**GreenSkills4VET**

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**Learn Box, section 2, methodological and didactic material of**

**Céreq Unit - France**

IO5

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# Section 1: The OER

* 1. **The OER Unit**

**Document n°0: Didactic Scenario**

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| **Title:** “Feasibility of the implementation of a sustainable reverse logistics” |
| **Basic concepts involved:** Legislation identification and analyze, constraints identification and analyze, anticipation and integration of sustainability concepts in Logistics professional practices |
| **Key words:** Reverse logistics, Green Supply Chain, Sustainable Development |
| **Targeted class:** * Higher technician’s qualification in transport and logistical services (Freight Forwarding Clerks)
* EQF Level 5 (In France, if you have completed a training level 3 or 4 (Bac Professionnel 3 years) you can enter in a training level 5 (BTS 2 years))
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| **Summary:**  The reverse logistic is the overall operations for the organization of the reverse flow of the products: from the client to the producer. Reverse logistics deals with: the return of unsold merchandise, the return of defective products or from operating errors, the recovery of obsolete equipment or machinery, and the recovery of hazardous waste or environmentally risky materials. It can bring to the reuse of logistics packages (wooden pallets, carton, bottle, containers); to the recycling, reuse or reassembly of products or components; to the elimination of end life products or waste treatment (sewage, waste oil, etc.). Reverse logistics includes all operations related to the reuse of products and materials: recover, remarket, recycle, reuse.This scenario proposes a 5 hours’ lesson. It is compound by two OER (print documents, in .pdf format) and a MCQ for evaluation.* **Document n°1**:  *Webquest* – description of WebQuest group workshop, aiming at defining and describing reverse logistics and return management processes before identifying the legislative, human, organizational, financial and environmental constraints to the implementation of a reverse logistics in a specific company.
* **Document n°2**:  *Course material* - a 17 pages text describing the characteristics of a reverse logistic and the important information needed to analyze a transport demand. Some video links are indicated at the end of the document.

**Document n°3:** An evaluation model of the learning outcomes assessed by MCQ.**Document n°4:** A summary of the critical assessment of the documents.  |
| **Methodological approach:** Pedagogy of Activity, Flip learning, Problem Based Learning, and Digital Pedagogy. |
| **Pedagogical objectives – expected learning outcomes:** **Knowledge:** * Know the different types of logistical services related to reverse logistics
* Acquire and process information about the national, European and international legislation in relation with sustainable development and environmental protection

**Skills:**Identify legislative, organizational, human, financial and environmental constraints to the implementation of a reverse logistics**Competences:*** Synthesize the pertinent information
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| **Description of the content:****Document n°1:** 1-Characteristics of a Green Supply Chain2-Definition of a Reverse Logistic3-Types of Returns4-Management of Returns: Specifics Constraints5-Environmental Legislations and Regulations Applicable * **Document n°2**:
* 1- Presentation of a real-life professional situation
* 2- List of links from professional documentation (printed and videos)
* **Document n°3:** An evaluation model of the learning outcomes assessed by MCQ.

**Document n°4:** A summary of the critical assessment of the documents.  |
| **Estimated time:** 5 hoursGroup workshop: 2X 60 minutes; Group presentations and debates: 90 minutes Lecture and MCQ: 90 minutes;  |
| **Tools – required infrastructure:** Classroom, Tables and Chairs organized in little groups and easily transportable |
| **Means:** A computer and access to the Internet for each group, Printed copies of .pdf documentation, Paper and pens. |
| **Training evaluation:** **Document n°3 : Multiple Choices Questionnaire**Objective :Evaluate the learner capacity to determine the feasibility of transports and logistical services operations   |
| **Critical evaluation of the scenario:****Document n°4:** Synthesis of the evaluation by the silent partners |
| **Bibliography:**Beamon B. M. (1999), “Designing the Green Supply Chain”, Logistics Information Management, Vol. 12, No. 4, pp. 332-342.Dowlatshahi S. (2000), “Developing a Theory of Reverse Logistics”, Interfaces, Vol. 30, No. 3, pp. 143-155.Elmas G., Erdoğmuş F. (2011), “The importance of Reverse Logistics”, International Journal of Business and Management Studies, Vol. 3, No.1, pp. 161-171.Ghobakhloo M., Tang S. H., Zulkifli N., Ariffin M. K. A. (2013), “An Integrated Framework of Green Supply Chain Management Implementation”, International Journal of Innovation, Management and Technology, Vol. 4, No. 1, pp. 86-89.Hawks K. (2006), “What is Reverse Logistics?”, Reverse Logistics Magazine, Winter/Spring, Retrieved from: <http://www.rlmagazine.com/edition01p12.php>Huscroft J. R., Hazen B. T., Hall D. J., Skipper J. B., Hanna J. B. (2013), “Reverse Logistics: past research, current management issues, and future directions”, The International Journal of Logistics Management, Vol. 24, Issue: 3, pp. 304-327.Mutingi M. (2014), “The impact of reverse logistics in green supply chain management: A system dynamics analysis”, International Journal of Industrial and Systems Engineering, Vol. 17, No.2, pp. 186-201. Rogers D. S., Tibben-Lembke R. (2011), “An Examination of Reverse Logistics Practices”, Journal of Business Logistics, Volume 22, Issue 2, pp. 129-148.Rogers D. S., Tibben-Lembke R. (1999), *Going Backwards: Reverse Logistics Trends and Practices*, Reverse Logistics Executive Council, University of Nevada, Reno. Rubio S., Jiménez-Parra B. (2014), “Reverse Logistics: Overview and Challenges for Supply Chain Management”, International Journal of Engineering Business Management, Vol: 6, No. 12., pp. 1-7.Sarkis J. (2003), “A strategic decision framework for green supply chain management”, Journal of Cleaner Production, No. 11, pp. 397-409.Senthil S., Srirangacharyulu B., Ramesh A. (2011), “A decision making methodology for the selection of reverse logistics operating channels”, Procedia Engineering, n°38, pp. 418-428. Shan W., Wang J. (2018), “Mapping the Landscape and Evolutions of Green Supply Chain Management”, Sustainability, Vol. 10, No. 3, pp. 1-23.Srivastava S. K. (2007), “Green supply-chain management: A state-of-the-art literature review”, International Journal of Management Reviews, Volume 9, Issue 1, pp. 53-80.Stock J. R. (1992), “Reverse Logistics”, Oak Brook, IL, Council of Logistics Management, 18p.Toke L. K., Gupta R. C. (2010), “Green Supply Chain Management; Critical Research and Practices”, *International Conference on Industrial Engineering and Operations Management*, Dhaka, Bangladesh. Wang J-J., Chen H., Rogers D. S., Ellram L. M., Grawe S. J. (2017), “A bibliometric analysis of reverse logistics research (1992-2015) and opportunities for future research”, International Journal of Physical Distribution & Logistics Management, Vol. 47, Issue: 8, pp. 666-687.Wotjek R. (2015), “E-commerce and the Return of Unwanted Goods: A Case for Cooperation Among Providers of Postal and Non-postal Parcel Services”, in Crew M.A., Brennan T.J. (eds.), *Postal and Delivery Innovation in the Digital Economy*, Topics in Regulatory Economics and Policy, Vol. 50, pp. 17-29.**Websites*** http://ec.europa.eu/environment/archives/waste/eu\_guidance/introduction.html accessed May 2018.
* https://www.iso.org/iso-14001-environmental-management.html accessed May 2018.
* http://www.rlmagazine.com accessed May 2018
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**Document n°1: WebQuest**

**Define what is a Reverse Logistics. Elaborate an efficient return management model (in terms of cost and sustainability), identifying specific constraints with regard to the type of company and sold goods.**

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| **Pedagogical objectives:** * To investigate, search for relevant information, interact and construct active knowledge
* To define reverse logistics and identify its - regulatory, material, human, financial and environmental - constraints based on real life examples.
* To synthetize information for decision support, to present it and debate about better practices.
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**OER: Feasibility of the implementation of a sustainable reverse logistics**

**WEBQUEST**

**Identify the constraints linked to Reverse Logistics**

“*EU Cellular* operates a wireless telecommunications network in the European Union, serving 10 million customers in 8 EU member States. EU Cellular wishes to rationalize its return flow process (after-sales services, repair, recycling…) from scratch based on one of its North-American couterpart (*US Cellular*) return management practices.

As a part of a small group of classmates, you will first define what are the basis of reverse logistics, return management and their purpose from the company perspective. Then, based on the results of your WebQuest, you will have to elaborate a return management model that you think would best suit EU Cellular activities in terms of efficiency, cost and sustainability, taking into account the European Waste Electrical and Electronic Equipment (WEEE) directive. While considering the specific constraints and main characteristics to take into account to implement an efficient Reverse Logistics in this Europe-based company, you’ll justify your decision with regards to:

* The reverse logistics path chosen starting from the customers
* The return management process and its - regulatory, material, human, financial and environmental - constraints

Finally, you’ll map this process, present it to your fellow students in class through a 15 minutes’ oral restitution including a PowerPoint (or similar software) presentation (up to 10 slides) detailing the steps of the goods going backward through the reverse logistics process before taking part to a debate with the other groups about your choices and further possibilities to improve reverse logistics processes in terms of costs and sustainability. Specific attention will be paid to the clarity and relevance of the model produced and presented collectively and to the following discussion between the groups in class. Time: 2x2 hours for the preparation.”

