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## European cooperation in developing earth building training standards: results of the PIRATE project

Earth building in Europe has changed and developed over the past few decades. From a 1970's non-subject to an inspiring highly sustainable building form today, many actions were needed and performed across a group of countries. National earth building associations formed, discovering what could be achieved by working as a group within a national boundary. Through this, the development of national guidelines, codes and standards for earth building began.

One area to be included in 'standards' was training. Training offers the knowledge, skills and competences to those who will eventually apply the guidelines, codes and standards on the building site. The interesting dimension of this area was that it sought international co-operation. A first European project was conceived and began in 2002: six countries developed a range of teaching materials for earth plasters. This was followed by the *LearnWithClay* project, producing a first set of units of learning outcomes that now allowed for competence assessment and fostered transnational mobility.

After a period of dissemination of the powerful body of knowledge and experience, the next step was to develop training standards for structural earthen elements and masonry, a harder area to tackle due to its inherent perceived risks.

By the end of 2011, a funding application had been elaborated including 18 organisations from 8 countries who had agreed to work together for 3 years in what became the PIRATE project. It was agreed that the Units of Learning Outcomes should be for European Qualification Formwork (EQF) levels 3-5, in order to capture the knowledge of already experienced workers, site managers and company owners.

At the end of the project, after dedicating many hours and days to discussion, deliberation and testing, a group of units was added to the existing plaster units. As in the case of the plasters project, the power of working together was that a competence standard was simultaneously disseminated across 8 countries having a much broader effect in contrast to a standard solely developed in one country which would be a single step forward. Before its completion it was adopted in the UK as a National Occupational Standard. This route to national certification is certainly a dissemination tool available to all the other participating partners who worked on the Units. Working with standards beyond national boundaries within Regional Economic Communities (RECs) like the EU is extremely empowering, given the possibilities it creates being able to be used by other countries in the REC, or even by other RECs. It can also become a model for products and codes, harnessing the co-operation of the national groups and their knowledge and ability to work together. The experience of participating in this procedure and collaboration certainly goes beyond the initial goals of the project.

By promoting the integration of units of learning outcomes into the national vocational training systems and by making the ECVET Earth building units and the Learn•Earth certificates more visible and available, new organizations around Europe are encouraged to join the network of partners. This is helping the earth family of professionals expand but it is also growing awareness around ECVET accreditation and sustainable construction practices using earth as a building material throughout Europe.

After fourteen years of European projects in vocational training in earth building, it is possible to measure the impact, dynamics and future challenges of this informal network consisting of repository users:

Unit	Subunit	Level	L1	L2	L3	L4	L5	Unit name
M								From raw material to earth mix
P								Production of prefabricated elements
B	B1 earth masonry							Building with earth
	B2 cob							
	B3 rammed earth							
C								Application of clay plaster
F								Formwork for earth building
R	R1 building							Repair and conservation in earth building
	R2 clay plaster							
D								Interior design
O								Decorative techniques
E								Earth building market

Figure 1 The matrix of ECVET Earth building units of learning outcomes, version 2015

learners, trainers, training organizations and certification institutions. The tools to support the units and parallel initiatives of work on the repository are presented: exchange of students and trainers, training of trainers, certification and dissemination, overflow professionalizing context. Finally, future lines of work and collaboration are exposed.

**Earth and training – a triple statement**

A – Earth as a building material does not form an integral part of training programs for professionals in the building sector: builders, architects, planners, site managers or civil engineers, laboratory technicians, conservation officers etc. The scope of work is yet huge in light of existing buildings with earthen components, regardless of the country. This often means that the interventions made either on or around existing earthen buildings by professionals using other building materials are not compatible or that buildings are simply abandoned or destroyed (Scarato Jeannet and 2015). The lack of general and specific knowledge on earthen architecture in the decision-making bodies (governments and local authorities, design and control offices, heritage conservation, housing services...) is an obstacle towards the dissemination of earth building techniques (Leylavergne 2012).

B – In Europe, during the last ten or more years, the earthen building market and products are growing in many countries, even if there are few qualified professionals for applying earth building techniques, including new construction, rehabilitation, conserva-

tion or decoration. This commercial development is accompanied by research (Faria et al. 2015).

