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TRUST IN: FINAL REPORT



July 2012

European Training Partnership on Sustainable Innovation

TRUST IN is a partnership project funded by the Leonardo da Vinci programme. The PREPARE Network has acted as backbone for the partnership, which contains several institutions that are somehow related to vocational education and training (VET)

TRUST IN: Final Report

EUROPEAN TRAINING PARTNERSHIP ON SUSTAINABLE INNOVATION

INTRODUCTION

Developed countries have enjoyed many decades of growth based on intensive use of resources. But today they face the dual challenge of stimulating growth needed to provide jobs, and of ensuring that the quality of this growth leads to a sustainable future. Our economy will thereby require a fundamental transformation in energy, industry, agriculture, fisheries, transport systems, and in producer and consumer behaviour within a generation¹. Learning about sustainability (accommodation) is not enough anymore. Education for sustainability (reformation) of future generations, followed by re-designing education on sustainability principles (transformation) will be crucial for changing the habits and dematerializing the everyday life. From doing things better, we have to do better things and, finally, start seeing things differently². TRUST IN – European Training Partnership on Sustainable Innovation was formed by a large group of well recognized institutions, members of PREPARE Network. They represent different actors involved in vocational education and training (VET): universities, research centres and other organizations which through network activities and projects have for several years been engaged in education, and in translating innovative sustainability strategies and instruments/tools into training concepts and contents. Funds have been supplied by Leonardo da Vinci Programme which is a part of the European Commission's Life Long Learning Programme. Taking the climate change and ecological footprint challenges into account, partners have identified the need of a European training course on eco-efficiency as a contribution to tackle the EU goal of reducing energy consumption by 20 % below the 1990 levels by 2020, by realizing the 20 % improvement in energy efficiency and thereby reducing greenhouse gas emissions by 20 %³. The flagship initiative for a resource-efficient Europe under the Europe 2020 strategy supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth⁴. Therefore, the collaborative activities of the present project have been dedicated to developing the concept of a general course on resource-efficiency, targeting technical staff from companies and municipalities who need to strengthen and update their knowledge and skills in these very dynamic and demanding areas. The needs of trainers have also been taken into account, in order to build the necessary capacity for its successful implementation. Another very important outcome of this partnership is the design of sector or area specific training courses, with a similar target group. They are addressing sectors or areas of major concern in the context of sustainable development and innovation, in line with the EU focus on sustainability and environmental policies: building and construction, food, mobility, and energy-related products. In addition, the partnership aimed to reflect and formulate recommendations on how to successfully integrate sustainable innovation concepts and practices into the European VET system. To achieve the above mentioned objectives, the partnership has organized regular meetings, involving not only the partners but also relevant players in the VET system from different European countries. Some events were organized in conjunction with two European Roundtables on Sustainable Consumption and Production (ERSCP) and other conferences in the sustainability arena in which some partners have been involved as organizers.

¹ European Commission, A Roadmap to Resource Efficient Europe, COM (2011) 571 final, September 20, 2011.

² S. Sterling, Higher education and sustainability, Kluwer, 2004.

³ European Commission, Energy 2020 – A strategy for competitive, sustainable and secure energy, COM(2010) 639 final, November 10, 2010.

⁴ European Commission, A resource-efficient Europe – flagship initiative under the Europe 2020 strategy, COM(2011) 21, January 26, 2011.