**Guidelines:**

**The WebQuest has to be prepared at least one week before the course on Reverse Logistics (document n°2).**

Learners have to **analyse** professional documentation, articles and videos available online, starting from the **three main sources mentioned below**, a complementary list of suggested sources, and possibly of other Internet sources chosen freely. They will be able to work in small groups (ideally, four groups of 3 to 5 students), if needed by allocating to each member of the group a type of constraint (such as financial, human resources[[1]](#footnote-1), material[[2]](#footnote-2), environmental and regulatory ones). Through an analysis of these various sources available online, they will have to produce **a 15 minutes’ oral restitution including a PowerPoint presentation** presenting the steps of the goods going backward through the reverse logistics process and explaining their choices before taking part to a debate with the other groups. Specific attention will be paid to the clarity and relevance of the model produced and presented collectively and to the following discussion between the groups in class. **Time:** 2x2 hours preparation time, 90 minutes (60+30) for the group presentations and debate.

**Main sources (Read it carefully)**

Aschenbrand J., Mikitka M., Sciarrotta T., Trebilcock B., “The Circular Supply Chain”, Supply Chain Management Review, May 2 2018:

<http://www.scmr.com/article/the_circular_supply_chain>

Berman J., “Reverse logistics season is in full post-holidays bloom”, Logistics Management, January 10 2018:

<https://www.logisticsmgmt.com/article/reverse_logistics_season_is_in_full_post_holidays_bloom>

Waste Electrical & Electronic Equipment, European Comission (last update: January 15 2018).

<http://ec.europa.eu/environment/waste/weee/index_en.htm>

**Indicative list of WebQuest online sources:**

**Complementary articles**

“Understanding the true ‘cost to serve’” (pp. 6-10) & “Criteria to consider when choosing a Reverse Logistics service provider” In “Future-proof your reverse logistics” (pp. 12-16), KPMG International, 2017, 20p :

<https://assets.kpmg.com/content/dam/kpmg/au/pdf/2017/future-proof-reverse-logistics.pdf>

“WEEE: EU-wide enforcement of producer responsibility”, Umwelt Bundesamt, October 2, 2017. <https://www.umweltbundesamt.de/en/topics/weee-eu-wide-enforcement-of-producer-responsibility>

Waste Electrical & Electronic Equipment (WEEE) package, European Commission (report on the review of the scope of Directive 2012/19/EU on WEEE) <http://ec.europa.eu/environment/waste/weee/index_en.htm>

Acharya K., 2017, “Moving in Reverse. How the Internet of Things will transform the world of reverse logistics”, Supply & Demand Chain Executive, March 22:

<https://www.sdcexec.com/warehousing/article/12312721/moving-in-reverse>

Wunderlin A., 2017, “Navigating Reverse Logistics in an E-commerce World”, Supply & Demand Chain Executive, September 11: <https://www.sdcexec.com/warehousing/article/12359086/navigating-reverse-logistics-in-an-ecommerce-world>

**Complementary videos:**

“WEEE: Electronic Waste Recycling - EcoEye Series 9”, Environmental Protection Agency ireland, 2012, 8’02”.

<https://www.youtube.com/watch?v=IBpCq7C8Fz8>

“WEEE TRACE traceability”, European Commission, 2013, 4’21”. <https://ec.europa.eu/easme/en/tags/weee-trace>

## “Reverse logistics as enabler for a Circular Economy - Interview with RLG CEO Patrick Wiedemann I Systems and Network Innovation”, World Economic Forum, 2016, 5’59”. <https://www.youtube.com/watch?v=EJPFhXTPL4o>

**Document n°2: Course material**

**Target audience :**

* Course material for trainers and teachers in Higher technician’s qualification in transport and logistical services / freight forwarding clerks - (EQF Level 5)
* Can be read and understood by learners

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| **Pedagogical objectives:** * To know the different types of logistical services related to reverse logistics
* To acquire and process information about the European and international legislation in relation with sustainable development and environmental protection
 |

**OER: Feasibility of the implementation of a sustainable reverse logistics**

**Course Material**

**Introduction**

**The course will be introduced by a WebQuest that the students will have to conduct at least one-week prior the start of the course on Reverse Logistics (document n°1)**

Current environmental studies underline an alarming climate change. As populations, economies and standards of living grow, so does the cumulative level of greenhouse gases (GHGs) emissions. According to the United Nations, there are some basic well-established scientific links:

* The concentration of GHGs in the earth’s atmosphere is directly linked to the average global temperature on Earth;
* The concentration has been rising steadily, and mean global temperatures along with it, since the time of the Industrial Revolution;
* The most abundant GHG, carbon dioxide (CO2), is the product of burning fossil fuels.

Therefore, companies get aware of sustainability and willing to take more account of environmental impacts of their activities. They endeavour to their company on a sustainable development according to the UN climate negotiations (climate conference of Paris 2013) by suitable medium and long-term strategies. By this, they assume not only responsibility for the next generations, but also avoided the global impacts of their non-sustainable actions. Not only ecological and social aspects are considered, but also business efficiency. This course material should help carriers to better understand and put into practice a reverse logistics in order to do so.

**Reverse Logistics: A core element of the Green Supply Chain Management**

Research shows that investment on green strategies is essential if environmental, economic and social performance benefits are to be realized (Mutingi, 2014). Reverse logistics plays an important part in improving sustainable performance of the green supply chain.

* 1. **A push for a Sustainable Logistics**

Since the 1990’s, the organizational use of Green Supply Chain Management and Reverse Logistics has spread through the reinforcement of the International, European and national legal frameworks regarding sustainable development:

**[1997]** Treaty of Amsterdam: **Community responsibilities related to environmental protection are strengthened** and the concept of sustainable development is evoked in the Preamble of the Treaty.

**[1997]** UN Conference on Climate Change in Kyoto: **gas emissions are aimed at for the first time.**

**[2008]** EU Climate Change package: establishment of a “20:20:20 target” for **20% of energy to come from renewable sources and committed to reduce greenhouse gas emissions to 20% by 2020**.

**[2009]** Treaty of Lisbon: made **sustainable development a key objective for the EU**. European environmental policy rests on the **principles of precaution, prevention, rectifying pollution at source, and ‘the polluter pays’**. Several **complementary policies and instruments** (such as environmental impact assessments, LIFE+, and the EU eco-label and eco-audit) have also been adopted to guide EU action in the area of environmental protection and, more broadly, sustainable development).

**[2016]** COP21: the “Paris Agreement” **requires** **decarbonisation of all economic sectors, including transport, by 2050**. As of May 2018, **194 states and the European Union have signed the Agreement**. 176 states and the EU, representing more than 87% of global greenhouse gas emissions, have ratified or acceded to the Agreement.

**As one of the largest contributor to greenhouse gas emissions and air pollution (nitrogen oxide and PM10 emissions) with home heating and the industry, transport and its logistics are particularly concerned. Whereas reducing polluting emissions through better driving methods and through supporting cleaner transport are the most commonly known actions to do so, a broader view of the supply chain and its actors underlines another way to “green” transports and logistics.**

* 1. **Green Supply Chain Management**

**Supply Chain Management** (SCM) is **the oversight of materials, information, and finances as they move in a logistic process from supplier** to manufacturer to wholesaler to retailer **to consumer** (**Figure 1**). It designates “the process of planning, implementing and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements”[[3]](#footnote-3).

**Figure 1: Standard Logistics Process**

Suppliers

Manufacturer

Wholesaler

Retailer

Consumer

Merchandise Delivery Path

 **Author: Mathieu Hocquelet, 2018**

The contribution of **Green Supply Chain Management** (GrSCM) consists in « **integrating environment thinking into supply chain management**, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management of the product after its useful life » (Srivastava, 2007) (**Figure 2**).

**Figure 2: Green Supply Chain Management through Life Cycle Thinking**

Life Cycle Thinking

Transportation

/Distribution

Production

/ (re) Manufacturing

Consumption

Use, Re-Use, Repair

Recycling

Raw Materials

Residual Waste

Concept

/Design

Collection

/Disposal

 **Author: Mathieu Hocquelet, 2018**

**Green Supply Chain Management** and tools such as **Life Cycle Thinking** are going **beyond the traditional focus on production site and manufacturing processes** to **include environmental, social and economic impacts of a product over its entire life cycle** (**Table 1**).

 **Table 1. Green Supply Chain Management, from environmental awareness to a green value chain (source: ReverseLogisticsMagazine.com)**

|  |  |
| --- | --- |
| **Why is need for Green SCM ?** | **Areas to Green the Supply Chain** |
| * Increasing Environment Constraints due to Global Warming
* Corporate Social Responsibility
* Beneficial for Organization
* Eco-Friendly
* Increasing Environmental awareness in stakeholders
* Evolving Consumer and Client Demand
* Response to increasing fuel price
 | * Designing of products
* Production
* Material Purchase
* Packaging
* Warehousing
* **Logistics & Reverse Logistics**
 |

The main goals of LCT are to **reduce a product’s resource use and emissions to the environmen**t as well as **improve its socio-economic performance through its life cycle**. This may facilitate links between the economic, social and environmental dimensions within an organization and through its entire value chain (**Table 2**). While Life Cycle Thinking is a philosophy, Life Cycle Assessment (LCA) is a tool which enables this way of thinking. LCA allows quantitative assessment of environmental impacts of a product or a service. LCA looks at a product's entire life cycle from the extraction of raw materials (cradle) to the product's disposal (grave). It takes into account all energy, materials and emissions related to the production, use and disposal of a product.

