TVET system should not be limited to

being a mere supplier satisfying

economic demands. It also has a

responsibility and opportunity to

help generate a new generation of

workers and entrepreneurs willing and

able to frame an economic model

adhering to the principles of

sustainable development, in a way

that fits the national political

orientation.

(Majumdar 2010 in   
UNESCO-UNEVOC 2017, p. 12)

**GreenSkills4VET**

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**Intellectual Output 3:**

**Manual for using and developing OER for ESD in VET**

**Learnbox Section 3**

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# List of abbreviations

CAR Comparative Analysis Report

CC Creative Commons

CEDEFOP European Centre for the Development of Vocational Training

DRR Disaster Risk Reduction

ECVET European Credit System for Vocational Education and Training

EQF European Qualifications Framework

ESD Education for sustainable development

FGSVET Framework for Green Skills in VET

GAP Global Action Programme

ICT Information and Communications Technologies

IO Intellectual Output

MERLOT Multimedia Educational Resource for Learning and Online Teaching

MORIL Multilingual Open Resources for Independent Learning

NQF National Qualifications Network

OER Open Educational Resources

SCP Sustainable Consumption and Production

SD Sustainable Development

SDG Sustainable Development Goal

TPACK Technological Pedagogical Content Knowledge

TVET Technical and Vocational Education and Training

UN United Nations

UNESCO United Nations Educational, Scientific and Cultural Organization

VET Vocal Education and Training

WCED World Commission on Environment and Development

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# Introduction

This manual is a main part of the GreenSkills4VET project. It summarizes the work on IO1 and IO2. In IO 1 each partner undertook desk researches in specific occupations in the field of Logistics and Health Care. According to the aims of the project the country-specific curricula and teaching materials had to be evaluated concerning Education for Sustainable Development (ESD) and Open Education Resources (OER). The results are documented in the Comparative Analysis Report (CAR), compiled by BFI, Linz. The essential elements of the CAR, which include the most import criteria leading the research in IO1, were used as the basis for the Framework for Green Skills in VET (FGSVET), created in IO2. The compilation of this Framework was done by ASPETE, Patras.

## What are the aims of this Manual?

The main aim of this Manual is to empower teachers and trainers as well as students to reach the ESD competences and get used to new teaching and learning methods. Methods which are more orientated to enhance the activities of the students and to concede more scope for the students for self-organized learning within the learning process.

This includes the following sub goals:

* Enhancing the thinking and acting in the sense of the Sustainable Development Goals (SDGs) with the aim of promoting prosperity while protecting the planet in order to achieve Sustainable Development (SD).
* Integration of ESD in teaching arrangements and learning arrangements for occupations in Logistics and Health Care.
* Improving the knowledge, skills, attitudes, values and ethics of teachers, trainers and students for living in a digital, knowledge-based economy and in a globalized world
* Enhancing the challenges of digitization for education and new (interactive) and co-operative teaching and learning methods, in particular Open Educational Resources – OER

According to the main aims, this manual will provide a short but sufficient overview of the SDGs and ESD as documented by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as well as some important elements of OER. This manual also includes the main aspects of OER and some easy to use examples for teaching and training.

## How to use this Manual?

The headlines of the subchapters of this Manual are formulated as questions. If you can answer the questions in a certain way, it is possible to skip this particular (sub)chapter and continue with the following one. At the end of each chapter there is a box showing the answers to the questions of the headlines in a short and compressed manner. These boxes should help you to navigate through the chapters of the Manual and to get a quick insight into the content of the (sub-)chapter.

Because this Manual can`t cover all conceivable issues regarding the use and development of OER for ESD in VET, it should be understood as a general guide. For a deeper understanding and for specific issues, the named literature can provide some help and solutions. In the annex of this manual a commented list of country-specific OER-links (for every partner-country) is provided to to give you access to further information.

## What are the new circumstances for teaching and learning?

**Knowledge-Based Society/Economy**:

Daniel Bell traced the beginning of the so called *Knowledge Based Society* back to the 18th century. He wrote that the first edition of the Encyclopaedia Britannica was written only by one or two scientists. They had an overview of the whole knowledge at that time. From the third edition on, more experts were needed. In the 1967 edition about 1,000 experts were involved. He made a clear distinction between *knowledge and information. Knowledge* is new judgments (from research and science) or new exposure of old views (in books and lectures) (Bell 1975, p. 180).

In the Lisbon strategy for 2010, announced at the meeting on 23rd and 24th March 2000 and held by the European Council, they emphasised the development for the next ten years:

“8. The shift to a digital, knowledge-based economy, prompted by new goods and services, will be a powerful engine for growth, competitiveness and jobs. In addition, it will be capable of improving citizens' quality of life and the environment. To make the most of this opportunity, the Council and the Commission are invited to draw up a comprehensive eEurope Action Plan to be presented to the European Council in June this year, using an open method of coordination based on the benchmarking of national initiatives, combined with the Commission's recent eEurope initiative as well as its communication «Strategies for jobs in the Information Society«.” (Lisbon European Council 2000)

**Digitization – Industry/Logistics 4.0:**

The fast changing world of Information and Communications Technologies (ICT) (Computers, the Internet, mobile phones, texting, social networking) spread the impact of *knowledge* in all spheres of the economy, society and policy.

The term Industry 4.0 is most common used as a cypher for the three main alterations of modern industry: automation, decentralization and networking, “which we call generally digitization and which will dramatically change our economic life and working life.” (Buhr 2017, p. 357). The phenomenon is also named fourth industrial revolution.

In 2016 PwC made a survey on the impact of digitization on industrial companies. They state “that their biggest implementation challenge isn’t the right technology, it’s a lack of digital culture and skills in their organisation. This finding is also consistent with our Digital IQ research. While investing in the right technologies is important, ultimately success or failure will depend not on specific sensors, algorithms or analytics programmes, but on a broader range of people-focused factors.” Companies have to form a concept of “a robust digital culture and to make sure change is driven by clear leadership from the C-suite. They’ll also need to attract, retain, and train digital natives and other employees who are comfortable working in a dynamic ecosystem environment.” (PwC 2016)

The computerization has not yet taken over most of the manufactory processes but it has already substituted manpower in administration and management. A survey made by Dengler and Matthes shows “that 15 per cent of employees subject to social insurance contributions have a high substitution potential in the year 2013 in Germany, i.e. they are employed in an occupation in which more than 70 per cent of the tasks could already be substituted by computers.” (Dengler & Matthes 2015, p. 4)

A survey done by Kersten et al. stated that “Digitization of business processes and transparency in the supply chain are the most important trends, and ones that companies will need to develop considerably in the future.” (Kersten et al. 2017, p. 14)

Most of the attempts in the field of digitization are predominantly focused on the implementation of ICT reorganizing all the processes within the companies, procurement, distribution and supply chain. The impacts on skills are mostly restricted to employability in a very narrow sense.

**The Need for Educational Reform:**

Siemens describes the impact of new technologies on learning and learning theories and postulates a fundamental chance in teaching and learning. Knowledge is not anymore clearly defined and stated in specific subjects. “*Behaviourism, cognitivism, and constructivism are the three broad learning theories most often utilized in the creation of instructional environments. These theories, however, were developed at a time when learning was not impacted through technology. Over the last twenty years, technology has reorganized how we live, how we communicate, and how we learn. Learning needs and theories that describe learning principles and processes, should be reflective of underlying social environments.” (Siemens 2005).* He stated that constructivism views learning as a process of inputs which is *“managed in short term memory, and coded for long-term recall.”* And later he said: *“Behaviourism and cognitivism view knowledge as external to the learner and the learning process as the act of internalizing knowledge. Constructivism assumes that learners are not empty vessels to be filled with knowledge. Instead, learners are actively attempting to create meaning. Learners often select and pursue their own learning. Constructivist principles acknowledge that real-life learning is messy and complex. Classrooms which emulate the “fuzziness” of this learning will be more effective in preparing learners for life-long learning.”* (Siemens 2005) The new technologies enforce the need to revise learning and learning theories and adapt them to the efforts of the digital age.