C – Training activities in earthen construction are growing steadily across the globe. Sustainable construction, improvement of living conditions of disadvantaged populations, conservation of architectural heritage and cultural identity, improving building systems in post-disaster situations, appreciation of professional skills of migrants, self-construction are all cases where women and men of any age, educational levels and professions acquire new skills around earthen material. The specialists who develop and provide such content generally base their teaching on a technical framework, without reference to learners, their future needs on the sites or their level of responsibility or autonomy. In addition, there is rarely a learning assessment as a result of the learning process. Furthermore, there is a demand for coordination and capitalization of the actors (Guillaud 2010) so that the initiatives can fertilize each other and that each new training project does not need to start from zero every time.

Thus, a shared competence and assessment framework is a powerful tool. It does not replace the bodies that remain masters of their training framework and their program. It provides a common base on which all kinds of actions and educational products can be developed. The repository ECVET Earth Building was designed with this mindset (Brown et al. 2015).

### Nine learning units in 5 levels

The nine fields of activity covered by the units are (Figure 1):

Unit M	From raw material to earth mix
Unit P	Production of prefabricated elements
Unit B	Building with earth – masonry, cob, adobe
Unit C	Application of clay plaster
Unit F	Formwork for earth building
Unit R	Repair and conservation in earth building
Unit D	Interior design
Unit O	Decorative techniques
Unit E	Earth building market

Each unit corresponds to a set of tasks that form a specific activity of earth construction which competences can be achieved at the level of a workstation on a construction site, a job in a company or activity for an entire company.

As shown in Figure 1, ECVET Earth Building is a multi-level repository. It was developed in transnational working groups during 14 years of cooperation between practitioners, trainers, training organizations and associations representing 9 countries. Designed for clay plaster between 2007 and 2009, with partners from four countries, it was expanded to load-bearing structural element techniques (masonry) between 2012 and 2015. All units have not yet been described for all levels; future work is still needed. Levels 1 and 2 apply beyond purely professionalizing contexts, allowing to include and value the learning outcomes of people in a discovery and initiation situation for earth building.

**Units M and E** have been adapted and review from the initial clay plaster matrix (units 1 and 6).

**Units D and O** also provide from the clay plaster matrix (units 4 and 5) and are unchanged for the moment but they might be extended to other techniques in the future, creating a common part and sub-units.

According to the principles of ECVET (European Parliament 2009), each unit is defined by a list of knowledge, skills and competences (in the sense of respon-

sibility and autonomy) which are necessary to an individual to perform a specific activity. The contents of these three lists varies depending on the level of qualification or professional profile. For the moment, the units ranging from level 1 to level 5 of the European Qualifications Framework (EQF) (<http://www.ecvet-team.eu/fr/cadre-européen-des-certifications-cec>) are defined. Up to level 4 of the EQF, learning outcomes in the building process concern execution. From level 5, the “doing” becomes “design”, “coordinate” and “control”. Criteria and indicators for assessing are also included in each unit.

Table 1 provides a simplified overview of the construction trades at different levels. This is much more complex when comparing levels between European countries, but the main features of the division of roles in decision-making, implementation, supervision and control are universal.

The new units developed in the PIRATE project are presented in a leaflet (for download under [http://pirate.greenbuildingtraining.eu/public/?page\\_id=1433](http://pirate.greenbuildingtraining.eu/public/?page_id=1433)) available in eight languages: German, English, Spanish, French, Portuguese, Serbian, Slovak, Czech. Other translations are planned as the expansion of the repository to other techniques and levels is envisaged.

To understand how the units develop through the five levels, one must consider each in detail:

Currently the L1-L2 levels exist only for plasters and D and O units also apply only to earth plasters.

**Units B and R:** at levels 3-4, there is a common part and sub-units with specific criteria for assessment: B sub-units for cob, masonry and rammed earth R sub-units for walls and plasters. From level 5 there are no further sub-units.

**Table 1** EQF levels of certification and professions

<b>Level 2</b>	Helper
<b>Level 3</b>	Qualified worker (mason, plasterer, etc.)
<b>Level 4</b>	Team manager, foreman
<b>Level 5-6</b>	Construction site manager, surveyor
<b>Level 7</b>	Engineer, architect

**Unit P:** The L3-L4 levels concern earth brick production (adobe, CEB, extruded brick) while the L5 level applies to brick production but also to other prefabricated elements.

