG entries with document abbreviation key.
1.1	February 2026	Initial metadata package created from project documents

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This metadata package was compiled from verified content in the following project documents: `erdpuls_master_index_v1_2.md`, `01_learning_guide_grades_1-4_EN.md`, `02_learning_guide_grades_5-8_EN.md`, `03_learning_guide_grades_9-12_EN.md`, `04_teachers_guide_EN.md`, `05_citizen_scientist_handbook_EN.md`, `bne_quality_living_guides.md`, `pattern_discovery_toolkit_appendices.md`. *All field values are derived from document content; fields requiring author input are clearly marked.*