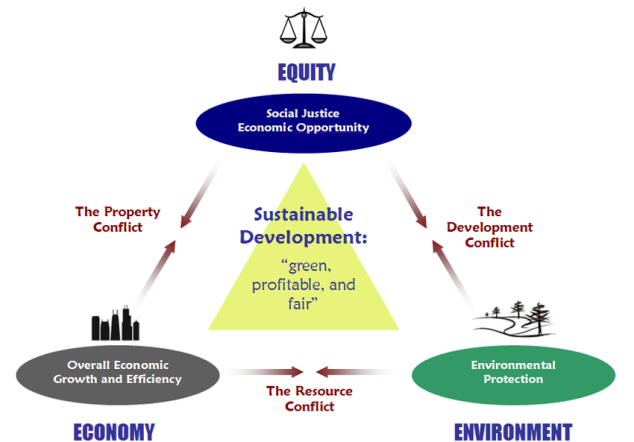
|  |
| --- |
| Key Points of Chapter 1: Summary and comment |
| **This Manual seeks to empower teachers and trainers as well as students to reach**  **the ESD competences (as described in chapter 2) and get used  to new teaching and learning methods.**  **This Manual cannot cover all specific issues and therefore should be used as a general guide.**  **The new circumstances for teaching and learning are shaped by the knowledge-based**  **society / economy and the digitization in the so called Industry 4.0.  These new circumstances require an educational reform and new  teaching and learning methods.** |

# ESD and ESD competences in VET

## What is our definition of ESD?

There is no universal definition of Sustainable Development and Education for Sustainable Development in a global context. The definition we choose for this Manual should be manageable in the context of VET and suitable for reaching the aims listed in chapter 1. The most common definition of sustainable development is the one formulated by the World Commission on Environment and Development (WCED):

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”   
(WCED 1987, p. 37)



**Figure 1** The Sustainability Triangle (Campbell & Fainstein 2003)

Figure 1 shows the three dimensions of SD: equity which is the social aspect, economy and environment. For a Sustainable Development as required by the WCED all dimensions must be mentioned. Problems from meeting the needs of the dimensions can occur because of some conflicts or tensions in between them. So there is the property conflict between the social and economical aspects, which means that a balance is needed between the social benefits and the economical development, because one is affecting the other. The same thing happens between the economic development and the environmental protection; if the priority is only to protect the environment then there are no resources for the economic growth. And finally the same happens between social development and environmental protection; if the target is only one of them then there is no space for development of the other aspect.

The members of the General Conference of UNESCO agreed in 2013 at the 37th session the *Global Action Programme (GAP) on ESD* as the follow-up to the Decade of ESD. The following **Dimensions** of ESD are stated in the GAP (UNESCO 2014, p. 12):

**Learning content:** Integrating critical issues, such as climate change, biodiversity, disaster risk reduction, and sustainable consumption and production, into the curriculum.

**Pedagogy and learning environments:** Designing teaching and learning in an interactive, learner-centered way that enables exploratory, action-oriented and transformative learning. Rethinking learning environments – physical as well as virtual and online – to inspire learners to act for sustainability.

**Learning outcomes:** Stimulating learning and promoting core competencies, such as critical and systemic thinking, collaborative decision-making, and taking responsibility for present and future generations.

**Societal transformation:** Empowering learners of any age, in any education setting, to transform themselves and the society they live in.

ESD is a holistic, dynamic approach that goes far beyond the conventional definition of technical and vocational education and training. All efforts in education should keep in mind that ESD must not be reduced to only one aspect of the concept. The coherence of each SDG has to be maintained as far as possible. Teaching ESD in the context of VET has to enrich the traditional teaching contents and the teaching and learning methods. It has to be a step for transforming education and the whole society. That means a transformation of all functional parts of the whole society (politics, economy and justice) in the sense of the SDGs.

## What to know about learning outcomes, EQF and ECVET?

“Usually, qualifications frameworks indicate the overall level of learning outcomes in a qualification. For ECVET purposes the European Qualifications Framework (EQF) is used as a reference for levels.” (European Commission 2011, p. 4)

Learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process. Learning outcomes can be used for various purposes such as to establish descriptors of qualifications frameworks, define qualifications, design curricula, assessment, etc. Learning outcomes are set out in various levels of detail depending on their purpose and context. Learning outcomes are developed in the process of designing qualifications. There are different approaches to identifying and describing learning outcomes depending on the qualifications system. Learning outcomes may be acquired through a variety of learning pathways, modes of delivery (school-based, in-company, etc.), in different learning contexts (formal, non-formal and informal) or settings (i.e. country, education and training system). Learning outcomes are described by using the terminology and descriptors existing in the qualifications system. The European definition of learning outcomes, which uses the terms of knowledge, skills and competence (see the EQF Recommendation), is the common denominator that fits with the diversity of existing approaches of describing learning outcomes.

The whole material used and created should consider the level of the VET according to the EQF. The VET specializations that are being studied in this project correspond, depending on the country, to the EQF Levels 4 and 5. The latter is a level of particular interest for VET according to the European Centre for the Development of Vocational Training (CEDEFOP 2014, p.1) because its qualifications “*appeal to learners as they open up prospects on several fronts – immediate employment, career advancement, and further learning. At the same time, their focus on advanced technical and managerial skills makes them valuable to employers”.* Learning outcomes in terms of knowledge, skills and competence regarding EQF levels 4 and 5 are presented in the following table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **KNOWLEDGE** | **SKILLS** | **COMPETENCES** |
| **Level 4** | Factual and theoretical knowledge in broad contexts within a field of work or study | A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study | Exercise self-management within the guidelines of work or study contexts that are usually predicttable, but are **subject to change**; supervise the routine work of others, taking some responsibility for the evaluation and **improvement** of work or study activities. |
| **Level 5** | Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge | A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems | Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others |

**Table 1** Descriptors defining levels 4 and 5 of EQF (European Commission 2017)

**What to know about the European Credit System for Vocational Education and Training (ECVET)?**

ECVET does not provide a template or a taxonomy concerning the format of learning outcomes descriptions. Such templates or classifications may exist at national, regional or system level (for example as part of national qualifications frameworks).

However, it is essential in implementing ECVET, to ensure that learning outcomes for qualifications and units are clearly identified and described to enable mutual understanding of qualifications and judgments on:

* Whether the qualifications covered in the framework of a partnership for mobility lead to the same or similar occupation;
* Whether learning outcomes, as described in one setting or context, are comparable with those expected in another setting or context.

**How are learning outcomes used in ECVET?**

To implement ECVET it is necessary that qualifications are described by using learning outcomes. Learning outcomes are grouped to create units. In ECVET, learning outcomes are used as a basis for credit transfer and accumulation. Learning outcomes are not dependent on the learning process, the content of teaching or the learning context in which they have been achieved. Therefore it is possible to use them to identify what the learner has achieved in one learning setting or context is comparable to what s/he is expected to have achieved in another setting or context. (European Commission 2011)

**What does that mean for the development of OER?**

First of all the desired outcomes of the OER or OER´s should be formulated in terms of learning outcomes, defined in terms of knowledge, skills and competences, related to the different aspects of the professions selected, by using descriptors. As stated above, usually, qualifications frameworks indicate the overall level of learning outcomes in a qualification. So knowing the National Qualifications Framework (NQF) and the overall level of learning outcomes in a qualification, teachers and trainers can search for OERs that fit with the learning outcomes or contextualize an OER to contribute to the desired learning outcome. Different learning outcomes can be packed into units, so different OERs can be used in one unit or build up an entire unit, and therefore are packed into grouped learning outcomes. For the implementation of ECVET it is necessary that all qualifications are described using learning outcomes. Assessed learning outcomes constitute credit which is the basis for enabling the transfer between learning contexts and for the accumulation of learning outcomes.

## How can ESD-competences look like?

The ESD-competences shown by way of example in this chapter have been developed following the examples of ESD competences developed in the collective work of Jörg-Robert Schreiber and Hannes Siege (2016) *Curriculum Framework. Education for Sustainable Development* and especially the work in this book regarding VET (Kutt, Meyer & Toepfer 2016). A further elaboration has been undertaken for the development of competences which are pertinent for the sectors Health Care and Logistics. The classification of ESD-competences (Recognizing, Assessing and Acting) has been taken into account.