**Table 2. Green SCM and the three pillars of sustainable development (source: RLmagazine.com)**

|  |  |  |
| --- | --- | --- |
| **Financial Benefits** | **Environmental Benefits** | **Social Benefits** |
| * Increased Revenue
* Increase Asset Utilization
* Enhanced Customer Service
* Reduced Costs
 | * Increased Energy Efficiency
* Reduced Waste
* Reduced Air Emissions
* Reduced Water Emissions
* Reduced Fuel Consumption
 | * Reduced Community Impacts
* Noise Reduction
* Reduced Traffic Congestions
* Improved Health
* Improved Safety
* Improved Security
 |

* 1. **Reverse Logistics**

Growing green concerns and advancement of green supply chain management concepts and practices make the Reverse Logistics even more relevant. The number of publications on the topic of RL significantly increased over the past two decades. The first use of the term "reverse logistics" in a publication was by James R. Stock in a White Paper titled "Reverse Logistics," published by the Council of Logistics Management in 1992. The concept was further refined in subsequent publications by Stock (1998) in another Council of Logistics Management book, titled ***Development and Implementation of Reverse Logistics Programs***, and by Rogers and Tibben-Lembke in a book published by the Reverse Logistics Association titled ***Going Backwards: Reverse Logistics Trends and Practices*** (1999).

**Definition:** Reverse logistics (RL) is a part of Green Supply Chain Management (GrSCM). RL is the “process of planning, implementing and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information **from the point of consumption to the point of origin for the purpose of recapturing value** **or proper disposal**. **Remanufacturing and refurbishing** activities also may be included in the definition of reverse logistics”[[4]](#footnote-4).

**Figure 3. Reverse Logistics process**

Suppliers

Manufacturer

Wholesaler

Retailer

Consumer

Merchandise Delivery Path

Overseas Remarketer (Reseller/Trader)

Consumer

Retailer

 Return Center

 **Recover/Remarket/Recycle/Reuse**

Original Vendor or Local Remarketer (Reseller/Trader)

Merchandise Return Path

**Author: Mathieu Hocquelet, 2018**

While Green Logistics refers to minimizing the ecological impact of logistics as a whole, Reverse Logistics refers to all efforts to move goods from their typical place disposal in order to recapture value. Reverse logistics is for **all operations related to the reuse of products and materials**. When a manufacturer's product normally moves through the supply chain network, it is to reach the distributor or customer. **Any process or management after the delivery of the product involves RL**. If the product is defective, the customer would return it. The manufacturing firm would then have to organise shipping of the defective product, testing it, dismantling, repairing, recycling or disposing it. The product would travel in reverse through the supply chain network in order to retain any use from the defective product**.**

1. **“Recover, Recycle, Remarket, Reuse”: Reverse Logistics in practice**

**Usually, logistics deal with events that bring the product towards the customer. In the case of RL, the resource goes at least one step back in the supply chain.** For instance, goods move from the customer to the distributor or to the manufacturer through a more complex process (**Figure 3 & Table 3**). Besides, the **RL process includes the management and the sale of surplus as well as returned products**.

**2.1. Reverse Logistics history in a few key dates and examples**

Reverse Logistics is not new. The first examples of documented and systematic RL highlighted by the literature find their origins in the second half of the 19th Century North America (Rogers and Tibben-Lembke, 1999). These examples underline the diversity of the return management processes (depending on the type of goods, industry and actors involved, reasons for returning, return process, etc…):

**[1865]** **Supplying soldiers on the march** during the US Civil War: General William T. Sherman reflexions on **supply and mobility** of his troops (Sherman supposedly had his soldiers dump tons of ammunition and weapons in the Neuse River north of Raleigh, North Carolina.).

**[1872]** **Adopting customer service policies based on customers’ satisfaction** in retail: Montgomery Ward (US Furniture Shop) was among the first to adopt a **customer service policy** based on the principle: “100% satisfied or fully refunded/money back”.

**[1942]** **Answering to material shortages** during World War II by rebuilding automobile parts: Today, it’s a $36 billion business where more than 90% of all starters and alternators sold for **replacement** are **remanufactured**.

**[1984]** **Recalling products**: Johnson & Johnson and McNeil Laboratories **quickly removed** **tainted lots** of Tylenol **and replaced it by new lots** with tamper-proof bottles.

**[1991]** **Passing** **recycling ordinances** in the environmental reverse flow and deploying **mandatory recycling programs**: The Federal Republic of Germany decided to include fines and prosecutions for violators of the ordinances implying **guidelines for the handling and transporting of hazardous materials** and **responsibilities for recovering hazardous wastes**.

**[1996]** Following the FRG ordinances, United Kingdom adopted a **legislation requiring shippers and manufacturers to be responsible for the return and recycling of packing materials**.

**[2001]** Going **one step further**, the European Union established **a goal of 50 to 65%** **recovery or recycling of packaging waste** for member countries and countries who want to do business with UE.

**Figure 4. Activities of Reverse Logistics / Return Management (source: RLmagazine.com)**



**2.2. Reverse Logistics and the growing role of sustainable development in organizations**

Today and over the past two decades, the number of organizations who chose to integrate mandatory and voluntary environmental practices into their strategic plans and daily operations has continuously increased. “Whereas numerous initiatives have provided incentives for organizations to become more environmentally benign, the latter view many of these environmental programs, which include technological and organizational development projects, as possible alternatives for gaining or maintaining a competitive advantage” (Sarkis, 2003). Thus, the urgency of the situation (Global warming) underlined by European and National regulations led to the rise of environmental issues in organizations (CSR, extended producer liability, ISO 14001 standard) which have been reinforced by the dissemination of ICT and the transformations of retail (customer oriented management and growing role of e-commerce):

**The Extended Producer Responsibility (EPR)**

According to the OECD definition, **EPR** consists in an environmental policy approach in which a **producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle**. **Whereas the initial fees paid by European Union producers 15 years ago represented only a partial contribution to solid waste management costs, the operational costs coverage by producers’ fees has gradually increased, sometimes reaching 100%.**

**The Corporate Social Responsibility (CSR)**

Once considered as an internal policy or as a business strategy based on voluntary decisions at the level of organisations, **CSR** has moved to mandatory schemes at regional, national and transnational levels beyond individual and industry-wide initiatives.

**The ISO 14000 family**

The ISO 14000 family, Including ISO 14001:2015 and its supporting standards such as ISO 14006:2011, represents the core set of standards used by organizations for designing and implementing an effective environmental management system (EMS). The other standards in the family focus on specific approaches such as audits, communications, labelling and life cycle analysis, as well as environmental challenges such as climate change. The major objective is to provide "practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities”[[5]](#footnote-5) while being based on a voluntary approach. As with its predecessor ISO 9000, the international standard of quality management, ISO 14000 acts both as an internal management tool and as a way of demonstrating a company’s environmental commitment to its customers and clients.

**E-Commerce and the aftermarket**

Last but not least, the rise of ICT, e-commerce, the aftermarket and shortening of products life circle: **online return rate is more than 20% and as high as 50%** depending on the industry and on the time of the year **when brick-and-mortar return rate is under 10**% (Wotjek, 2015).

**2.3. Reverse Logistics and Return Management**

In order to decide what to do with its returned goods, a company has to think about the whole logistics and return logistics process. Upstream, **avoidanc**e, that is to say **finding ways to minimize the number of items that are returned** is essential to reduce the reverse logistics costs. Downstream, **gatekeeping**, i.e. **screening returned goods to prevent incorrect acceptance of goods** is another major task to prevent extra costs. Thus, products are returned to companies or third-party handlers for a variety of reasons – mainly **Recover, Remarket, Recycle, Reuse** (**Figures 3 and 4**) depending the industry, the products and their return conditions:

**Excess Inventory:** some products and goods are prone to larger quantities of returns, which is usually the result of excessive supply of inventories for the purpose of shelf availability. In some cases, the quantity of returns is up to ten times the quantity of the retail chain distribution flow of inventories (CDs, DVDs, postcards and greeting cards) (Ivona et al. Op. cit).

**Seasonal inventory:** as other types of inventory in the distribution (speculative, overstock), seasonal inventories usually result in a larger quantity of return goods (Ivona et al., Op. cit).

**Damages:** as underlined by Ivona et al. (2014), “Damaged packaging results in more complex transport, storage and handling, i.e. increases the level of complexity of organizing the logistics activities, and may result in potential damaging of the return product. In relation to inventory management, at the gatekeeping, the damaged packaging can also be the cause of the lack of data and necessary information related to the return product itself” (p.10).

**Obsolete Equipment/WEEE/Hazardous materials disposition:** Today, extended producer responsibility is mandatory within the context of the WEEE, Batteries, and ELV Directives, which put the **responsibility for the financing of collection, recycling and responsible end-of-life disposal** **of WEEE, batteries, accumulators and vehicles on producers** (manufacturers of specified disposal equipment are directly responsible for the disposal of electronic waste.  These companies must meet collection targets, collecting 65% of the average weight of electronics placed on the market in the previous two years). The Packaging Directive also indirectly invokes the EPR principle by requiring Member States (MS) to take necessary measures to ensure that systems are set up for the collection and recycling of packaging waste. Additional waste streams for which producer responsibility organisations have been most commonly identified within the European Union include **tyres**, **waste** **oil**, **paper** **and** **card**, and **construction** **and** **demolition** **waste**. However, a much broader range of waste streams are subject to obligatory or voluntary producer responsibility systems in some MS, including: **farm plastics, medicines and medical waste, plastic bags, photo-chemicals and chemicals, newspapers, refrigerants, pesticides and herbicides, and lamps, light bulbs and fitting**s[[6]](#footnote-6).