The EU Action Plan on Sustainable Consumption and Production⁵, the EU Sustainable Development Strategy⁶, National Strategies for Sustainable Development, and the European energy-related commitments⁷ pose a major challenge to the VET systems in Europe. Up-to-date and specific know how is required, not only to respond but also to anticipate the competence needs of the labour market in extremely important topics under the umbrella of sustainable innovation such as eco-efficiency, design for sustainability, sustainable consumption, green purchasing and social responsibility, amongst others. The partners are engaged in these topics in different ways – either as universities which include sustainability-related courses or subjects in their offers, or as research and other institutions which perform training activities in the context of Research and Technology Development projects. Over the years they have observed that despite of many good examples of sustainability-related courses and subjects at universities, training centres, etc., there is still a lack of in-depth competences targeting different levels of VET training and education, and lifelong learning, especially in view of the climate change debate and sustainability related goals of Europe. Another important reason behind this proposal is the diversity in sustainability-related VET in Europe, which is a strength in the sense that different countries and their socioeconomic contexts imply different VET systems, but on the other hand a minimum leverage should be achieved to support sustainable development all over Europe. This is why the partnership presents a good geographical coverage, including new EU members and candidate countries from the South-East Europe. With this collaboration, partners intend to bring in different approaches, experiences and knowledge about the gaps of available VET programmes, and market needs on the European level which will allow addressing different needs in partner countries, too. Partners' previous collaboration in other initiatives such as EU projects and joint organization of conferences and workshops, paved the ground for a successful cooperation within the present partnership. Furthermore, many of them are members of PREPARE (Preventive Environmental Protection Approaches in Europe), a network of experts in the field of sustainable consumption and production successfully working together for over 20 years, and in a formal collaboration with UNIDO (United Nations Industrial Development Organization) in the area of cleaner production.

The objectives of this partnership were to:

- Exchange experiences and formulate recommendations to VET in the field of sustainable innovation, addressing the needs and realities of a wide variety of European countries
- Define the concept of a European training course on eco-efficiency
- Define the concept of training courses on relevant topics within sustainable innovation, addressing critical sectors or areas, to be defined by the partnership in view of its exchanges and debates

The partnership has organized six meetings, to achieve the above mentioned objectives, involving not only the partners but also relevant players in the VET system of the hosting countries. In addition, expert consultation process was used to optimize the results. Some events were organized in conjunction with relevant conferences in the sustainability arena. Two European Roundtables on Sustainable Consumption and Production (ERSCP) were particularly relevant for this project:

- The ERSCP 2010 in Delft, a joint initiative on Environmental Management for Sustainable Universities (EMSU) – its topic was “Knowledge Collaboration and Learning for Sustainable Innovation”
- The ERSCP 2012 in Bregenz with the motto “SCP Meets Industry”

They have brought opportunities for an active participation with different stakeholders and, therefore, attained significant results.

⁵ Commission of the European Communities, [Action Plan for Sustainable Consumption and Production and Sustainable Industrial Policy](#), COM(2008) 397 final, accessed May 27, 2012

⁶ Commission of the European Communities, [On the Review of Sustainable Development Strategy – A platform for action](#), COM(2005) 658 final, accessed May 27, 2012

⁷ European Commission, 20 20 by 2020 – Europe's climate change opportunity, COM(2008) 30 final, January 23, 2008.

TRUST IN PARTNERS

Austria – [Austrian Institute of Ecology](#) and [STENUM GmbH](#)

Belgium – [VITO](#)

Bulgaria - [SERC](#)

Czech Republic – [ENVIROS](#)

Denmark – [Aalborg University](#) and [Danish Standards](#)

Greece – [NTUA](#)

The Netherlands - [TNO](#)

Poland – [ATMOTERM](#)

Portugal - [LNEG](#)

Slovenia – [University of Maribor](#)

Spain – [PROSPEKTIKER](#)

Sweden – [TEM](#)

All information generated within the TRUST IN Partnership is available at

<http://www.prepare-net.com/project/trust>

SUMMARY OF MEETINGS

The following summaries are included in order to provide an overview of the progress and process in TRUST IN. Under each meeting is the direct link to the outputs and products of the meeting.

Meeting 1: Delft – The Netherlands

October 28 2010

The objective of the first workshop was: “Knowledge Collaboration and Learning for Sustainable Innovation: Recommendations for the European VET system”, which should provide a basis for a workshop report. Each partner was asked to give a short presentation on VET experience on sustainability issues in relation to eco-efficiency⁸. Presentations and additional material were compiled in a workshop report and draft recommendations approved at the next meeting in Lund Sweden.

Detailed meeting information:

- [2011 Delft – Agenda](#)
- [2011 Delft – Minutes](#)
- [2011 Delft – TRUST-IN Background Report](#)

Meeting 2: Lund - Sweden

April 6 2011

The meeting focused on brainstorming activities, facilitated by Stig Hirsbak, based on dialogue for further improvement of the mapping and report on the situation in each of the countries, documented in Knowledge, collaboration and learning for sustainable innovation: Recommendations for the European VET system.