**Unit F:** The L3-L4 levels apply only to the building techniques requiring formworks, mainly rammed earth, L5 covers any formwork for earth building techniques.

**Use of ECVET units and Learn•Earth certificates in Europe, impact and challenges**

Since 2002, an important community of practice has developed in Europe, to create, improve and spread earth construction skills training. It is grounded on the personal commitment of its actors. The introduction of a common core assessment tool coupled to the teaching activities has acted as a catalyst for the development of the network: recognizing a material and its variety of techniques for implementation in sustainable construction is not to be dissociated from recognising the skills and competence of the builders, whatever their background and personal learning path.

The ECVET Earth building matrix is a common denominator and that helps the dissemination and exploitation of earth construction training. It is a framework to develop content, programs, assessment, mobilities and skills. The units themselves are freely downloadable for all users at <https://ecvet-earth.hypotheses.org> but the recognition of learning outcomes through assessment is linked to a 'Memorandum of Understanding (MoU)'. Thus, only organizations adhering to this convention may issue a certificate. The agreement and certificates are called Learn•Earth (Figure 2), which exists today as a name and logo in fifteen languages. There is an admission procedure. This approach is both a guar-

antee of quality and a support tool for new training organizations become familiar with the repository, related tools and rules for evaluations as established between European partners.

Issued certificates are now stored in a database for statistical purposes (<https://docs.google.com/forms/d/1HpvVMM5gmKXeGnF8KtLBD6nKv-xrgW0BFjFUu5gZu2E/viewanalytics>). Since 2009, more than 500 certificates were issued. The nine countries which participated in the drafting of units are Germany, Bulgaria, Spain, France, Portugal, the Czech Republic, the UK, Serbia and Slovakia. The twelve countries that have already used the repository during learning assessments are Germany, Bulgaria, Spain, Estonia, Finland, France, Italy, Poland, Portugal, the Czech Republic, the United Kingdom and Slovakia. Contacts exist in a dozen other countries. Beyond Europe, the spread was initiated in several African and Latin American countries (Brown et al. 2015).

With this whole dynamic, even if the ECVET system does not lead to transnational diplomas and even if the units are not yet part of national qualifications (except for the UK), there will be recognition due to the number: the value of the certificates is proportional to the number of certificates issued. It is sufficient that any training be accompanied by an evaluation component. Given that the organization of an assessment is a major operation, the assessment offer must develop, independently to training, as to create and mutualise a pool of resources. National qualifications will not, in any case, cover all units at all levels of the existing and future matrix: it is the trans-European cooperation which helped to achieve this framework up until today, and it is the network's strength that will continue to ensure its development and scope.

Figure 2 The logo of the MoU and certificates

Bulgarian	<b>Кредит•Глина</b>	Slovak	<b>Poznaj•Hlinu</b>	Italian	<b>Apprender•Terra</b>
French	<b>Acquis•Terre</b>	Serbian	<b>Učiti•Zemlji</b>	Swedish	<b>Kunna•Lera</b>
German	<b>Lern•Lehm</b>	Polish	<b>Poznaj•Glinę</b>	Finnish	<b>Savi•Oppia</b>
English	<b>Learn•Earth</b>	Portugues	<b>Aprender•Terra</b>	Estonian	<b>Savi•Õpe</b>
Czech	<b>Poznej•Hlínu</b>	Spanish	<b>Formando•Tierra</b>	Greek	<b>Γεω•Μόρφωσις</b>

## Tools and initiatives connected to the ECVET earth building units

### Tools accompanying the units

In order to gather and make available for download tools produced since 2002 by our informal earth building network, a specific website was created: <https://ecvetearth.hypotheses.org>. The dispersion of the results coming from various European projects in different languages, on multiple websites, was making their visibility and accessibility very difficult. The new site is intended for different users:

- **learners**: any person interested in training or assessing their competences in earth building: young people and artisans in vocational training, students, adult re-training;
- **trainers** wanting to teach and assess earth building techniques and artisans who lead training in training centres or associations, university teachers;
- **Institutions** wishing to incorporate in their activities training and evaluation of earth building and mobility of learners and trainers: certification bodies, training organizations.

This new website solves the problem of the four ECVET Earth Building textbooks produced before the PIRATE project and whose content had become partially obsolete due to the revision and merging of some units.