**Recycling Program/Returnable Goods:** Reusable packaging systems require a closed-loop logistics system. Examples include reusable pallets, bulk boxes such as Euro containers, Reusable bottles for milk, soda, and beer, compressed gas cylinders, beer kegs, etc. i.e. : « Pfand » system in Germany (glass and plastic bottles recycling).

**Recalls:** As underlined by Carl Brewer in Reverse Logistics Magazine: “Recalls take all forms and can happen to any manufacturer. For most manufacturers, nearly all the brainpower and muscle goes into pushing products out the door – often overlooking the critical moment in the customer relationship that comes when something is returned. Those who invest in planning for a reverse logistics event before one happens will find that when done right, returns can deliver opportunities for building better relationships with customers, salvaging revenue and learning from past mistakes to build a better, next generation product” “The key to any successful return process – whether due to product failure, public pressure or criminal tampering – lies in having a plan in place that can be implemented on a moment’s notice and addresses the major components of recall management.”[[7]](#footnote-7).

**Refusal of the products in the cash on delivery (COD):** In the case of e-commerce, many websites offer cash on delivery (COD) to their customers who can refuse the product at the time of delivery as there is no commitment to take the product. The process of reverse logistics on the refused product is also known as Return to Origin (RTO). In this process, the e-commerce company adds the refused product to its inventory stock again, after proper quality checks according to the company's rules (Vogt et al., 2002).

**Salvage:** When a product cannot be repaired and should be discarded, its components can be taken apart and put back into use. This process is known as salvaging parts and can be useful to companies who want/have to decrease their ecological footprint, recycle rare components, save money, and add to their pool of replacement parts.

**Handling of returned merchandise / Return of unsold goods:** In certain industries, goods are distributed to downstream members in the supply chain with the understanding that the goods may be returned for credit if they are not sold (e.g., newspapers and magazines). This acts as an incentive for downstream members to carry more stock, because the risk of obsolescence is borne by the upstream supply chain members. However, there is also a distinct risk attached to this logistics concept. The downstream member in the supply chain might exploit the situation by ordering more stock than is required and returning large volumes. In this way, the downstream partner can offer high level of service without carrying the risks associated with large inventories. The supplier effectively finances the inventory for the downstream member. It is therefore important to analyse customers’ accounts for hidden costs.

**Table 3. Main differences in conventional logistics and reverse logistics management (source: RLmagazine.com)**

|  |  |  |
| --- | --- | --- |
|  | **Conventional Logistics** | **Reverse Logistics** |
| **Product quality**  | Uniform | Uncertain |
| **Product price** | Uniform | Variable |
| **Type of customer** | Easy to identify (marketing) | Difficult to identify |
| **Financial Management** | Clear | Vague and contentious |
| **Inventory Management** | Coherent | Non-coherent |
| **Distribution costs** | Comprehensible | Hard to Comprehend |
| **Product Life Cycle** | Controllable | Hardly controllable |
| **Process Visibility** | Transparency | Opacity |
| **Negotiations among stakeholders** | Simple and direct | Ambiguous |

**Conclusion**

To put in a nutshell, reverse logistics is a complex process (**Table 3**). The eight following indicators have been identified among the various significant components to be considered to measure the financial effectiveness of a reverse logistics operation (source: Retail Chain Paris):

**Quantity** **of** **recovered** **and** **resold** **products**

**Percentage** **of** **recycled** **equipment**

**The** **loss** (How much products and other materials are incinerated, put in discharge?)

**Average costs** **of** **treatment** **per** **article** (The ratio “total costs of the equipment per month/ articles” can be also used to compare the efficiency of several stock rooms, or other equipment)

**Percentage** **of** **costs** **recovered** (Does the company maximize the profitability of the unsold or returned articles?)

**Distance covered** (In a general way, it is preferable to reduce to the maximum the distance travelled by an article in the opposite circuit)

**Energy** **used** **in** **the** return **management** **process** (This indicator measures the quantity and/or the cost of the energy used (fuel, electricity, etc) during the logistic processes)

**Total costs** **of** **possession** (It includes its transfer, return, resale, cost of acquisition of the product on a resale market or to put it into landfill)

Once this evaluation carried out, the companies will have to choose between internalizing or externalizing reverse logistics process.

**Appendix**

**The why, what, how and who De Brito’s and Dekker’s classification: the various ways in which reverse logistic activities are done (De Brito et al., 2005)**

|  |
| --- |
| **Products** |
| **Civil objects**(buildings, dikes, bridges, roads…) | **Consumer goods**(furniture, TV sets, cars…) | **Ores, oils and chemicals** | **Other materials**(glass, paper pulp…) | **Distribution items**(bottles, crates, pellets…) | **Spare parts** |
| **Recovery Process** |
| **Direct recovery**(i.e. without major processing)Re-sale, re-use, re-distribution | **Recovery requiring processing****Repair** (i.e. making products working again or bringing them to working condition), refurbishing (i.e. product upgrading), remanufacturing (i.e., recovery of products to an “as new” level), (parts) retrieval (i.e. recovery of a selected number of parts from products), recycling (i.e. recovery of materials from products), incineration, (proper) disposal |
| **Actors** |
| **Forward supply network actors** (manufacturers, wholesalers, retailers, service providers…) | **Specialized reverse logistics actors** (recyclers, independent remanufacturers…) | **Governmental entities**(European Union, national governments…) | **Opportunistic players**(Charity organisations…) |
| **Return Reasons** |
| **Manufacturing returns**(i.e. returns related to the execution of production processes: raw material surplus, quality-control returns, production leftovers, by-products…) | **Distribution returns**(i.e. returns related to the distribution of production to [potential] customers: product recalls, B2B commercial returns, stock adjustments, distribution items…) | **Market returns**(i.e. returns from the users of products: B2C commercial/reimbursement returns, warranties, service returns [repairs and spare parts], end-of-use returns, end-of-life returns…) |
| **Drivers** |
| **Economics**(direct and indirect profits related to reduced production costs, green image, market protection, improved customer/supplier relations, etc…) | **Legislation** | **Corporate Citizenship** |

The main idea behind de Brito and Dekker’s framework is that, In the context of reverse logistics, companies have to make several strategic, tactical and operational decisions. At strategic level, the collection network has to be designed. At tactical level, the relationships with partners have to be developed. At operational level, inventories have to be managed and activities have to be planned and controlled (de Brito et al., 2005).

|  |  |  |  |
| --- | --- | --- | --- |
| **Costs above the cost of the product** | **Reverse Logistics Challenge** | **Return problems & symptoms** | **Barriers to good Reverse Logistics** |
| \*Merchandise credits to the customers\*The transportation costs of moving the items from the retail stores to the return centre\*The repackaging of the serviceable items for resale\*The cost of warehousing the items awaiting disposition\*The cost of disposing of items that are unserviceable, damaged, or obsolete | \*From the Retailer – Manufacturer Conflicts to the necessity to develop a working partnership to derive mutual benefit\*Inefficiencies that lengthen the time for processing returns: Condition of the item, Value of the item, Timeliness of response | \*Lack of information about the process\*If it’s not measured (no indicators, no anticipation), it’s not managed | \*Management inattention\*Lack of importance of reverse logistics\*Corporate strategy for handling returns and non-salable items |

**(source: RLmagazine.com)**

|  |  |
| --- | --- |
| **RL potential levers** | **RL Key indicators** |
| * Product Quality
* Product Size
* Product Position within its Life circle
* Product Price
* Market Strategy (including marketing and supply chain)
* Financial Indicators
 | * Quantity of Products possessed and percentage resold
* Percentage of recycled material
* Percentage loss
* Average cost of a product
* Average recovered costs
* Distance travelled
* Energy used through the return management process
* Total cost of ownership
 |

**(source: RLmagazine.com)**

|  |  |
| --- | --- |
| **Strategic Use** | **Challenges** |
| * Strategy Weapon
* Competitive Reasons
* Good Corporate Citizenship
* Clean Channel
* Recapture Value and Recover Assets
* Legal Disposal Issues
 | * Retailer – Manufacturer conflicts
* Problem Return Symptoms
* Cause and Effect
* Reactive Response
 |

**(source: RLmagazine.com)**

**Related videos and websites**

**“Reverse Logistics in circular economy”:** a 2 minutes video by Bio by Deloitte dealing with RL both as “a profitable and environmentaly friendly opportunity for companies”

<https://www.youtube.com/watch?v=fCQjsU6FRJk>

**“What is Reverse Supply Chain Management”?:** In a little more than one minute, Re-Teck/LTG Chief Strategy Officer Linda Li explains the fundamentals of Reverse Supply Chain Management and the pivotal role it plays in both economic and environmental sustainability.

<https://www.youtube.com/watch?v=1vbb411EnJw>

**“Spencer//Butcher Reverse Logistics”:** Spencer//Butcher presents in a 3 minutes video how the company streamlines the process of RL by planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory and finished goods.

<https://www.youtube.com/watch?v=bTU4p91Xjlk>

**“TAKE Supply Chain Enterprise Returns Management. 2-Minute Explainer”**: in two minutes, this video from TAKE Supply Chain describes the integration of reverse logistics into supply chain management.