Detailed meeting information:

- [2011 Lund - Agenda](#)
- [2011 Lund - Minutes](#)
- [2011 Lund – Background Report](#)
- [2011 Lund – Recommendations Report](#)

As a practical example of an area with a large need for vocational training the meeting included and a Sustainable Lighting Seminar:

- [2011 Lund - Sustainable Lighting Program & Questions](#)
- [2011 Lund - Sustainable Lighting Answers to questions](#)

Meeting 3: Bilbao - Spain

November 10 2011

⁸ The OECD (1998) has defined the term in such a way that "Ecoefficiency expresses the efficiency with which ecological resources are used to meet human needs"

The meeting held in Bilbao consisted of the discussion of key topics that training courses should address about sustainable innovation, along with the target groups that these specific training courses should consider.

With this objective, a brainstorming session and discussion among all partners was developed, through a team-dynamic methodology called metaplan. According to this methodology, the following key topics to be included were identified to be:

PROCESS AND METHODS

- Continuous Improvement Process: Plan-Do-Check-Act
- Innovation in business models: from selling products to selling services (dematerialization of economy) (Case study: Interface)
- Services Design
- Raising (building) awareness and responsibility
- Basic methods for analysis
- Best practices and telling visions for motivation
- Interpretation of environmental information
- Indicators EMS
- Life Cycle Assessment: make it as simple as possible (disposable in companies, 80:20 principle) Simple and transparent= reliable
- How to implement PDCA process
- Eco-branding

ECONOMICS

- Train on green entrepreneurship: integrating economic, environmental and social axis in the core business
- Understanding strategies (macro and micro level)
- Life cycle thinking and eco-design
- Design for sustainability (products and services)
- Where do you start and where do you end - money efficiency

ENERGY

- Fossil fuels and energy
- Saving techniques
- Technology
- ISO 50001 Energy Management
- Energy utilization of renewable resources
- Resource efficiency: recycling and waste management
- Energy efficiency: ESCO's in buildings, energy management in companies
- What shall an energy check include

BUILDING

- Materials and Building
- EPD and Environmental labels for building materials
- Green constructions

- Re-use of building construction materials
- Communication of the achievable environmental improvements of building products for green procurement
- New materials and technologies for sustainable renovation of buildings
- Develop new business models within renovation of buildings

MOBILITY

- Air and mobility

FOOD

- Promote organic food/cuisine

On the other hand, as for the target groups for whom to address the training courses, the following were identified:

PEOPLE

- Consumers/Citizens (awareness, attitude) (Potential customer e.g. house owners, facility managers). Make them aware that “less is better”
- Professionals
- Post graduates
- MBA students
- Jobless
- Sectorial experts value chain (covering all parts of the value chain)
- Story tellers and journalists
- Demonstrators and NGOs
- Final sellers

COMPANIES

- SME's, decision makers in SMEs, entrepreneurs, local companies in energy renovation, designers, product developers in industry (Target group for the TRUST IN project)
- Manufacturing/services/public organizations
- Group of companies (Cross corporate, thematic, professional)
- Companies with ISO 14001 certificate
- Companies with great consumption and waste management companies

BUILDING SECTOR

- Building and construction craftsmen
- Architects/project planners
- Building promoters
- Civil engineers

STAFF

- Management level staff

- Energy and Building can be offered to both academic and technical staff (high demand which will continue to exist in the future)
- Food does not present/show high demand
- Mobility refers mainly to academic staff
- Environmental staff
- Design and development staff
- Marketing staff of building materials

PUBLIC AUTHORITIES

- Policy makers
- Local authorities (government and local)

EDUCATION

- Training organizations
- Teachers at primary schools
- Teachers at technical schools (VET institutions and apprentices)

Detailed meeting information:

- [2011 Bilbao - Agenda](#)

Meeting 4: Bregenz - Austria

December 12-13 2011

This meeting aimed

1. a) to the preparation of the 15th European Roundtable on Sustainable Consumption and Production in May 2012 and;
2. to get practical information about corporate VET.