**Some ESD-competences for Health Care:**

|  |
| --- |
| **Recognizing** |
| *Identify* factors related to global change environmental pollution and modern way of living that contribute to the development of diseases. |
| *Identify* socio-cultural characteristics which contribute to the health status of individuals or of social groups. |
| *Analyze* the concept of holistic approach of health and disease and describe the factors influencing them. |
| **Assessing** |
| *Shape* personal stance regarding health policies |
| *Cultivate* self responsibility along with community responsibility as means of contributing to environmental equilibrium and to health of people. |
| *Appreciate* the potential of cooperation with other health professionals and with scientists for the management of health problems of the community or of broader populations in national or international levels. |
| **Acting** |
| *Adopt* and *demonstrate* hygienic behavior. |
| *Administrate* his/her services without prejudice irrespective of social provenance of patient. |
| *Encourage* rational consumer behavior regarding health services and medicament use |

**Table 2** ESD-competences for Health Care

**Some ESD-competences for Logistics:**

|  |
| --- |
| **Recognizing** |
| *Acquire* knowledge about rural/local economic parameters |
| *Recognise* operational diversity between different countries and regulations to be followed in Transport Sector |
| *Acquire* and *process* information about workplace safety |
| **Assessing** |
| *Comment* in a well-founded way on the technological revolution and its benefits to the management of freight |
| *Reflect* upon and link social responsibility to the main core activities of a freight forwarding clerk |
| Differentiate between the outcomes/results of different technical solutions/environmental management models/sustainability concepts |
| **Acting** |
| *Use* simple local economic key figures |
| *Focus* on Corporate Identity and Social Responsibility, determine your area of action in practice using examples |
| *Optimise* the transportation flow by reducing the number of kilometres travelled in the process of freight forwarding |

**Table 3** ESD-competences for Logistics

At the UN General Assembly on 25th September 2015, the 2030 Agenda for Sustainable Development was adopted (UNESCO 2017). The formulated competences include cognitive, affective and volitional and motivational elements. They involve knowledge, capacities and skills, motives and affective dispositions and their interdependences. These cross-cutting key competences have to be integrated into the competences discussed above.

|  |
| --- |
| 1. **Systems thinking competency:** the abilities to recognize and understand relationships; to analyze complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty. |
| 1. **Anticipatory competency:** the abilities to understand and evaluate multiple futures – possible, probable and desirable; to create one’s own visions for the future; to apply the precautionary principle; to assess the consequences of actions; and to deal with risks and changes. |
| 1. **Normative competency:** the abilities to understand and reflect on the norms and values that underlie one’s actions; and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions. |
| 1. **Strategic competency:** the abilities to collectively develop and implement innovative actions that further sustainability at the local level and further afield. |
| 1. **Collaboration competency:** the abilities to learn from others; to understand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empathic leadership); to deal with conflicts in a group; and to facilitate collaborative and participatory problem solving. |
| 1. **Critical thinking competency:** the ability to question norms, practices and opinions; to reflect on one’s own values, perceptions and actions; and to take a position in the sustainability discourse. |
| 1. **Self-awareness competency:** the ability to reflect on one’s own role in the local community and (global) society; to continually evaluate and further motivate one’s actions; and to deal with one’s feelings and desires. |
| 1. **Integrated problem-solving competency:** the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote sustainable development, integrating the above-mentioned competences. |

***Table 4*** *Cross-cutting key competences for achieving all SDGs (UNESCO 2017, p. 10)*

|  |
| --- |
| Key Points of Chapter 2: Summary and comment |
| A definition of Sustainable Development (SD) and Education for Sustainable Development (ESD) is given.  The European Qualifications Framework (EQF) and the European Credit System for Vocational Education and Training (ECVET) must be considered to ensure that the learning outcomes are defined, described and identified adequately.  **There are several possible ESD-competences and cross-cutting key competences. The specific green Skills for VET can *and have to* be identified for each profession. In this chapter this has been done on an exemplarily basis for the professional  sectors Health Care and Logistics.** |

# Using Open Educational Resources for ESD in VET

## What are OER?

Regarding OER in theory Butcher (2015, p. 5) states that “in its simplest form, the concept of Open Educational Resources (OER) describes any educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are openly available for use by educators and students, without an accompanying need to pay royalties or license fees.”

The questions that follow the definition of OER concern the relevance of OER and e-learning (Butcher 2015, p. 5). The first direct answer to this question clearly declares that “OER is not synonymous with online learning or e-learning, although many people make the mistake of using the terms interchangeably.” OER is not necessarily e-learning as it can also be seen in printable versions of didactic material. The next issue regarding the distinction between OER and Open Education is stated as follows: “While effective use of OER might give practical expression to some of the principles of Open Education, the two terms are distinct in both scope and meaning.”

**Open Educational Resource Types and Format Types:**

Open Educational Resources are teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows free use, adaptation, and distribution. This open license permits authors to choose freely which rights they want to grant users. OER include individual material, course material, Videos, pod-casts or complete books. Any medium can be used to create OER. (UNESCO and Commonwealth of Learning 2015)

Resource **types** of OER are OER courses, learning objects, digital library collections, OER-Encyclopaedia, open text books, images and OER online archive.

OER resource **types** integrate a variety of **format types**, for example, text, video, images (e.g. graphic, charts, tables and photos) audio, animation, quizzers and games, multimedia in a combination of formats which may be interactive. Often the **resource types** overlap and fit loosely rather than rigidly into one or more categories.

## What are the different types of licenses for OER?

A main aspect of OER are the conditions of licences. The common way of licensing in the field of OER are the possibilities offered by Creative Commons (CC). There are seven different forms of conditions.

|  |  |
| --- | --- |
| http://www.aje.com/en/arc/dist/img/arc/CC0.0e7dbd14.png | Authors wishing to place works completely into the public domain can do so with the CC0 mark. In such a case, all rights are surrendered, and the image can be used in any legal way. |
| http://www.aje.com/en/arc/dist/img/arc/CC-BY.b719c844.png | The least restrictive Creative Commons license, the Attribution or **CC-BY**, allows any user to “distribute, remix, tweak, and build upon your work,” provided that they credit the original authors in all cases. This license would allow not just for downloading and copying something, but for textmining and other automated processes. |
| http://www.aje.com/en/arc/dist/img/arc/CC-BY-SA.2f32e489.png | The Attribution-ShareAlike, or **CC-BY-SA**, license builds upon the CC-BY by requiring that the user license any new products based on the original under identical terms (in addition to crediting the original author). |
| http://www.aje.com/en/arc/dist/img/arc/CC-BY-NC.4d6574d4.png | The Attribution-NonCommercial, or **CC-BY-NC**, license allows for others to remix or otherwise alter the original material (with proper attribution), provided that they are not using it for any commercial purpose. There is no restriction on how the new material is licensed. |
| http://www.aje.com/en/arc/dist/img/arc/CC-BY-NC-SA.8250c307.png | The Attribution-NonCommercial-ShareAlike, or **CC-BY-NC-SA**, license combines the non-commercial restriction with the requirement to share new material under the same conditions, all with due credit. |
| http://www.aje.com/en/arc/dist/img/arc/CC-BY-ND.94096da8.png | The Attribution-NoDerivs, or **CC-BY-ND**, license likewise requires proper credit for the original authors but also that the material be passed along in its entirety without any alteration. |
| http://www.aje.com/en/arc/dist/img/arc/CC-BY-NC-ND.d83f124c.png | Finally, the Attribution-NonCommercial-NoDerivs, or **CC-BY-NC-ND**, license only permits users to download and share the original work (provided they credit the original source), without any alterations or commercial use. This license is the most restrictive of Creative Commons’ offerings. |

***Table 5*** *License Conditions (UNESCO and Commonwealth of Learning 2015)*

## Are there some existing projects concerning OER for ESD in VET?

In the following paragraphs, taken chiefly from Papadimitriou and Lionarakis (2016), the most notable initiatives for OER development for university education are recorded. MERLOT (Multimedia Educational Resource for Learning and Online Teaching) is a collection of free, open learning resources for e-learning, designed primarily for schools, staff and higher education students from all over the world to share teaching materials and pedagogical practices.

The OER-HE project looks at the OER movement launched by MIT and the methods by which it is used in Europe's university education. The project examines the increase in OER resources, their internationalization and the quality of the educational resources provided. The project started on 1/9/2009, was completed on 31/08/2011 and belongs to the ERASMUS Lifelong Learning Programme (Papadimitriou & Lionarakis 2016, p. 242).