<https://www.youtube.com/watch?v=MEkXfxleLBk>

**BibliographyT**

Beamon B. M. (1999), “Designing the Green Supply Chain”, Logistics Information Management, Vol. 12, No. 4, pp. 332-342.

De Brito M., Dekker R., Flapper S. D. (2005), “Reverse Logistics: A Review of Case Studies”, In Fleischmann B., Klose A. (eds), D*istribution Logistics. Lecture Notes in Economics and Mathematical Systems*, vol 544. Springer, Berlin, Heidelberg Distribution Logistics, pp. 243-281.

Dowlatshahi S. (2000), “Developing a Theory of Reverse Logistics”, Interfaces, Vol. 30, No. 3, pp. 143-155.

Elmas G., Erdoğmuş F. (2011), “The importance of Reverse Logistics”, International Journal of Business and Management Studies, Vol. 3, No.1, pp. 161-171.

Ghobakhloo M., Tang S. H., Zulkifli N., Ariffin M. K. A. (2013), “An Integrated Framework of Green Supply Chain Management Implementation”, International Journal of Innovation, Management and Technology, Vol. 4, No. 1, pp. 86-89.

Granlie M., Hvolby H-H., Cassel R. A. (2013), “A Taxonomy of Current Literature on Reverse Logistics”, IFAC Proceedings Volumes, Vol. 46/7, pp. 275-280.

Hawks K. (2006), “What is Reverse Logistics?”, Reverse Logistics Magazine, Winter/Spring, Retrieved from: <http://www.rlmagazine.com/edition01p12.php>

Huscroft J. R., Hazen B. T., Hall D. J., Skipper J. B., Hanna J. B. (2013), “Reverse Logistics: past research, current management issues, and future directions”, The International Journal of Logistics Management, Vol. 24, Issue: 3, pp. 304-327.

Ivona B., Novacko L., Ogrizovic D. (2014), “Processing reverse logistics inventories”, Multidisciplinary Scientific Journal of Maritime Research, No. 28, pp. 10-16.

Mutingi M. (2014), “The impact of reverse logistics in green supply chain management: A system dynamics analysis”, International Journal of Industrial and Systems Engineering, Vol. 17, No.2, pp. 186-201.

Retail Chain Paris, 2017, *La Reverse Logistic*, Les rendez-vous Experts de la Supply Chain omincanale, 25 avril 2017, La Défense, Paris.

Rogers D. S., Tibben-Lembke R. (2011), “An Examination of Reverse Logistics Practices”, Journal of Business Logistics, Volume 22, Issue 2, pp. 129-148.

Rogers D. S., Tibben-Lembke R. (1999), *Going Backwards: Reverse Logistics Trends and Practices*, Reverse Logistics Executive Council, University of Nevada, Reno.

Rubio S., Jiménez-Parra B. (2014), “Reverse Logistics: Overview and Challenges for Supply Chain Management”, International Journal of Engineering Business Management, Vol: 6, No. 12., pp. 1-7.

Sarkis J. (2003), “A strategic decision framework for green supply chain management”, Journal of Cleaner Production, No. 11, pp. 397-409.

Senthil S., Srirangacharyulu B., Ramesh A. (2011), “A decision making methodology for the selection of reverse logistics operating channels”, Procedia Engineering, n°38, pp. 418-428.

Shan W., Wang J. (2018), “Mapping the Landscape and Evolutions of Green Supply Chain Management”, Sustainability, Vol. 10, No. 3, pp. 1-23.

Srivastava S. K. (2007), “Green supply-chain management: A state-of-the-art literature review”, International Journal of Management Reviews, Volume 9, Issue 1, pp. 53-80.

Stock J. R. (1992), “Reverse Logistics”, Oak Brook, IL: Council of Logistics Management, 18p.

Toke L. K., Gupta R. C. (2010), “Green Supply Chain Management; Critical Research and Practices”, *International Conference on Industrial Engineering and Operations Management*, Dhaka, Bangladesh.

Vogt J. J., Pienaar W. J., De Wit P. W. C. (2002), *Business Logistics Management : theory and practice*, Oxford University Press.

Wang J-J., Chen H., Rogers D. S., Ellram L. M., Grawe S. J. (2017), “A bibliometric analysis of reverse logistics research (1992-2015) and opportunities for future research”, International Journal of Physical Distribution & Logistics Management, Vol. 47, Issue: 8, pp. 666-687.

Wotjek R.(2015), “E-commerce and the Return of Unwanted Goods: A Case for Cooperation Among Providers of Postal and Non-postal Parcel Services”, in Crew M.A., Brennan T.J. (eds.), *Postal and Delivery Innovation in the Digital Economy*, Topics in Regulatory Economics and Policy, Vol. 50, pp. 17-29.

Paris Agreement, United Nations Treaty Collection, 8 July 2016: <https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en>

**Document n°3 : Multiple Choice Questionnaire**

**OER: Feasibility of the implementation of a sustainable reverse logistics**

**Multiple-choice questionnaire**

**Answer the multiple choice questions below to test your knowledge about Reverse Logistics. To do so, you can refer to the Document n°1 “Course Material” on Reverse Logistics and to the links included in the Documents n°1 and n°2 of the Online Educational Resource. Timeframe: 30 minutes.**

1. **What does the contribution of Green Supply Chain Management (GrSCM) consist in?**

A - Reducing polluting emissions through better driving methods and cleaner trucks.

B - Integrating environment thinking into supply chain management, from product design to end-of-life management.

C - Planning, implementing and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements.

D - Planning, implementing and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal.

1. **The Extended Producer Responsibility consists in an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle. What percentage of solid waste management operational costs European Union producers have to cover today?**
2. Up to 15%
3. Up to 35%
4. Up to 65%
5. Up to 100%
6. **What are the main characteristics of a reverse logistics management process?**
7. Uniform product quality - uniform product price - easily identifiable customers - clear financial management - coherent inventory management - comprehensible distribution costs - controllable product life cycle - transparent process visibility - simple and direct negotiations among stakeholders.
8. Uniform product quality - uniform product price - easily identifiable customers – vague and contentious financial management – Non-coherent inventory management – hard to comprehend distribution costs – hardly controllable product life circle - transparent process visibility - simple and direct negotiations among stakeholders.
9. Uncertain product quality - variable product price - difficult to identify customer - vague and contentious financial management – Non-coherent inventory management – hard to comprehend distribution costs – hardly controllable product life circle - poor process visibility – ambiguous negotiations among stakeholders.
10. Uncertain product quality - variable product price - difficult to identify customer - clear financial management - coherent inventory management - comprehensible distribution costs - controllable product life cycle - poor process visibility – ambiguous negotiations among stakeholders.
11. **In the context of a Reverse Logistics operation, companies have to make several strategic, tactical and operational decisions. At strategic level, the collection network has to be designed. At tactical level, the relationships with partners have to be developed. At operational level, inventories have to be managed and activities have to be planned and controlled (de Brito et al., 2005). With whom will your company is likely to work?**
12. Governmental entities (European Union, National government)
13. Recyclers, independent remanufacturers
14. Charity organisations
15. Manufacturers, wholesalers, retailers
16. None of these actors
17. All of these actors
18. **Reverse Logistics is a complex process. Which one of these data is not a key reverse logistics indicator?**
19. Distance travelled
20. Average cost of a product
21. Percentage of recycled material
22. None of these indicators
23. All of these indicators
24. **Complete the Reverse Logistics Scheme below, filling the (1, 2, 3 and 4) blank parts choosing the most appropriate words among the following list :**
25. Retrieve, transport, receive, inspect, sort
26. Consumer
27. Warehouse
28. Merchandise return path
29. Recover, remarket, recycle, reuse
30. Supplier
31. Delivery
32. Materials, information and financial flows

**Reverse Logistics process**

**1**

Manufacturer

Wholesaler

Retailer

**2**

Merchandise Delivery Path

Overseas Remarketer (Reseller/Trader)

**3**

Retailer

 Return Center

**2**

Original Vendor or Local Remarketer (Reseller/Trader)

**4**

**Appendix**

**Answers**

1. **B.** According to Srivastava (2007), the main contribution of Green Supply Chain Management (GrSCM) consists in « **integrating environment thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management of the product after its useful life** ».
2. **D.** According to the OECD definition, the Extended Producer Responsibility (EPR) consists in an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle. **Whereas the initial fees paid by European Union producers 15 years ago represented only a partial contribution to solid waste management costs, the operational costs coverage by producers’ fees has gradually increased, sometimes reaching 100%.**
3. **C.** According to RLmagazine.com, the main differences between conventional logistics and reverse logistics management are summed up in this table:

|  |  |  |
| --- | --- | --- |
|  | **Conventional Logistics** | **Reverse Logistics** |
| **Product quality** | Uniform | **Uncertain** |
| **Product price** | Uniform | **Variable** |
| **Type of customer** | Easy to identify  | **Difficult to identify** |
| **Financial Management** | Clear | **Vague and contentious** |
| **Inventory Management** | Coherent | **Non-coherent** |
| **Distribution costs** | Comprehensible | **Hard to Comprehend** |
| **Product Life Cycle** | Controllable | **Hardly controllable** |
| **Process Visibility** | Transparency | **Opacity** |
| **Negotiations among stakeholders** | Simple and direct | **Ambiguous** |