The main emphasis was placed on a broad discussion with corporate representatives from various industries about sustainable innovation and education/training in this field. This included visits in three companies and in-depth discussion with apprentices and instructors.

Detailed meeting information:

- [2011 Bregenz – Agenda](#)
- [2011 Bregenz - Minutes](#)

Meeting 5: Prague – Czech Republic

January 26-27 2012

The Prague meeting focused on tasks in working groups for specific sectors: buildings, mobility, food and energy-related products. A general outline of the eco-efficiency course was presented and discussed first. The worksheets were designed for collection of information on VET courses at the following levels: general,

building, mobility, food and energy. Examples of eco-efficiency related courses were presented and a follow up review of existing courses and materials was agreed. There was developed an outline of the TRUST IN workshop to be implemented within ERSCP in Bregenz.

Detailed meeting information:

- [2012 Prague - Agenda](#)
- [2012 Overview Of Existing Training Products In The Field Of Sustainable Innovation](#)
- [2012 Identification Of Existing Training Products In The Field Of Sustainable Innovation - General](#)
- [2012 Identification Of Existing Training Products In The Field Of Sustainable Innovation - Building and Construction](#)
- [2012 Identification Of Existing Training Products In The Field Of Sustainable Innovation - Energy-related Products](#)
- [2012 Identification Of Existing Training Products In The Field Of Sustainable Innovation - Food](#)
- [2012 Identification Of Existing Training Products In The Field Of Sustainable Innovation - Mobility](#)

Meeting 6: Bregenz - Austria

May 3-4 2012

The TRUST IN meeting and workshop took place in conjunction with ERSCP (European Roundtable on Sustainable Consumption and Production) conference.

The main purpose of the TRUST IN events in Bregenz was the overview and presentations of the current situation of four critical sectors of the Eco-Efficiency Course for Vocational Education and Training (VET): building and construction, food, mobility and energy related products. Based on these analyses, and in accordance with the European guidelines on resource efficiency, partners have formed the framework structure of VET course on eco-efficiency for the four above mentioned sectors that will fill the gap between current teaching materials in VET system and the actual needs of the labour market and society. Practical modules and recommendations for textbooks, guides and manuals were formulated and presented by University of Maribor.

The other important aim was presentation and dissemination of the project to the broader public (poster presentation), and discussion especially with the participants from industry and other relevant VET players who attended the TRUST IN workshop.

The principle advantage of the ERSCP form of dialogue

Vocational training is especially difficult in situations of transformative change. As an explicit example, TRUST IN has been studying vocational training for lighting, which is a sector influenced by a strong wave of change. In the Lund meeting and in the ERSCP workshop *Lighting for sustainable business development* it has been found that there is a great advantage with multidisciplinary dialogue.

The project assessment shows that the ERSCP framing was a very good setting for the multi-disciplinary action oriented dialogue that is needed, as a basis for effective Vocational training. One reason is that ERSCP attracted both international experts and also local companies and that the workshop included demonstrations of real lighting equipment, by a local actor with practical knowledge.

Detailed meeting information:

1. [2012 Bregenz - Minutes](#)

2. [Mobility: Arnold Tukker](#)
3. [Food: Gregor Waltersdorfer](#)
4. [Energy related products: Kim Christiansen](#)
5. [Practical modules and recommendations for textbooks, guides and manuals: Peter Glavič](#)
6. [Published paper \(European Training Course on Eco-Efficiency\)](#)

Meeting 7 Copenhagen

June 7-8 2012

The objectives of the meeting were to wrap up, make conclusions, to make a dissemination plan for the results achieved and to make recommendations for further work.

Wrap up was made on basis of draft set up of final report. Recommendations were developed - see below - and the content of the sector approaches was further developed concerning buildings, transport/mobility, food and energy related products.