MORIL (Multilingual Open Resources for Independent Learning) (2008-2012) is a cutting-edge initiative for the use of OER by Open and Distance Education Universities. The initiative comes from many countries and aims to create educational content broadly accessible through OER to a wide range of students of both institutions and lifelong learning (Papadimitriou and Lionarakis 2016, p. 243).

The ODS-ISE portal is a European-wide project and in December 2016 it already hosted (Stavropoulos 2017):

* 818643 educational resources
* 1201 communities
* 2590 schools
* 11830 teachers
* 165 activities

The contribution of the Open Discovery Space platform to the training of both teachers and pupils is important. Open schools with thematic innovations in education and in particular STEM methodologies are some of the elements it provides. ISE has many interactive capabilities and is not just a repository of lesson plans or digital scenarios. One of the advantages it provides is to extract cognitive results in excel sheet form. Comparative results from European countries are also exported.

The **"Aesop"** platform (Gomatos, Dimou & Parissis 2016, p. 80) was developed by the Institute of Educational Policy and is an innovative integrated tool for developing, designing, evaluating and presenting digital interactive teaching scenarios in a modern and functional environment. AESOP platform supports the Design and / or Utilization of existing digital materials using a large number of interactive tools utilizing the most up-to-date web technologies. Digital materials can be transformed and fully adapted to the Digital Teaching Skills Structure, as the creator can use the tools available individually and in combination, depending on his / her imagination, by matching to Teaching Goals, Thematic Classifications and Implementation Phases (<http://aesop.iep.edu.gr/)>

**Fotodentro** is the central online service of the Greek Ministry of Education to collect, organize, search for, and make available the digital educational content for school education (Ministerial Decision 131377 / C2, 19-08-2014). It comprises a) a number of digital repositories of educational content each one with the name "Fotodentro" and each one serving different purposes. b) National Educational Content Library for Primary and Secondary Education (Megalou 2015).

## How to find relevant OER?

The **OER-World Map** (<https://oerworldmap.org/)> lists the results of the OER-Atlas 2016. The aim of the project is establishing a network of all OER-based initiatives, makers, institution etc. “Our aim is to capture the OER-Movement worldwide and present it as profoundly as possible. We gather information about persons, organisations, services, projects, and events.” Currently, 8245 organisations, 393 projects, 259 persons, 165 events and 73 publications are shown.

Of course, web search of an existing OER is the most effective and least time consuming way; nevertheless, exchange between professionals in different expert groups and networks seems to be a reasonable way to find appropriate OER for the purpose of teaching, learning, skills development, especially in VET.

<https://www.oercommons.org/> OER Commons is a dynamic digital library and network. Explore open education resources and join the network of educators dedicated to curriculum improvement.

## What skills and competences are needed for using OER?

When talking about skills it is logical to initially report that both users of OER – the trainer and trainee - need to have good digital skills in order to use the OER platforms with confidence.

From the perspective of trainer/ developer:

Highlighting parts of the “shopping list” of Guidelines for Open Educational Resources in Higher Education, UNESCO and Commonwealth of Learning (2015, p. 17) state that, apart from digital skills, it is also important to have

* Expertise in advocacy and promotion of OER as a vehicle for improving the quality of learning and teaching in education
* Expertise in managing networks/consortia of people and institutions to work cooperatively on various teaching and learning improvement projects including an ability to adapt to challenging environments
* Monitoring and evaluation expertise to design and conduct formative evaluation processes
* Communication and research skills to be able to share information about OER

On the other hand, these Guidelines mention also technical skills with extended knowledge of computer, like software development. It is important to underline that a trainer should not bear the burden of in depth technical knowledge. The didactical expertise of a trainer is far more important for the effective use of OER, as it is the mean aspect of knowledge transfer. From the perspective of a trainee, there also are soft skills necessary for perception and adoption in order to engage himself in this new didactic approach.

**Challenges to be addressed in use of OER:**

An essential challenge is the effectiveness of the process of change which will be happening while introducing OER. The trainer is repeatedly subject to the act of knowledge transfer, one course after another, one year after another. This brings in the element of pattern, an established teaching process. The trainer is accustomed to the training material. It will be logical that when introducing new teaching tools as OER to trainers, the phenomenon of Resistance to Change may arise. It is important as a first step, to present to the trainer the benefits of this change in order to engage him/her in this process of change and create an effective new training environment. The trainee/pupil on the other hand, is subject to the act of receiving the knowledge once and as a result there are no such phenomena as habit, pattern, standardization of process. Especially in this new digital age, the use of contemporary tools of two- and more way communication, using the web makes knowledge an interesting journey.

It goes without saying that a teacher must have a good knowledge of the content of a learning unit. This is called the ‘Content Knowledge’ (CK). The perspective of teaching implies additional knowledge. This is the knowledge of how the teacher makes a subject understood by students. This focuses on the assumption that in order for a teacher to teach a particular subject (content), he must have first understood how his pupils can learn. Shulman (1986) introduced the term of ‘Pedagogical Content Knowledge’ (PCK) and described it as the result of the effective combination of pedagogy and content.



**Figure 2** Technological Pedagogical Content Knowledge (Koehler & Mishra 2009, p.63)

When using technology in the process of teaching, the teacher must have technological skills concerning the specific tools that she/he utilizes. But this is not enough. There is a difference between using technology as a performance tool and using technology as part of a teaching strategy as a teaching tool. The latter is usually called ‘Technological Pedagogical Content Knowledge’ (TPACK). According to Schmidt et al. (2009), it refers to the knowledge and understanding of the interaction between Content Knowledge, Pedagogical Knowledge and Technological Knowledge when using technology for teaching and learning. Figure 1 facilitates understanding of this consideration. In this figure Content Knowledge, Pedagogical Knowledge and Technological Knowledge are depicted as initial circles of the figure. The interest is chiefly in their combinations. These are represented by the cross-sections of the circles.

It is clear by the aforementioned considerations that the task of a teacher is complicated and demanding. Regarding the usage of OER for ESD two points have to be taken into consideration:

1. Good use of OER demands not only Technological Knowledge on the part of the teachers but what is described above as TPACK
2. Content Knowledge which in general is considered as granted for certified teachers cannot be considered as granted for a subject such as SD. The teacher may be competent regarding the vocational aspects of the subject but not in ESD. Besides, in traditional curricula the SD objectives are not always proposed along with the vocational competences.

This also has some implications regarding the preparation of OER for ESD. The first is that the material has to be detailed, clear and informative for the teacher as well. There is little chance that students of VET utilize this material effectively if the teacher has not been adequately sensitized and informed on ESD in the first place by the proposed OER material. The second is that OER has to be easily accessible and usable by the teachers so that they are able to develop and incorporate it in their own TPACK. These implications are important because maybe in reality a large number of VET teachers have never been systematically trained in the use and development of OER for ESD.

## What to have in mind when using OER?

As described above, teachers and trainers need to have some specific skills and competences for making the use of OER adequate for conveying SD-aspects. Additionally, teachers and trainers should consider certain aspects concerning the use of OER:

**Ensure that the content will work within the existing system**

Using digital OERs, it’s important to make sure they will work on all platforms and devices students might be using, in and out of school. To make the most use of OER, districts also need ways of storing and organizing content so it can be accessed, modified, and shared by teachers.

A good wireless network, high broadband connectivity, and a solution that provides students with regular and equitable access to a device is key. This can be one-to-one, bring your own device, a computer lab, or some other solution.

**Provide professional development**

Some teachers may already be using OER and conducting the task with digital content and technology. Others may be less comfortable implementing these resources. It’s important to provide training for all teachers on the best practices of using OER and digital resources.

As with any educational resource, there are both advantages and disadvantages associated with using OERs in the classroom.