1. **F.** According to the “why, what, how and who” De Brito’s and Dekker’s classification highlighting the various ways in which reverse logistic activities are done (De Brito et al., 2005), **forward supply network actors** (such as manufacturers, wholesalers, retailers, service providers), **specialized reverse logistics actors** (recyclers, independent remanufacturers), **governmental entities** (European Union, national governments) and **opportunistic players** (including charity organisations) **can ALL be actors working on the reverse logistics process.**
2. **D.** The average cost of a product, the distance travelled and the percentage of recycled material are among the most important reverse logistics indicator. Thus, according to the question, **none of them “is not a key indicator”**.
3. **1/F; 2/B; 3/E; 4/D**. (see figure 3 in the Course material document). Two other answers are possible for 1 (/C) and 4 (/H) but not accurate.
	1. **Unit Description**

**Key information on the OER-unit**

|  |
| --- |
| The title of unit, Sector (Health Care / Logistics), Job-Title & EQF-Level |
| Feasibility of the implementation of a sustainable Reverse Logistics, Logistics, Forwarding Clerks, EQF Level 5 |
| Resource type of the unit (Such as OER courses, WebQuest) |
| A course, a WebQuest and a multiple choice question |
| Media format (Such as Text, Video, Images, Audio, Quizzes and games, Multimedia in a combination of formats which may be interactive) |
| Text, links to video |
| Short Description with background of the unit (workplace scenario) |
| The reverse logistic is the overall operations for the organization of the reverse flow of the products: from the client to the producer. Reverse logistics deals with: the return of unsold merchandise, the return of defective products or from operating errors, the recovery of obsolete equipment or machinery, and the recovery of hazardous waste or environmentally risky materials. It can bring to the reuse of logistics packages (wooden pallets, carton, bottle, containers); to the recycling, reuse or reassembly of products or components; to the elimination of end life products or waste treatment (sewage, waste oil, etc.). Reverse logistics includes all operations related to the reuse of products and materials: recover, remarket, recycle, reuse.This scenario proposes a 6 hours lesson. It is compound by two OER (print documents, in .pdf format) and a MCQ for evaluation.* **Document n°1**: *WebQuest* – description of WebQuest group workshop, aiming at identify in the web the legislative, human, organizational, financial and environmental constraints to the implementation of a sustainable reverse logistics.
* **Document n°2**: *Lesson* - a text describing the characteristics of a reverse logistic and the important information needed to analyze a transport demand. Some video links are indicated at the end of the document.
* **Document n°3:** An evaluation model of the learning outcomes assessed by MCQ.
* **Document n°4:** A grid for the evaluation of the OER in order to improve it
 |
| Key words |
| Reverse logistics, Green Supply Chain, Sustainable Development |
| Justification with regard to the **GreenSkills4VET Reference Framework** (in terms of ESD) |
| *The reverse logistics is an important and new phenomenon, which allows the increase of a circular economy, a European priority for a sustainable economy. Evaluating the feasibility of a sustainable reverse logistic in terms of transportation management corresponds to various ESD competencies such as: “identify factors/threats that will influence optimisation of time and resources in the logistic chain”, “learn about life cycle products assessment”, “reflect upon the great importance of the skill of multi-factorial decision making of the clerk”, “differentiate types of possibilities for local material supply and waste treatment”, “differentiate between different possibilities of technical solutions in environmental protection”, “create, alter and influence local material flows”, “avoid negative environmental effects of material inputs, energy consumption and waste treatment/recycling”.*  |

**Pedagogical preconditions and outcomes**

|  |
| --- |
| Is this a new learning field or does it add to existing learning fields? |
| The learning unit is added to an existing field |
| Targeted trainees, e.g. school-beginners or trainees with practical experience? |
| The learning unit is adapted to school beginners that have concluded a training level 3-4 in logistics and trainees with practical experience |
| Is previous knowledge required?  |
| *It is important that the trainees received a qualification in Logistics and Transports level 3-4* |
| Expected learning outcomes (pedagogical objectives) |
|  |
| Learning Objectives with regard to the European Qualifications Framework | Knowledge |
| * Know the different types of logistical services related to reverse logistics
* Acquire and process information about the national, European and international legislation in relation with sustainable development and environmental protection
 |
| Skills |
| Identify legislative, organizational, human, financial and environmental constraints to the implementation of a reverse logistics |
| Competences |
| Synthesize the pertinent information |

**Further classification of content and extent**

|  |
| --- |
| Methodic approach |
| Pedagogy of Activity (pédagogie de l’activité), Flip learning, Problem Based Learning, and Digital Learning |
| Timespan in total |
| 5 to 6 hours |
| Does the unit have sub-units? If yes: How many? |
| The unit has three sub-units |
| Available learning languages |
| English, French |
| Number of participants (min/max) |
| 15/30 |

**1.3 Justification of the OER**

**1.3.1 The created OER-unit and Open Education**

This Open Educational Resource (OER), entitled “Feasibility of the implementation of a sustainable Reverse Logistics” is a mix of classic material and innovative learning methods made of four complementary parts: a didactic scenario, a WebQuest, a lecture support and an evaluation support in the form of a multiple choice questionnaire. The target group of this Learning-Unit is transport and logistics services-trainees (and more specifically freight-forwarding clerks. EQF Level 5).

The OER unit has been built following the principles of Open Educational Resources in order to make it easier to replicate it, handle it, mix it (for example by implementing new articles, videos, new WebQuests, MCQ questions or exercises dealing with a specific company, sector or country). The intellectual property license is clearly indicated in all documents and supports. We made the choice to protect the OER contents with a Share-Alike attribution (CC-BY-SA), a license requiring to label with the same license any new products based on the original in addition to crediting the original authors. Reuse, revision and content remix or merge possibilities are practicable and straightforward for all the presented resources. Presentation methods accord with the learner’s knowledge and abilities, using the learners' knowledge on logistics management and helping them to further improve it. To put in a nutshell, you are free to share, mix, transform and adapt but you must give appropriate credit, indicate if changes were made and distribute your contribution under the same license). Besides, in an Education for Sustainable Development (ESD) perspective, we made the choice to present all contents in PDF format which appears as clear, consistent, easy to disseminate and readable online, without the need to print it.

Available in French - with specific national framework - and English - with a general European framework that can be reframed easily to a specific country or area -, this OER aims at providing teachers with all the necessary elements to facilitate the implementation of the new resources in their teaching programme through a learner-centred approach and in a blended learning manner. Whereas the OER Unit is based on a mix of innovative pedagogical methods (WebQuest) and traditional - albeit more inclusive - lecture, it reaffirms the central role of the teacher. A clear shift takes place from the classical teaching posture, based on theoretic transfer of notions (teacher-centred model), to a role of guidance and support for the active learning in classes (learner-centred approach). The teacher will support learners all along the preparation of the WebQuest providing useful hints, clarifying ambiguous concepts, helping solving predicaments. The teacher’s role and responsibility consist in thinking about how he/she will integrate the material into the class and how to guide students in their own quest for professional knowledge.

This OER is specifically conceived to provide information about the overall operations for the organization of a sustainable reverse flow of products: back from the customer to the producer and other reverse logistics actors for different reasons. Thus, it includes concepts related to the regulations framing reverse logistics, returns management, reuse of products and materials: recover, remarket, recycle, reuse of specific goods in various business contexts. Indeed, the different experts we met and conducted interviews with - senior experts from the sector council, from the Ministry of Education and VET teachers- agreed to underline the considerable lack of teaching material related to both reverse logistics and sustainable development in the transport and logistic EQF Level 5 / ”BTS Transport et Logistique” curriculum. Thus, the OER unit is addressing two major blind spots in VET teaching.

The OER Unit is mainly based on texts, images, schemes and introduces links to videos and articles to support its pdf format documents, both in order to enrich and to trigger students’ interest and involvement. In this OER Unit, videos have to be considered more as complementary information and to sum up broad concepts in a short amount of time and in a dynamic way. Using these videos during the WebQuest is an important point for keeping students’ attention while constituting a way to save time.

**1.3.2 *Back to the roots* - Pushing ESD into VET**

Current environmental studies underline an alarming climate change. As populations, economies and standards of living grow, so does the cumulative level of greenhouse gases (GHGs) emissions. According to the United Nations, there are some basic well-established scientific links: the concentration of GHGs in the earth’s atmosphere is directly linked to the average global temperature on Earth; the concentration has been rising steadily, and mean global temperatures along with it, since the time of the Industrial Revolution; and the most abundant GHG, carbon dioxide (CO2), is the product of burning fossil fuels.

Therefore, companies get aware of sustainability and willing to take more account of environmental impacts of their activities. They endeavour to their company on a sustainable development according to the UN climate negotiations (climate conference of Paris 2013) by suitable medium and long-term strategies. By this, they assume not only responsibility for the next generations, but also avoided the global impacts of their non-sustainable actions. Not only ecological and social aspects are considered, but also business efficiency. This OER unit should help carriers to better understand and put into practice a sustainable reverse logistics in order to do so.

Since the 1990’s, the organizational use of Green Supply Chain Management and Reverse Logistics has spread through the reinforcement of the International, European and national legal frameworks regarding sustainable development. Indeed, research shows that investment on green strategies is essential if environmental, economic and social performance benefits are to be realized. Reverse logistics plays an important part in improving sustainable performance of the green supply chain. As one of the largest contributor to greenhouse gas emissions and air pollution (nitrogen oxide and PM10 emissions) with home heating and the industry, transport and its logistics are particularly concerned. Whereas reducing polluting emissions through better driving methods and through supporting cleaner transport are the most commonly known actions to do so, a broader view of the supply chain and its actors underlines another way to “green” transports and logistics.