Detailed meeting information:

- [2012 Copenhagen – Agenda](#)
- [2012 Copenhagen - Minutes](#)

RECOMMENDATIONS

During the two years of the TRUST-IN partnership, recommendations were elaborated by partners in three different occasions:

- Following the first TRUST-IN workshop, held in the framework of the “European Roundtable on Sustainable Consumption and Production – Knowledge Collaboration and Learning for Sustainable Innovation” in Delft, the Netherlands, the 28th October 2010 (see [TRUST-IN Background Report, 2011](#)). Together with national reviews of the European VET system in the partner countries, recommendations were elaborated on a country basis.
- Building on the previous work, a list of key areas that were identified and deemed important in regard to training for sustainable innovation was elaborated during the partnership meeting held in Lund, Sweden, on the 6th April 2011 (see [TRUST-IN Recommendations Report, 2011](#)).
- A debate that took place during the final TRUST-IN meeting in Copenhagen, Denmark (7th June 2012), following the identification of training offers on eco-efficiency in specific need areas (buildings, mobility, food and energy appliances) in the partner countries and the drafting of a training course (see [the minutes of the Copenhagen meeting](#)).

This chapter summarizes and systemizes the recommendations for VET in Europe in the field of sustainable innovation and, more specifically, eco-efficiency.

Recommendations Concerning the Organization of the VET System in Europe

- The main challenge is to create a clearer stakeholder community with joint responsibility. In this field a better dialogue is needed between the institutions offering the training and institutions like sectorial organizations, trade organizations, local governments, etc.
- National programmes and incentives for the enterprises. Employees have to be developed, recognizing better performance.
- Dissemination of current resource efficiency knowledge, best practices and technologies will further stimulate the development and use of VET programmes.
- The problem with the lack of financial resources to provide trainings for the staff and improve their qualification can be overcome by national training programmes in the field of environmental protection and resource efficiency. Further enterprises could be stimulated with tax reductions and national regulations for a minimum level of training to the personnel.
- Establishing train the trainers programmes. There is a deficiency of qualified experts in training eco-efficiency, corporate social responsibility and other related issues.
- Better accreditation of knowledge, skills and abilities.
- Courses should be aligned with employment policies in the countries
- Connection of initial and continuous vocation training in order to consolidate a complete and able management system.
- Better management and assessment of the national vocational training system with the participation of social entities and institutions.
- Quality assurance: The quality assurance is a process which helps to guarantee a standard and continuous improvement of quality. It could be achieved by using or cooperating with existing sources or projects (e.g. with the project European Quality Assurance in VET). The focus of the quality assurance should be the training structure and could include also „trainer“/teacher verification and possible trainings of „trainers“/teacher.

Recommendations Concerning Didactics and Training Means

- The learner should be in the centre of the interest. To optimise the efficiency of VET, the role of teachers and trainers should be redesigned from “teaching” towards “organising learning processes”.
- VET for eco-efficiency not only needs a theoretical training approach; more attention should be given to gaining of practical experiences in order to learn how to translate theory in practice.
- To promote the active action learning model, where learning periods (in-classroom or through distant learning) are combined with practical application of know how
- Prepare a plan for didactics (textbooks, laboratory exercises, problem solving, case studies, excursions, etc.).
- Increase of “smart” learning tools, which can be steered by an intelligent application of ICT in existing training programmes (including raise of E-learning and E-tools).

Recommendations Concerning Contents

- The sustainability priorities for the future and the ability and priority to promote sustainability oriented innovation should be included in the process.
- Sustainable building and construction represents an enormous challenge and clearly calls for a holistic, integrated and multidisciplinary approach.
- Establishing favourable conditions for increasing the awareness, interest and of general understanding among managers and employees about the needs from vocational education and training. Communication and dialogue about the importance and benefits of Cleaner Production (CP) and Corporate Social Responsibility (CSR), and the need of training on environmental issues and resource efficiency have to be improved by providing relevant information and better involvement of all interested stakeholders: national and local authorities, professional unions and sector associations, NGOs and training institutions, business and SMEs
- Attracting attention of big enterprises and especially SMEs and assisting them in establishing an appropriate system of creating, controlling and analysing the environmental indicators and joining training programmes for sustainable enterprise development, including the issues of CP and CSR.
- Developing sector specific training programmes for the most energy intensive industries and sectors: construction, transport, chemical industry, tourism and supply chains, etc. These tailor-made programmes have to be developed with the involvement of sector organizations and thus will attract the interest of the enterprises as they will cover their needs and problems.
- In addition to horizontal training programmes, focus on strategic areas such as sustainable construction, sustainable tourism, renewable energies, sustainable mobility and sea activities.