**Advantages of using OERs include:**

* **expanded access to learning**. Students anywhere in the world can access OERs at any time, and they can access the material repeatedly.
* **scalability**. OERs are easy to distribute widely with little or no cost.
* **augmentation of class materials**. OERs can supplement textbooks and lectures where deficiencies in information are evident.
* **enhancement of regular course content**. For example, multimedia material such as videos can accompany text. Presenting information in multiple formats may help students to more easily learn the contents being taught.
* **quick circulation**. Information may be disseminated rapidly (especially when compared to information published in textbooks or journals, which may take months or even years to become available). Quick availability of material may increase the timeliness and/or relevance of the material being presented.
* **less expense for learners**. The use of OERs instead of traditional textbooks or course packs, etc. can substantially reduce the cost of course materials for learners.
* **showcasing of innovation and talent**. A wide audience may learn of faculty research interests and expertise.  Potential students and donors may be impressed, and student and faculty recruitment efforts may be enhanced.
* **ties for alumni**. OERs provide an excellent way for alumni to stay connected to the institution and continue with a program of lifelong learning.
* **continually improved resources**. Unlike textbooks and other static sources of information, OERs can be improved quickly through direct editing by users or through solicitation and incorporation of user feedback. Instructors can take an existing OER, adapt it for a class, and make the modified OER available for others to use.

***Disadvantages of OER include:***

* **quality issues**. Since many OER repositories allow any user to create an account and post material, some resources may not be relevant and/or accurate.
* **lack of human interaction between teachers and learners**. OER material is created to stand alone, and since self-learning users may access the material outside of a classroom environment, they will miss out on the discussion and instructor feedback that are characteristic for credit classes and that make such classes useful and valuable.
* **language and/or cultural barriers**. Although efforts are being made to make OERs available in multiple languages, many are only available in English, limiting their usefulness to non-English speakers. Additionally, not all resources are culturally appropriate for all audiences.
* **technological issues**. Some students may have trouble using some OERs if they have a slow or erratic internet connection. Other OERs may require software that students don’t have and that they may not be able to afford.
* **intellectual property/copyright concerns.** Since OERs are meant to be shared openly, the “fair use” exemption from the U.S. Copyright Act ceases to apply; all content put online must be checked to ensure that it doesn’t violate copyright law

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| Key Points of Chapter 3: Summary and comment |
| This chapter shows what the meaning of OER is and that OER can be  designed in different types and formats.  OER usually are licensed with one out of seven possible CC-licences  with a gradation from free to restrictive.  There are few projects dealing with OER for ESD in VET. Some of them are highlighted on an exemplary basis. They contain helpful content but are not suited perfectly to the occupations Logistics and Health Care.  Two tools for searching OER are presented, oerworldmap.org and  oercommons.org  The skills and competences needed to work with OER adequately are discussed and the Technological Pedagogical Content Knowledge is highlighted.  Some aspects to have in mind while working with OER are described, including some possible advantages like the broad access to the material and risks as issues regarding the quality of OER. |

# Creating OER for ESD in VET

## How to get from an idea to teaching material?

For the creation of OER, it is essential to create competence oriented teaching material first. The need for the competence orientation, especially in the case of ESD and VET, is described in detail in chapter 2. A strategy for planning the development of the teaching material is necessary to enhance the quality of the results. Schott & Ghanbari (2012, p. 161) worked on this matter based on a large empirical research and developed a pattern for compiling teaching lessons. It goes back to the concept of “GovI” – “Goal-valid Instruction” from the same authors. The scheme can also be used for the development of teaching materials. The structure consists of three phases and four modules with ten steps.

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| **10 steps for creating competence oriented teaching material,**  **separated in 3 phases and 4 modules** | | |
| **PHASE 1:**  **Objective** | **MODULE 1: Concretion of the learning target in accordance to the aimed competences** | |
| STEP 1: | Defining the general learning target and sub-goals according to a needs analysis and their embedment in concerning subject areas as well as consideration for transfer (learning subject, ESD and OER) |
| STEP 2: | Specification of the sub-goals and identifying the relations between them |
| **MODULE 2: Competence-oriented lessons/teaching materials** | |
| STEP 3: | From the gross teaching subjects to the net teaching subjects |
| **PHASE 2:**  **Analysis of the scope of design** | STEP 4: | Analysing the shaping possibilities concerning the needs of the learners, the net teaching subjects, the boundary conditions and the possibilities to arrange the learning environment. |
| **PHASE 3:**  **Construction of  teaching materials** | STEP 5: | Construction of the reconstructed, situationally learning tasks |
| STEP 6: | Construction of the reconstructed, situationally  learning environment |
| **MODULE 3: Competence oriented assessment** | |
| STEP 7: | Construction of *relevant* tasks |
| STEP 8: | Considerations of *formative* learning assessment |
| STEP 9: | Construction of the *summative* learning assessment |
| **MODULE 4: Quality assessment** | |
| STEP 10: | Quality assessment of the lessons |
| **10 steps for creating competence oriented teaching material,**  **separated in 3 phases and 4 modules** | | |

Table 6 10 steps for creating competence oriented teaching material (Schott & Ghanbari 2012, p. 161)

## What competences are needed to create OER?

With reference to the OER Competency Framework designed by the organisation internationale de la francophonie (OIF) (2016), specific competences and capacities are required for creating OER. These OER-competences and capacities are presented in the first column of table 7. In the other columns you can find examples of a translation of these aspects into the learning-outcomes according to EQF (Level 4) and ECVET (described in Chapter 2). As you can see, there are links and similarities between these two concepts.

**Design an OER**

1. Produce original or reusable content that can be assembled in a work to be licensed to become an OER
2. Be familiar with best practices for designing resources that take into account the resource's educational and cultural aspects, technical quality and ergonomics, as well as basic concepts to ensure its discovery and accessibility

**Revise an OER**

1. Be able to identify and determine an editable OER in open format (by, in particular, ensuring that the original design format is available)
2. Be aware of the different adaptation options of an OER (translation, sound, illustration, accessibility, contextualisation, etc.)

**Remix OER**

1. Be able to create an OER made up of various OER by taking into account the specificities of licenses and their dissemination potential
2. Be able to create an OER made up of various OER and content that are not open by complying with constraints related to this type of composite work and by specifying the rights associated with each piece of content

**Co-create OER**

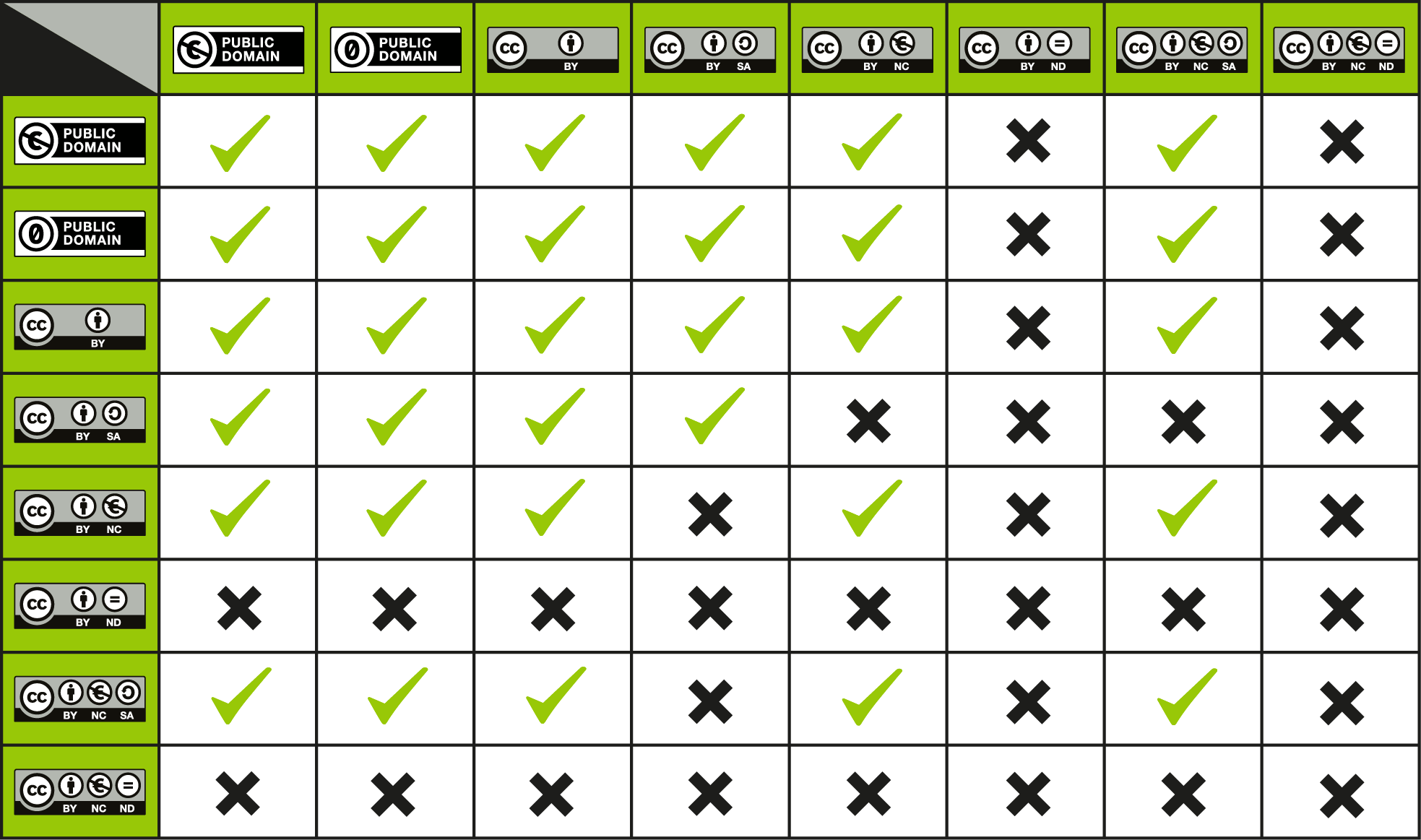
1. Distinguish between the different methods of co-creation so as to appropriate them effectively to create the OER
2. Identify the contributors involved in creating the OER by establishing and clearly mentioning the levels of contribution and intellectual property of each one.