Three types of documents are available to all:

- A. Units of learning outcomes, each consisting of:
  - “knowledge-skills-competences” sheets regarding different levels;
  - criteria and indicators for evaluation at various levels;
  - evaluation sheets for collecting the results of the evaluation for one person for one unit;
  - worksheets for examiners;
  - texts, videos and photos showing the tasks for each unit.
- B. Other educational tools, especially for the preparation of mobilities and assessments, such as checklists, template forms, recommendations and guidelines for trainers and examiners.
- C. Explanatory communication materials in various languages: booklets, leaflets, brochures, posters, papers.

At present, the network cannot provide a dynamic agenda with the offer of updated training and assessment. However, the site is intended to provide information regarding who the authorized partners to issue Learn•Earth certificates are and the list of units and levels offered by each organization.

Finally, there is a site section for internal use by the participating organizations of the MoU Learn•Earth.

### Initiatives parallel to work on the repository

**Mobility**: Openness to others and the desire for discovery and sharing are the basis of our work. All can learn from each other, get acquainted with Europe and of course its earthen architecture. Initiated as early as 2007, exchanges of learners and trainers have proven to be a powerful development engine for earth building training. Although mobilities have focused mainly on training activities, they are also increasingly coupled with European festivals.

In this dynamic, there are more and more connections with academic conferences and UNESCO Chair “Earthen Architecture, constructive cultures and sustainable development”. So it is natural and intentional that the spread of the Learn•Earth repository begins to overflow Europe.

**Training for trainers**: The principles of ECVET are new to many trainers, and the ins and outs of ECVET Earth Building may seem complex. For this reason partners began offering training for trainers and for assessors in order to support the dissemination and implementation of all these tools.

Some countries have selected an approach via their national associations to establish a group of assessors familiar with the assessment defined by the MoU agreement between European countries.

**Certification strategies**: The national associations may also carry the responsibility of the process of leading a portion of units towards recognition in national certification systems. This can be a long term procedure, depending on the country, beyond the scope of the various European projects. This procedure additionally requires the establishment of a dialogue between the bodies involved and the network of actors of earth construction and training.

The UK this procedure has already been completed. There was progress since in 2007, so that earth would appear next to lime material in the repositories on heritage conservation (heritage skills). Under the PIRATE project, the trades repository (national occupational standard NOS) was modified so that it became possible to have qualification units (National Vocational Qualifications NVQ) for earth building. At the moment, some professionals, in this case one or two members of EBUKI (Earth building association of the UK and Ireland) can officially become examiners for ECVET Earth Building units Level 3.

In the UK evaluation is mandatory in a professional context on-site. The institution issuing certificates (Qualification Awarding Body) is the Stirling College. Foreign candidates can be admitted to these assessments and may therefore obtain a certificate recognized by the United Kingdom.

In Czech Republic, a new national qualification for earth building has been achieved after a several years process.

In France and Portugal, the development of educational content will be coupled to the process of implementation of professional rules, based on regional constructive knowledge.

### Conclusions

Cooperation between entrepreneurs and trainers from all over Europe helped design a tool flexible enough to adapt to different national or even regional contexts while providing a strong common foundation.

Quality assurance in the dissemination and application of the units is an issue. There is room for maneuvering between the bureaucracy that could result from the creation of the certificate database and the zapping that users would be tempted to do on what interests them in the units only. The favourable factors for quality are:

- The continuation of exchanges between users at different scales;
- The development of training for trainers and examiners;
- Improving access to documents in all languages.

Any meeting or future cross-border project should enable to reflect on the following questions:

- How can the evaluation practices be anchored and the tools be improved?
- What are the requirements and good practices in terms of teaching, assessment and dissemination of results?
- What are the missing links in the networks as to improve mobility and the integration of units into national qualifications?

After the PIRATE project, working paths are numerous, the most obvious being:

- Integrating non-structural earth masonry techniques (earth-fiber for instance) and associated thermal and acoustic insulation;
- Earth building skills in design and engineering (level 7);
- Educational material covering the content of all the units.

Even if the MoU agreement is designed to broaden the community of ECVET Earth Building practices in the European context, the MoU institutions will be happy to support any international institution who is interested in using these tools. The UNESCO Chair “Earthen Architecture, constructive cultures and sustainable development” may be the location for this.

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