Recommendations Regarding the Eco-efficiency Courses

- During the review of the available eco-efficiency courses, it was observed that there is no lack of technology, but lack of training offers and practical dialogue, to bring the knowledge to the applicants. The challenge is to close the gap.
- There should be a special emphasis on apprentices within crafts. There is the biggest lack of specific courses on eco-efficiency, especially on the young ones from 14-20 years.
- In order to motivate teachers and trainers:
 - There should be financial incentives to use the courses;
 - There should be presentation-packages (e.g. eco-efficiency course materials).
- Special materials for vulnerable groups (people with special needs) should be developed.

- Social media should be included in web-based approaches. This will ensure a dialogue between students.
- Pedagogical approach is very important - practical experiments are recommended, i.e. learning by doing.
- A lot of single aspects of eco-efficiency (e.g. waste) are included in general courses or very specific courses. There is the need to develop more holistic approaches.
- In terms of target groups, the recommendation is to enhance competence at downstream university (post-secondary - technical school teachers).
- Use the Bregenz-framing (as a meeting-point for dialogue between experts and 'normal' people).
 - Bregenz provided several workshops and networking-opportunities
 - Make it a local dialogue - bring it down from the academic level. The meeting between the practical application and WHY we should have good lighting (or similar examples).

POSSIBLE FUNDING FOR TRUST IN-COVERED THEMES

Brussels, 25.10.2011 COM(2011) 681 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

A RENEWED EU STRATEGY 2011-14 FOR CORPORATE SOCIAL RESPONSIBILITY

CHAPTER 4.6. FURTHER INTEGRATING CSR INTO EDUCATION, TRAINING AND SEARCH. (COM(2011) 681, 4.6 p. 12

4.6. FURTHER INTEGRATING CSR INTO EDUCATION, TRAINING AND RESEARCH

THE FURTHER DEVELOPMENT OF CSR REQUIRES NEW SKILLS AS WELL AS CHANGES IN VALUES AND BEHAVIOUR. MEMBER STATES CAN PLAY AN IMPORTANT ROLE BY ENCOURAGING EDUCATION ESTABLISHMENTS TO INTEGRATE CSR, SUSTAINABLE DEVELOPMENT AND RESPONSIBLE CITIZENSHIP INTO RELEVANT EDUCATION CURRICULA, INCLUDING AT SECONDARY SCHOOL AND UNIVERSITY LEVEL. EUROPEAN BUSINESS SCHOOLS ARE ENCOURAGED TO SIGN THE UN PRINCIPLES FOR RESPONSIBLE MANAGEMENT EDUCATION.

HIGH QUALITY ACADEMIC RESEARCH SUPPORTS THE DEVELOPMENT OF BUSINESS PRACTICE AND PUBLIC POLICY IN THE FIELD OF CSR. FURTHER RESEARCH SHOULD BUILD ON THE RESULTS OF PROJECTS FINANCED UNDER THE 6TH AND 7TH EU FRAMEWORK PROGRAMMES. THE COMMISSION WILL EXPLORE OPPORTUNITIES FOR FINANCING FURTHER RESEARCH AND INNOVATION ON CSR, AND SUPPORTING CSR PRINCIPLES AND GUIDELINES IN RESEARCH FUNDED STILL UNDER THE 7TH FRAMEWORK PROGRAMME, AS WELL AS UNDER ITS SUCCESSOR, HORIZON 2020, AND IN BUILDING THE EUROPEAN RESEARCH AREA.

THE COMMISSION INTENDS TO:

8. PROVIDE FURTHER FINANCIAL SUPPORT FOR EDUCATION AND TRAINING PROJECTS ON CSR UNDER THE EU LIFELONG LEARNING AND YOUTH IN ACTION PROGRAMMES, AND LAUNCH AN ACTION IN 2012 TO RAISE THE AWARENESS OF EDUCATION PROFESSIONALS AND ENTERPRISES ON THE IMPORTANCE OF COOPERATION ON CSR.