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| **OER-competence (OIF 2016)** | **Knowledge** | **Skills** | **Competence** |
| O1: Produce original or reusable content that can be assembled in a work to be licensed to become an OER | O1.1: Identify the conditions of CC-licenses. Know the different resource and format types of OER. | O1.2: Differentiate between the licenses and the different types and formats. | O1.3: Produce OER and reflect themselves as a part of the OER-community. |
| O5: Be able to create an OER made up of various OER by taking into account the specificities of licenses and their dissemination potential | O5.1: Acquire knowledge about the spe cifities of licenses and their compatibility. Recognise the potential of dissemination. | O5.2: Appreciate the potential of dissemination of mixing OER as well as the work of the creators of the original OER. | O5.3: Optimise the dissemination potential of OER in a specific context by mixing existing OER. |

Table 7 OER-competences described in the framework of EQF/ECVET

## What to know about license compatibility?

The different types of CC-licenses are described in chapter 3.2. Because of the characteristics and restrictions of the certain types of licenses, some issues regarding the compatibility for mixing them can occur. Figure 3 shows, if certain types of licenses are compatible for mixing or not.



**Figure 3** CC License Compatibility Chart (CC-Wiki 2017)

Another helpful tool for combining und remixing material with different types of licenses is the Creative Commons Mixer: <http://ccmixer.edu-sharing.org> Select on the left all the CC licenses you want to use combined in your material. Then hit the "Will it Blend?"-Button and see all the possible licenses under which you can publish your remix.

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| Key Points of Chapter 4: Summary and comment |
| Before creating OER it is necessary to transform an idea into teaching material. Therefore a guideline is presented.  The capacities and competences required to create an OER are listed and described on an exemplary basis in the framework of EQF and ECVET.  It is important to pay attention to the compatibility of the CC-licenses  in order to combine or remix OERs. Two helpful tools concerning  this issue are presented. |

# The occupational scenarios of the Learning Units of the GreenSkills4VET project

The 7 application scenarios listed in this section were selected / identified by the GreenSkills4VET partners to exemplify the promotion of sustainability competencies. The scenarios represent occupational fields in the area of health care and logistics in which, from the authors' point of view, a change to an orientation towards substantial sustainability-oriented objectives offers a valuable contribution to social development. In the following overview of the contents of the Learning Units the professional sector (HC / Log) and the title of all units are listed:

1. University of Applied Sciences Osnabrück (Kumbruck/Piwowar): **Challenges and coping in Interaction Work – Social Sustainability in Health Care** (Health Care Learning Unit): Working on and with emotions can be very demanding. Learn how to activate your resources to cope with emotionally burdening situations in your professional work routine. The resource type of this unit is a **WebQuest**.
2. University of Kassel (Peitsch/Scheiding): **Developing a new Strategy: Logistics in 2050 – Delivering Tomorrow** (Logistics Learning Unit): Current environmental studies make clear, that among other things, because of the very high CO2-emmissions an alarming climate change is likely to occur. Therefore, companies get aware of sustainability and are willing to take more account of environmental impacts of their activities. They endeavour to achieve a sustainable development in their company according to the UN climate negotiations (climate conference of Paris 2013) by suitable medium and long-term strategies. By this, they not only assume responsibility for the next generations, but also avoid the global impacts of their non-sustainable actions. The resource type of this unit is a **PDF**.
3. Centre d’études et de recherchessur les qualifications (Drouilleau/Hocquelet): **Feasibility of Transport Operation and Logistical Services** (Logistics Learning Unit): The Teaching Unit is specifically conceived to provide information on the overall operations for the organization of the reverse flow of products: back from the customer to the producer, and it includes concepts related to the reuse of products and materials: recover, remarket, recycle, reuse.  
   The OER is conceived in 4 separated parts (didactic scenario, training support, **WebQuest**, evaluation support) and aims to provide teachers with all the necessary elements for easily implementing the new resources in the teaching programme.
4. BFI OÖ – Berufsförderungsinstitut Oberösterreich (Kaps/Winkler): **Sustainability and sustainable logistics** (Logistics Learning Unit): Logistics, and especially freight transport representing its most physical component, has accordingly received much attention in the sustainability debate in recent years. According to this, the objective of the Learning Unit is conveyinging basic knowledge on the sustainability concept and sustainable logistics. The unit includes different resource types as video and PDF.
5. ASPETE (Armakolas/Gomatos): **Medication administration open web quest** (Health Care Learning Unit): The administration of drugs is one of themost important, responsible and complex nursing activities. The nurse assistant as a future health professional can administer medicines under the supervision and in cooperation with the responsible nurses and doctors. Alongside, adopting personal attitudes could play an important role in informing patients and colleagues for the rational management of medicines. The knowledge on the part of nursing staff, the proper administration and management of the medicine, as well as safe and effective disposal and recycling are crucial axes and responsibility for health professionals. In this sense, there are multiple benefits for the patient, the environment and society in general.
6. Hellenic German Chamber of Commerce and Industry (Hoffmann; Tavlaridou): **Corporate Social Responsibility** (Logistics Learning Unit): The Learning Unit covers the wider topic of Corporate Social Responsibility with a specific focus on logistics companies. As stated in the International Implementation Scheme by UNESCO, environmental, economic and social dimensions are complementary for developing a full sustainable process. We decided to focus on CSR as the social leg of SD, which is less covered by the other partners and was coherent with overall mission of the Chamber to support the Entrepreneurship in Greece on a topic that still is largely neglected. The resource type of this unit is **WebQuest**.
7. WETCO (Toneva): **Health care activities for sustainable development** (Health Care Learning Unit): the unit focuses on the training of health care assistants and in the organization of their activities. The developed training aims to deliver knowledge on the rights and obligations of the Health Assistant in the labour processes, knowledge on structure and organisation of the Health Care work and sustainable development aspects of the job performance; to get deep knowledge on hospital functioning as well as how to perform HC Assistant’s duties while respecting the sustainability issues. The resource type of this unit is **WebQuest**

The Learning Units are part of the GreenSkills4VET-LearnBox and are available for download at [www.greenskills4vet.eu](http://www.greenskills4vet.eu) as PDF-Downloads or as weblinks. There is no registration or anything similar necessary for the access and you can use all materials in their capacity as OER (Open Educational Resources) 100% free, adapt them to your needs or those of your learners and even republish them, if you comply with the conditions of the Creative Commons License CC BY Corresponding to SA (see chapter 3 for further information).

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| Key Points of Chapter 5: Summary and comment |
| The project-partners developed seven Learning Units in seven specific occupational scenarios in the professional sectors Health Care and Logistics.  The Learning Units focus on different aspects of Sustainable Development and represent different resource types of OER.  All Learning Units are part of the GreenSkills4VET-LearnBox available on  [www.greenskills4vet.eu](http://www.greenskills4vet.eu/) |

# References

Bell, D. (1975): *Die nachindustrielle Gesellschaft*. Frankfurt.