Beyond reverse logistics and returns management *per se*, the OER unit deals with Green Supply Chain Management and tools such as Life Cycle Thinking and Life Cycle Assessment in order to exceed the traditional focus on production site and manufacturing processes. Thus, the OER unit perspective includes the environmental, social and economic impacts of a product over its entire life cycle and thus, ways to reduce both companies’ costs, social and environmental impact, aiming at the three dimensions of sustainability at the same time.

The basic idea of sustainable development is to spread both global and local thinking in terms of environmental and organisational sustainability. In this perspective, a blended learning approach consisting in an Open Educational Resource based on a WebQuest (document n°1) and a dynamic lecture on the feasibility of the implementation of a reverse logistics based on the course material (document n°2) seems particularly tailored for students in transportation and logistics (EQF Level 5). Indeed, according to the experts interviewed, the better way to convince students that numerous important questions are at stake is to have a participative learning experience related to real life professional cases, starting from the WebQuest and finishing with a Lecture and an assessment test (document n°3. MCQ). Indeed, environmental matters meet the need for knowledge to make sense for the learner. In this perspective, the OER unit offers to analyse real life situations through a participative approach. While the teacher is not at the centre of the learning process, this approach encourages students to seize practical and theoretical professional knowledge by themselves and make it easier to mobilize it empirically. Thus, the OER unit gives to the learning activity a PBL (Problem Based Learning) character: students are faced with a real life problem which puts them in a situation to investigate, to search for relevant information to interact and to construct knowledge.

In terms of content, the OER Unit gives a general framework focusing on the history of the principles of a reverse logistics, but also on the environmental regulations and description of the different phases of the reverse logistics depending on the kind of goods, industry and country. To put in a nutshell, the OER Unit purpose is mainly to introduce the concept of reverse logistics, placing it in the general framework of traditional logistics and keeping it simple for a broader understating. Nevertheless, the teachers could integrate the financial dimension to the proposed contents through complementary exercises (i.e. by introducing financial figures in the case study).

The OERs contents covers educationally significant concepts and enable deep understanding. The degree of complexity of the unit is progressive. Moreover, we tried to reach an acceptable level of diversity in the different supports (video and web) to integrate in the OER. Despite our effort to provide as much diversity as possible (particularly in terms of gender and ethnicity), it was not often possible due to the limited availability of sources related to this male-dominated industry. Despite this limitation, the OER Unit can be easily handled, edited or mixed. Thus, new reverse logistics related links, examples, posters, WebQuests and PowerPoint (or equivalent) presentations made by students and teachers can complement the OER unit to bridge these gaps.

In terms of pedagogy, one of our goal with the production of the unit was to build supports capable of maintaining student’s attention and interest. The WebQuest includes open tasks dealing with reverse logistics and return management, a major issue both in environmental and organisational terms, that the students have the opportunity to discover and explore through online sources before the actual lecture in order to ensure their proactive learning. The responsibility of creating their own reverse logistics and return management schemes through a step by step guidance, before presenting it in group and discuss it with the other groups of students, should improve trainers focus, interest and involvement. Furthermore, the OER unit connects the WebQuest and MCQ with notions presented during the lecture that comes in between the two exercises to encourage further involvement and a dynamic lecture. The OER helps students search, recall, relate or apply prior knowledge, skills, experience by identifying and analysing problems, develop solutions and present the results.

As sustainability is strictly connected to the economic figures of an entity, students may also use their knowledge of previous courses. Indeed, the OER Unit provides a sound structure for knowledge and skills development. The different tasks lead to different but complementary skills: searching for information, information analysis and interpretation (WebQuest), presenting of the results and defining possible solutions (Group presentation). The OER Unit provides opportunities for task analysis and solving hands-on, real-world problems, making the link between ESD and VT, that is to say between Sustainability and tasks or problems occurring to a Freight Forwarding Clerk on a day to day basis. Besides, following suggestions formulated by VET-Teachers, we decided to sporadically use English language supports in the French OER Unit (schemes and videos) in order to push students to mobilize and improve their own language skills.

# Section 2: Didactical and methodological support

**2.1 Table**

This document is part of the didactical and methodical support for using the GreenSkills4VET Transport and Logistics Learning Unit *Feasibility of the implementation of a sustainable Reverse Logistics*. It contains time-specific sequences and needed materials for teachers and trainers who aim at featuring sustainability-related content in class and use material in a Blended Learning-manner, since it includes a WebQuest. If you’re asking yourself “What do I need to know – and to practically do – in order to prepare and use the featured Sustainablity-Learning-Unit in the form of OER in class?”, you can find practical information in the bullet point list and the lesson plan at hand.

In case you are interested in what to know and how to use Open Educational Resources (OER) in general, you might want to look up the GreenSkills4VET **OER-Manual**, which is part of the **LearnBox**, too.

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| --- |
| **Top Priorities before getting started:**Basic conditions and needed material - **The most important recommendations for working with this unit.** |
| * The target group of this Learning Unit is transport and logistics services-trainees (and more specifically freight-forwarding clerks). The concept of this unit involves sequences of reflexion about the opportunity to implement and/or improve, in terms of costs and environmental impact, a reverse logistic in their future company (it is not just a theoretical unit).
* If you want to use the complete Learning-Unit *Feasibility of the implementation of a sustainable Reverse Logistics* with all its components and without any adjustments, you’ll need **2 sessions of 60 minutes and 2 sessions of 90 minutes for a total of 5 hours**: 2 sessions to work in small groups on the WebQuest and explore the topic with real-life examples, 1 session to present and debate the results of the WebQuest and 1 last session in class to present and explain the theoretical and practical principles of the reverse logistics and its close links with sutainability. The two group sessions can be done outside (home, library) but we recommend that these sessions take place in the classroom too, in order to promote further interactions and debates within and between groups, with the help of the teacher.
* The 1st and 2nd sessions are group work. It starts with the WebQuest. Reunited in small groups (3 to 5 students), students have to define what is a Reverse Logistics and to elaborate an efficient return management model (in terms of cost and sustainability) while identifying specific constraints with regard to the type of company and sold goods. The small groups prepare a PowerPoint (or similar presentation software) presentation with their findings during this 2nd session – deciding what matters most based on their WebQuest.
* During the 3rd session the small groups present their results / findings to their peers and discuss it in class before the teacher gives a lecture to the students who have prepared practical and theoretical questions since they have already explored the topic during their WebQuest. Feel free to download the course material (available in English - European general framework - and French - National specific framework -) on GreenSkills4VET.eu.
* During the 4th session, the teachers give a lecture based on the Document 2 (Lecture Material). We recommend to enhance the input by testing the students’ knowledge with the MCQ based on the course material we prepared (Document n°3) at the end of the lecture.
* A short introduction in terms of „What a WebQuest is seems highly recommendable. But beware: There are a lot of WebQuests not properly designed out there. You should give good practices as references.
* You need an internet access and internet-capable devices for each group of students t, e.g. computer, smartphones when authorized. In the 1st and 2nd session, your students will need a computer with PowerPoint, Keynote or similar presentation software, paper and pens for each group (recommended: 3-5 members per team).
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Session 1: **Feasibility of the implementation of a sustainable Reverse Logistics / WebQuest (Duration: 3h30 [2 x 60 minutes + 90 minutes])**

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| --- | --- | --- | --- |
| **Phases (Content, Topic, Activities)** | **Methods**  | **Material** | **Duration** |
| **Introduction****What is a WebQuest?****Short definition of the principles of a WebQuest**  | **Students have to work on the WebQuest at least one week prior to the lecture**A WebQuest……is an inquiry-oriented activity in whichmost or all of the information used by students is gathered from the web.…is designed to use students’ time efficiently: students have to focus on using information rather than looking for it.…requires students to go beyond simple fact finding: Itasks them to analyse a variety of resources and use their creativity andcritical-thinking skills to solve a problem. …helps students analyse,synthesize, and evaluate information. | Document n°1: WebQuestPen and paper / Computer  | 60 minutes including5 minutesTo introduce the principles of a WebQuest (if necessary) |
| **Phase 1: the quest****A WebQuest to proactively explore the input****The WebQuest includes:** * **A presentation of a real-life professional situation**
* **A list of online links from professional documentation (pdf versions of printed articles and short videos)**
 | Reading and working in (ideally) up to 4 small groups of 3-5 trainees, following the instructions along the tasks that make up the Webquest, if needed by allocating to each member of the group a type of constraint and its impact on reverse logistics (such as financial, human resources, material, environmental and regulatory ones)Please note: The WebQuest and the creation / production of the group presentation have to be processed simultaneously by the group members. It’s also important to explicitly highlight the environmental stakes as one of the most important issue despite the fact that the professional literature doesn’t mention it systematically. Common reflection within each group (“What is reverse logistics and what do we learn from concrete return management processes in order to reach cost efficiency and limit its environmental impact”) | Document n°1: WebQuestInternet access and internet capable devices for each group of students (such as computers, smartphones if authorised)  |
| **Phase 2: completion of the WebQuest and preparation of the presentation****The students have to:*** **Elaborate a costly and environmentally efficient Reverse Logistics model in a Europe-based company**
* **Map this process, present it to their fellow students in class and, based on your online research and exchanges within your group, discuss with the other groups further possibilities to improve reverse logistics processes in terms of costs and sustainability”.**
 | Create a presentation with your groups findings (“What matters most from your perspective?”). Students can partly work on the project at home in order to prepare it. Learners have to analyse professional documentation, articles and videos available online, starting from the two main sources mentioned in the document, a complementary list of suggested sources, and possibly of other Internet sources chosen freely. They will be able to work in small groups (3-5), if needed by allocating to each member of the group a type of constraint (such as financial, human resources[[8]](#footnote-8), material[[9]](#footnote-9), environmental and regulatory ones).  | Document n°1: WebQuestInternet access and internet capable devices for each group of students (such as computers, smartphones = bring your own device)PowerPoint, Keynote or similar presentation software. | 60 minutes |
| **Phase 3: presentation of the WebQuest results and debate between the groups of students****The students have to produce a 15 minutes’ presentation using a presentation software (PowerPoint, Keynote, etc.)****Then, the different groups will have to present the results of their WebQuests and engage in debate with fellow students** | Through an analysis of these various sources available online, the oral restitution (between 10 to 15 minutes, up to 10 slides) presents the steps of the goods going backward through the reverse logistics process. Students have to explain their choices before taking part to a debate with the other groups. The debate can take the form of a general 20 to 30 minutes’ debate at the end of the groups presentations or the form of short (up to 8 minutes) discussions with the other groups at the end of each presentation. Specific attention will be paid to the clarity and relevance of the model produced and presented collectively and to the following discussion between the groups in class.  | Document n°1: WebQuestComputer, projector or widescreen, presentation software, usb keys | 90 minutes including: Presentation: 60 minutes(4 groups of 3 to 5 students)Debate: 30 minutes |