IDENTIFICATION OF COURSE-RELEVANT ECO-EFFICIENCY ISSUES IN SPECIFIC SECTORS

This section presents an initial overview of the four selected sectors that the TRUST IN partnership has dealt with. The contents are made in note-form with the purpose of providing a preliminary understanding of needs and relevant focus areas regarding eco-efficiency.

Sector: Energy-related Products

1. Introduction

Context of the "problem" - to reduce impacts of climate change and other energy-use related environmental impacts, energy consumption especially based on fossil energy resources needs to be reduced both in total and per product unit.

Focusing on regulation – all relevant personal need to know both in producing and using enterprises. Regulation at EU and national level defines the minimum performance requirements for manufacturing, purchasing and using energy-related products.

Regulation at EU-level is automatically implemented at the Member State level as regulations, not directives, are used. Relations to the use of standards both in the regulatory framework and in the implementation of the provisions can also be touched depending on the specific target group of the training.

2. Motivation

Reducing energy consumption of products in design, manufacturing and use will be mandatory requirements for many products groups and therefore relevant to many producers and users of these products.

3. EU Directives and Other Documents

http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/methodology/index_en.htm

<http://ec.europa.eu/enterprise/ecodesign>

4. ISO, CEN and Other Standards

[General intro to EE \(Electronic and electrical products\) and international standardization in the International Electrotechnical Committee \(IEC\)](#)

IEC has a [dedicated group on environmental standardization](#) related to EE

IEC has developed a [guide on consideration and evaluation on material efficiency of electrical and electronic products in environmentally conscious design](#), which can be purchased at the National Standardization Bodies. As well as other standards

On the European level, standardization is organized by [CENELEC](#)

An Ecodesign Coordination Group was established in February 2012.

5. History of the Eco-efficiency Concept

In the draft directive work on EEE - electronic and electrical equipment - several issues were in focus e.g. energy consumption, recyclability, and environment, but in the final directive on EnergyUsingProducts (2005/32/EF) on energy consumption in the use stage was kept. This was based on studies of different EE product groups using a simplified LCA methodology. With the extension of the regulation to energy-related products both the methodology and the relevant

issues are revised and broadened. Also regulation of the content of hazardous substances (RoHS) and on waste management (WEEE) could be mentioned as approaches to reduce the environmental impacts per unit of service i.e. eco-efficiency.

6. Energy: Renewables and Efficiency	See above.
7. Water Efficiency	Not in focus.
8. Material Efficiency	Partly in focus - primarily weight; see above.
9. Methods	<p>As a comprehensive proposal for a course structure the following headings have been developed. Materials etc. from the other sector areas as well as from the generic material should be included in the development.</p> <ol style="list-style-type: none"> 1. Legislation Issues (incentives, rules, standards...) 2. Current Situation (national and international energy production and consumption issues) 3. Technological Issues <ol style="list-style-type: none"> a. Production of energy (types, resources, renewable energy...) b. Reduction of energy needs (product and process analysis and re-design, consumption...) 4. System analysis tools and methodologies (LCA, LCC; CBA, Inventory analysis methods, economic and ecological issues...) 5. Social Issues <ol style="list-style-type: none"> a. Awareness and behavioural issues (information, energy labels...) b. CSR issues (Builder/owner vs. End-user dilemma, trust...added value)
10. Management	See above.
11. Sustainable Consumption	See above.
12. Organisations	Industrial sector organizations, National Standardization Bodies, national ministries and agencies etc. can be good centres of knowledge. The EU homepage on eco-design can be used to find national contact points.
13. Laboratory	See above.
14. Problem-Solving	No specific examples have been found.
15. Field Work	Visiting recycling stations for WEEE and field testing disassembly with proper introduction and protective equipment.
16. Textbooks	See homepages for updated info. Textbooks can be found, but information is not always updated. No textbooks having VET as target group have been found.
17. Teach the Students	No specific examples have been found.