Buhr, D. (2017): Industrie 4.0 und die Herausforderung für die Politik. *Gesellschaft – Wirtschaft – Politik. Sozialwissenschaft für politische Bildung*, (3), 357-369.

Butcher, N. (2015): *“A Basic Guide to Open Educational Resources (OER)”, the Commonwealth of Learning & UNESCO*. Retrieved from <http://unesdoc.unesco.org/images/0021/002158/215804e.pdf>. [10.11.2017].

Campbell, S. & Fainstein, S. (2003): *Readings in Planning Theory*, Second Edition. Oxford.

CC-Wiki (2017): Licence Compatibility Chart. Received from <https://wiki.creativecommons.org/images/5/5b/CC_License_Compatibility_Chart.png> [11.10.2017].

CEDEFOP (2014). *The hidden potential of level 5 qualifications*. Thessaloniki.

Dengler, K. & Matthes, B. (2015): *Folgen der Digitalisierung für die Arbeitswelt. Substituierbarkeitspotenziale von Berufen in Deutschland*. IAB Forschungsbericht. Aktuelle Ergebnisse aus der Projektarbeit des Instituts für Arbeitsmarkt- und Berufsforschung. 11/2015. Nürnberg.

European Commission (2011): *ECVET Questions and Answers*.

European Commission (2017): Descriptors defining levels in the European Qualifications Framework (EQF). Retrieved from <https://ec.europa.eu/ploteus/content/descriptors-page> [20.05.2018].

Gomatos, L.; Dimou, H. & Parissis, V. (2016): La place du constructivisme dans des scenarios pédagogiques numériques de la plateforme AESOP en Grèce. *Educational Journal of the University of Patras UNESCO Chair*, 3(2),77-88.

Kersten, W.; Seiter, M.; von See, B.; Hackius, N. & Maurer, T. (2017): *Trends und Strategien in Logistik und Supply Chain Management. – Chancen der digitalen Transformation*. Bundesvereinigung Logistik (BVL). Bremen.

Koehler, M. J. & Mishra, P. (2009): What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.

Kutt, K.; Meyer, H. & Toepfer, B. (2016): Implementation in school subjects and learning areas: Vocational Education. In Schreiber J.-R. & Siege, H. (ed.) *Curriculum Framework, Education for Sustainable Development*. Bonn: Engagement Global gGmbH.

Lisbon European Council (2000): *Lisbon European Council 23 and 24 March 2000 – Presidency Conclusions.* Retrieved from <http://www.europarl.europa.eu/summits/lis1_en.htm> [10.12.2017].

Majumdar, S. (2010): *TVET: Connecting the Dots in TVET for Sustainable Development.* Retrieved from <http://www.voced.edu.au/content/ngv%3A57647> [13.05.2018].

Megalou, E. (2015). *Open Educational Resources - Repository of Learning Objects: The Case of Photodentro*. Retrieved from <http://dschool.edu.gr/p61cti/wp-content/uploads/2015/07/oer-photodentro_deltio_imp_megalou_20150216_v1.0.pdf>. [10.09.2017]. [in Greek]

Organisation internationale de la francophonie (OIF) (2016): *Open Educational Resources Competency Framework OER*, OIF, Open Education Consortium, UVT, African Virtual University, UNESCO, ALESCO.

Papadimitriou, S. & Lionarakis, A. (2016): Open Educational Resources and Open Courses in University Education. *International Conference on Open & Distance Learning*, 7 (2A). [in Greek]

PricewaterhouseCoopers (PwC) (2016): *Industry 4.0: Building the digital enterprise*. Retrieved from <https://www.pwc.com/gx/en/industries/industry-4.0.html> [16.11.2017].

Schmidt, D., Baran, E., Thompson, A., Mishra, P., Koehler, M., & Shin, T. (2009): *Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Pre-service Teachers*.

Schott, F. & Ghanbari, S. A. (2012*): Bildungsstandards, Kompetenzdiagnostik und kompetenzorientierter Unterricht zur Qualitätssicherung des Bildungswesens. Eine problemorientierte Einführung in die theoretischen Grundlagen.* Münster.

Schreiber, J.-R. & Siege, H. (2016): *Curriculum Framework, Education for Sustainable Development*. Bonn: Engagement Global gGmbH.

Shulman, L. (1986): Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*,   
15 (2), pp. 4-14.

Siemens, G. (2005): *Connectivism. A Learning Theory for the Digital Age*. Retrieved from <http://www.elearnspace.org/Articles/connectivism.htm> [11.10.2017].

Stavropoulos, P. (2017) *Developing, Applying and Assessing an Educational Scenario "Catalytic* Converters*" in the STEM education framework to study its impact on the educational process*. Unpublished master’s thesis, STEM, ASPETE, Athens.

UNESCO (2014): *Roadmap for Implementing the Global Action Programme on Education for Sustainable Development*. Paris.

UNESCO (2017): *Education for Sustainable Development Goals Learning Objectives*. Paris.

UNESCO and Commonwealth of Learning (2015): *Guidelines for Open Educational Resources (OER) in Higher Education*. Retrieved from <http://unesdoc.unesco.org/images/0021/002136/213605e.pdf> [10.11.2017].

UNESCO-UNEVOC (2017): *Advancing Green Human Capital – A Framework for Policy Analysis and Guidance.* Retrieved from <https://unevoc.unesco.org/up/PAGHC_full.pdf> [13.05.2018].

WCED (1987): *Our Common Future, World Commission on Environment and Development*. Retrieved from <http://www.un-documents.net/our-common-future.pdf> [11.12.2017].

# Annex: Annotated country-specific links concerning OER for ESD in VET

**Austria:**

**Open Education Austria:**

<https://www.openeducation.at/home/>

Open Education Austria is a collaborative initiative among Austrian universities to develop a national infrastructure for creating, discovering, and sharing open educational resources (OER).  
Open educational resources are educator-created documents and media that are freely available for anyone to download and use without restriction in a wide array of educational settings. With Open Education Austria, the libraries, e-learning centres, and central computing services of our partnering universities will join forces for the first time to support grassroots educators in the development of innovative OER materials and educational strategies. The mission of the project is to boost the overall quality of teaching and learning in Austria’s classrooms, as well as expand access to best practice research and training within the expert community. Open Education Austria was launched in June 2016 with the generous support of a Ministry of Science, Research and Economics grant for higher education. The expected completion date is December 2018.

**iMoox: Massive open online courses**

<https://imoox.at/mooc>

Founded by the University of Graz and Graz University of Technology, iMoox offers a variety of free online courses on topics such as Graz, digital design, experimental physics and much more. These courses contain videos, presentations, quizzes etc. that you can view by signing up. After successfully completing a course, you will receive a confirmation of participation.

**L3t:**

<http://l3t.eu/oer>

This publication series with a total of 14 volumes is free to download. Of course, printed books can also be bought. These books bring us closer to Open Educational Resources and their commitment. Topics would be, for example, the use of Pocket Code in the classroom, or the creation of an open computer science school book.

**Virtuelle PH**

<http://www.virtuelle-ph.at/oer/>

The Virtual PH supports your further education with self-learning materials and cooperative learning offers and enables you to exchange with colleagues in the common virtual learning space. There are numerous courses such as Mobile Learning, Search and Find, Social Media, ... In addition to the wide range of online courses offered, there are also numerous eLectures or coffecup learning units. Everything available with registration

**Bulgaria:**

**E-mentoring Project LLp**

<http://www.e-mentoring.eu/?page=outcomes>

The transnational EU-project **e-Mentoring** aimed to increase the capacities of students in Higher Education, trainees in Vocational Education and Training institutions, and adults re-/entering the labour market by collecting good practice experiences and transferring best solutions into a common [**e-Mentoring model**](http://www.e-mentoring.eu/).

The e-Mentoring process was enhanced by integrating Open Educational Resources (OERs) for self-directed learning on [Employability](http://employability.e-mentoring.eu/) and [Entrepreneurship](http://entrepreneurship.e-mentoring.eu/) into e-Mentoring model. ICT-enabled learning solutions (Web 2.0, Moodle, etc.) enhanced productivity of and accessibility to e-Mentoring process ensuring its common use within three above-mentioned educational sectors.