Session 2: **Feasibility of the implementation of a sustainable Reverse Logistics / Lecture and MCQ** (Duration: 90 minutes)

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| --- | --- | --- | --- |
| Phases (Content, Topic, Activities) | Methods  | Material | Duration |
| **Lecture (document n°2)****Introduction** **Feasibility of the implementation of a sustainable Reverse Logistics****1-Characteristics of a Green Supply Chain****2-Definition of a Reverse Logistics****3-Types of Returns****4-Management of Returns: Specific Constraints****5-Environmental Legislations and Regulations Applicable** | The document n°2 (Course material) provides the essential background giving the students the basics of the implementation of a sustainable reverse logistics. Information about topic (logistics, green logistics and reverse logistics) and method (Lecture) Theoretical and practical input (The teacher can go back and forth between the course material and the students’ findings from the WebQuest. | Document n°2: Course Material | 60 minutes |
| **MCQ (document n°3)** | Multiple Choice Questionnaire testing students’ knowledge of Reverse Logistics. The MCQ is based on the course material (document n°2) contentTime: 30 minutes.  | Document n°3: MCQStudents can refer to the Document n°2 “Course Material” on Reverse Logistics and to the links included in the Documents n°1 and n°2 of the Online Educational Resource. | 30 minutes |

**2.2 Lessons learned**

**2.2.1 Lessons learned producing the OER-Unit**

The OER unit is called “Feasibility of the Implementation of a Sustainable Reverse Logistics”. It aims to develop technical competences and soft skills regarding the implementation of a reverse logistics by forwarding clerks in European Companies.

Reverse logistics is a key process in order to develop a circular economy and waste treatment in agreement with European Legislations.

The reverse logistic is the overall operations for the organization of the reverse flow of the products: from the client to the producer. Reverse logistics deals with: the return of unsold merchandise, the return of defective products or from operating errors, the recovery of obsolete equipment or machinery and the recovery of hazardous waste or environmentally risky materials. It can bring to the reuse of logistics packages (wooden pallets, carton, bottle, containers); to the recycling, reuse or reassembly of products or components; to the elimination of end life products or waste treatment (sewage, waste oil, etc.).

The Extended Producer Responsibility (EPR) consists in an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle. This policy approach has been reflected in European legislations. European companies (producers and distributors/sellers) have to offer to the customers a service of reverse logistics for a defined list of products (for example the waste electrical and electronic equipment).

In order to decide what to do with its returned goods, a company has to think about the whole logistics and return logistics process. Upstream, avoidance, that is to say finding ways to minimize the number of items that are returned is essential to reduce the reverse logistics costs. Downstream, gatekeeping, i.e. screening returned goods to prevent incorrect acceptance of goods is another major task to prevent extra costs. Thus, products are returned to companies or third-party handlers for a variety of reasons – mainly Recover, Remarket, Recycle, Reuse, depending the industry, the products and their return conditions.

The chosen topic (reverse logistics-RL) is very few mentioned within the national curricula in the European Countries analysed (France, Germany, Austria). However it is an important theme for the further developments of the logistics processes, with the rise of e-commerce activities for example.

It appeared thus essential to increase awareness among forwarding clerks, and to integrate RL within VET in Logistics, EQF Level 4/5. In France there is a real need and interest from trainers in Logistic’s VET, from the French Ministry of Education and from professional branches to develop and use training material on RL. The French curricula mention sustainable development as an important competence to acquire for the forwarding clerks, but without detailing the way to teach it, and the concrete topics to learn.

This OER proposes open and free access learning material that can be used by all trainers in Logistics, by the French Ministry of Education and by professional branches.

It is compounded by:

* A WebQuest
* A lesson
* An evaluation of the learning outcomes by Multiple Choice Questionnaire

This learning material is mainly intended for trainers. It is a good basis for a course on Reverse Logistics, but must be adapted to the public. Each trainer can use it depending on its pedagogical way of doing, and depending on the local and national public of learners.

It has been chosen to propose a WebQuest (document n°1), unlike a “case study”, as is traditionally the case in logistical teaching. A WebQuest, indeed, is a good way for learners to search the information by themselves and to be really “active” during their learning. The web contents a lot of information on Reverse Logistics: we thus indicated some links to help learners to classify and order their search.

To put in practice a WebQuest in class, trainers will need a wifi-connection. An addblocker-application on each device is also useful.

Trainers are invited to invent their own WebQuest, adapted to national context following this generic example. The resources are Open Educational Resources: trainers are very welcomed to adapt it and even publish their new version. Nonetheless, it is important in so doing to stick the conditions of the Creative Commons licence used (CC BY SA).

The lesson (document n°2) presents the general organisation of Reverse Logistics in companies and the Legislation concerned at European Level. It can be easily used unaltered in national contexts, as the definition of Reverse Logistics and technical and soft skills needed to put it into practice are equivalent in different European Countries.

It will be only necessary to find national legislation for Extended Producer Responsibility.

The Multiple Choice Questionnaire (document n°3) is mainly linked to the lesson (document n°2), it can also be used with almost no need to adapt it.

**2.2.2 Lessons learned from testing/evaluating**

The testing and evaluation phase helped to draw attention on distinct focus of attention. The evaluation have been conducted with Chief Education Inspectors from the French Ministry of Education; with a specialist of sustainable development education for VET in logistics (professional branches); with a trainer in VET in Logistics; with a researcher in educational studies; and with some members of the Greenskills4VET project.

*Pedagogical preconditions and level of the OER*

The OER produced is adapted to EQF level 5. It can be used for training from EQF level 6 and 7. On the level bellow (for example EQF level 4), it will require an adaptation and simplification from the trainers.

*Why a WebQuest?*

In the first version of the OER, the lesson was presented to the trainees before the WebQuest.

Most of the evaluators (professional branches, French Ministry of Education, etc.) suggested to use the WebQuest as a discovery activity for the learners.

As suggested by Leonidas Gomatos[[10]](#footnote-10), the real life situation (which is described in the WebQuest document) comes first. In the WebQuest, students are provided with sources (additional material) to study this real life situation: this can attract their interest and help them mobilize their knowledge and their personal resources. The detailed information (lesson material) is proposed afterwards so that they can complete what they have previously constructed *via* the WebQuest activity. This series of events gives to the learning activity a PBL (Problem Based Learning) character: students are faced with a real life problem which puts them in a situation to investigate, to search for relevant information to interact and to construct knowledge.

*Use of English language in national European contexts*

Some links to videos in English have been added: they can be used in national context without translation, in order to develop English Language skills for the forwarding clerks.

*Possibilities of further development of the OER*

This OER does not develop financial aspects of the Reverse Logistics and calculus of cost and benefice. This aspect is important and should be developed in further development of this OER.

*Uses of the OER: beyond logistics and transports*

This OER on Reverse Logistics can also be used in vocational education and training in Economy and Management Science EQF Level 5 in the context of Education for Sustainable Development.

*For a dematerialised format*

It is preferable not to use printed copies of this OER but dematerialised format.

1. Management of competences, etc. [↑](#footnote-ref-1)
2. Management of flows, management of time, etc. [↑](#footnote-ref-2)
3. Hawks K. (2006), "What is Reverse Logistics?", Reverse Logistics Magazine, Winter/Spring, <http://www.rlmagazine.com/edition01p12.php> accessed May 2018. [↑](#footnote-ref-3)
4. Hawks K., Op. cit. [↑](#footnote-ref-4)
5. <https://www.iso.org/iso-14001-environmental-management.html> accessed May 2018. [↑](#footnote-ref-5)
6. <http://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html> accessed May 2018. [↑](#footnote-ref-6)
7. Brewer C.(2007), Product Recalls : Now What ?, Reverse Logistics Magazine, May/June, <http://www.rlmagazine.com/edition06p33.php> accessed May 2018. [↑](#footnote-ref-7)
8. Management of competences, etc. [↑](#footnote-ref-8)
9. Management of flows, management of time, etc. [↑](#footnote-ref-9)
10. ASPETE, Greenskills4VET project. [↑](#footnote-ref-10)