**SMART project Erasmus+**

<http://www.managing-art.eu/en/open-educational-resources-training-materials_54>

The **SMART project** is a joint initiative of 6 organizations (2 youth NGOs, a university, an umbrella organization of NGOs, a National Youth Council and a private arts company) from Bulgaria, Hungary and 4 Partner Countries (PCs) – Botswana, Kenya, Namibia and the Republic of South Africa. All organizations have vast membership, outreach potential and strong credentials in the arts, arts management or education sectors.

The project’s overall objective is to promote collaborative development, dissemination and wide utilization of innovative Open Educational Resources (OERs) and training methods in arts and creative sector management and entrepreneurship, in view of building youth workers’ and youth organizations’ capacity to foster youth inclusion, youth employment, and youth-led community and social impact driven initiatives.

One key activity of the project is the development of high quality OERs and methodological guidelines for experiential (learning-by-doing) training approaches in the target fields, seeking to find a middle ground between sophisticated academic training and practical youth work.

**OER for Art and Craft, Erasmus+**

<http://www.craftstraining.eu/>

**OER-CRAFT** aims at addressing the capacity and training needs of the micro enterprises across EU to sustain their competitiveness for enhanced growth and employment.   
The idea behind **OER-CRAFT** is to develop and deploy Open Educational Resources (open and widely available training content and modules) targeted at micro and craft-type enterprises to foster their access to the EU single market and EU opportunities to ultimately enhance their competitiveness. The concept is to promote growth and employment by leveraging underutilised EU opportunities and promoting participation to EU Single Market.  
The**OER-CRAFT PROJECT** addresses those specific needs and priorities as identified by those policy statements. In addition the project addresses the specific strategies of the EU in promoting smart, sustainable and inclusive growth of EU2020.

**France:**

**Awareness module for sustainable development**

<http://www.graine-auvergne-rhone-alpes.org/DOC/CalForm15/Modules-formations.pdf>

Qualifying, Certifying and Professionalizing Programming (PQCP), Rhône-Alpes Region. Sustainable Development Awareness Module (lasting 4 hours) for trainees in the vocational training program developed by the Rhône-Alpes region, accompanied by educational tools to support the trainers (Introduction, type, history and definition, exercises, debate, evaluation of educational tools).

**Guidelines for Open Educational Resources (OER) in Higher Education**

<http://www.unesdoc.unesco.org/images/0023/002328/232842e.pdf>

United Nations Educational, Scientific and Cultural Organization, Commonwealth of Learning. A set of free and freely reusable, editable and shareable materials that support teaching. This guide addresses various questions and suggestions for the appropriate and increasing use of OER in higher education.

**Special Report "Digital Resources”**

<http://eduscol.education.fr/sti/sites/eduscol.education.fr.sti/files/ressources/techniques/5973/5973-197-p26.pdf>

Dossier of the journal Technology devoted to digital resources attaching in detail to the Creative Commons License. In addition, the page devoted to this review issue on eduscol, national resource portal of the Ministry of National Education, offers a selection of resource sites, including numerous links and a short bibliography depicting and discussing the uses of OER.

**Étude sur les portails et agrégateurs des ressources pédagogiques universitaires francophones en accès libre**

<https://hal.archives-ouvertes.fr/hal-01475551/document>

Ben Henda Mokhtar, 2015, Study on Portals and Aggregators of French Open Access Academic Educational Resources, IDNEUF, Initiative for the Development of Numbers in the French-Speaking University Area, University Agency of La Francophonie, Institute of Francophonie for the University of engineering of knowledge and distance learning.ERSCHEINT NICHT IN DE TEXT

**Germany:**

**Informationsstelle OER (OERinfo)**

<https://open-educational-resources.de/>

The Informationsstelle OER (OERinfo) is a thematic online portal that provides comprehensive information on OER to the public and specialist target groups. The goal is the broad visualization of OER and the addressing of new target groups. The current state of knowledge should be prepared for practical use, information on best practice examples bundled and the diversity of existing initiatives mapped. Very well prepared and practical (directly applicable for own work), see e.g. the following link in this list (Freie-lehr-lern-ressourcen-im-netz). In addition, a good overview of the current state is provided.

**Einsteiger Webinar COER13**

<http://www.coer13.de/unit0.html>

Page of the multi-week webinar for beginners (winner of an OER Award 2016). The C stands for Course, the number is a year: an open online course on e-Teaching.org. The online events are of course no longer available, but the pages with short texts and short videos, which deal with many interesting and important topics: OER search and find (for example license notices), OER make yourself, OER use scenarios…

**Übersicht Plattformen**

<https://open-educational-resources.de/freie-lehr-lern-ressourcen-im-netz/>

Open teaching and learning resources online - 15 good places to go for truly free teaching materials. By Jöran Muuß-Merholz on OERinfo. Well-known platforms such as edutags and imoox are presented and linked. At the bottom of the page, further links are provided, e.g. Points of contact for pictures in the net, photos and copyright (on motif search), foreign content on own pages etc.

**Lizensierung und Nutzung offener Bildungsmaterialien – Handreichung für Lehrerinnen und Lehrer**

<https://open-educational-resources.de/oer_materialien/lizenzierung-und-nutzung-offener-bildungsmaterialien-handreichung-fuer-lehrerinnen-und-lehrer/>

This publication provides answers to legal questions, practical OER application and references in the network. But what about working with free licenses and using open educational materials in practice? The Saarland Ministry of Education and Culture and the State Institute for Education and Media (LPM) have issued this handout.

**Greece:**

**The ‘photodentro’ (light-tree)**

<http://photodentro.edu.gr/aggregator/>

The most efficient and widely used tool in the Greek Educational System is Photodendron. It is supported by the Greek Ministry of Education and funded by National Funds as NSRF. It obtains all National Editions of School books and a big range of other tools and activities. As the website itself states, Photodendron promotes the use of open educational resources (OER) for schools, implementing the national digital content education strategy. All material available through the "Fotodentro" National Educational Content Accumulator is freely available, licensed under the Creative Commons CC BY-NC-SA license or other similar licensed license

**Didactic Scenarios Repository (DSR)**

<http://www.ocean.upatras.gr/scen/>

The DSR Depository after the completion of its construction (in early 2012) was hosted on a server with open source software (Apache, PhP, MySQL) for free access by the educational community. The system is maintained by the Laboratory of Computers and Educational Technology of the Pedagogical Department of the University of Patras. Nowadays, the repository has more than 19,300 visits, more than 1,300 registered users and more than 290 valid educational scenarios from many fields of primary, secondary and non-formal.

**AESOP**

<http://aesop.iep.edu.gr/>

The "Aesop" platform was developed by the Institute of Educational Policy and is an innovative integrated tool for developing, designing, evaluating and presenting digital interactive teaching scenarios in a modern and functional environment. AESOP platform supports the Design and / or Utilization of Existing Digital Materials using a large number of interactive tools utilizing the most up-to-date Web technologies. Digital Materials can be transformed and fully adapted to the Digital Teaching Skills Structure, as the creator can use the tools available individually and in combination, depending on his / her imagination, by matching to Teaching Goals, Thematic Classifications and Implementation Phases.

**Open Educational Resources in University Education**

<https://www.slideshare.net/sofipapadi/ss-48578622>

In search of OER material in the Greek educational system, a study/ presentation was found from Sofia Papadimitriou, Head of Educational Radiotelevision & Digital Media, Greece with the title ‘Open Educational Resources in University Education’ the presentation listed between others a list of digital libraries of the Universities. This research clearly shows that in the Greek meaning of OER –Open Education Resources refer to Repositories, Digital Libraries and digital platforms of training material. During this research no elements of OER connected with Vocational Education and Training in Greece were found.

**The Web Quest platform ‘Open Web Quest’**

<http://eprl.korinthos.uop.gr/openwebquest/>

The Greek Web Site for ‘Open Web Quest’ presents great educational and research interest as open source software. Developed by Antonio Temprano, and the eLearning research team from the University of Peloponnese it was released for a pilot application. This edition is available under the Creative Commons license 4.0. The term web-exploration (Web Quest) was first introduced in 1995 by Bernie Dodge to describe a structured learning activity oriented to problem solving through the use of information based essentially on Web sources. It is an educational scenario, a type of project activity aimed at activating all students so that they cooperate to negotiate a subject, problem or team task commissioned by the teacher.