18. Teach the Teachers No specific examples have been found.

19. Guides and Manuals See the above websites.

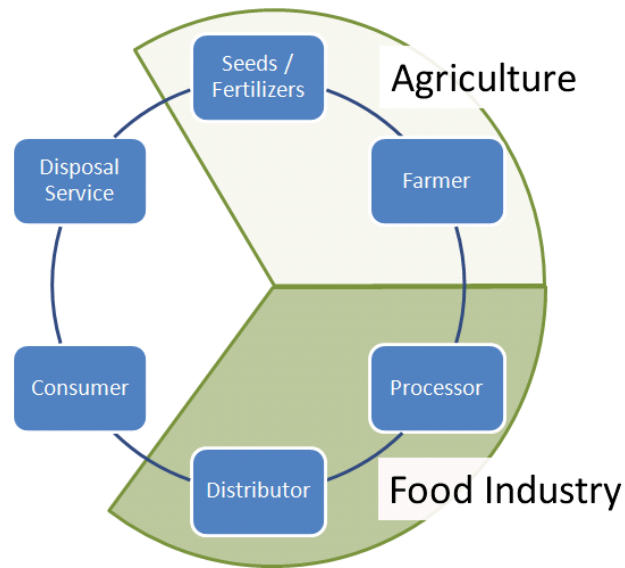
20. PowerPoints and Videos See the above websites.

21. Quizzes No specific examples have been found.

Sector: Food

1. Introduction

Foremost a definition of the food sector is performed to narrow down the area of interest. The following figure illustrates the different steps of the value chain and names the industries behind.



Agriculture includes the actors seed and fertilizer providers, plant breeders and farmer of arable crops, meat and fish.

The food industry mainly consists of processors, manufacturers and distributors and is the 3rd largest industry in the EU. Their products are drinks as wine, beer and beverages; oil, dairy products, meat products. Already 70 % of all agricultural goods in the EU are processed by this industry. The processing also includes packaging and - if applicable - deep freezing.

An own part is the consumption which includes the gastronomy with all its restaurants as service providers. The consumers are only followed by the last industry, which is the waste management.

As the food sector is a very broad area, it is up to the trainer and the needs of the trainees what breadth to take. If there will be separated courses for agriculture and the food industry it is important to keep an interdisciplinary approach. That is why it is proposed to organise at least an exchange session where trainees can get a more holistic view.

Since eco-efficiency is all about resources it also has to be defined which are used in which step.

Agriculture affects the following resources:

- Energy
- Water
- Materials

- Air
- Soil (underground)
- Land (surface)

Food Industry:

- Energy
- Water
- Materials
- Air
- And indirectly soil and land due to food waste

In the last decades the following trends have been monitored for consumers in the food sector:

- Year round availability of goods
- Global supply and globalization of different cuisine
- Little time for eating
- Healthy nutrition, high quality and variety as symbol for welfare
- Starting come-back of organic farming

To give the course the right framing and explain why it matters, the challenges of the food sector have to be highlighted:

- World hunger: 1/7 of the world population starved in 2009, 2/7 were too fat, and there is no equilibrium to that in sight, but it can only be alleviated locally.
- Energy intensity: The energy intensity of the food sector is only 1/5 of the most intense industry sector (metal industry), but on basis of the total consumption the factor is already 1/2.
- Energy usage: With regards to the rising energy demand, peak oil and climate change action is overdue.
- Water consumption: meat 15.000 L/kg, wheat 1 dL/kg, only. For comparison: middle class car needs 60.000 L of water over the life cycle.
- Demand for growth of resource use until 2030:
 - Land: +180 % compared to the growth in last 20 years, which are 120 % additionally of the existing European crop land (because of rising food demand, land degradation, urbanization, energy out of biofuels)
 - Water: +140 % compared to the growth in last 20 years, whereby agriculture will cause 65 % of these extra 1.900 billion m³ of water demand.

2. Motivation

Certainly the motivation behind a VET-course on eco-efficiency for the food sector is to provide focused education and knowledge transfer for the challenges that are described above to be mastered. Moreover the transition has to be achieved within the boundaries of food security, affordable food supply and food safety. For that the trainees can act as multipliers due to the awareness

rising during the course.

3. EU Directives and Other Documents

On European level a process has been initiated to harmonise the national food legislation. For that a framework on the general food law has been developed. It has its origin in the field of food safety and consumer protection but now also covers topics like food waste and animal nutrition.

General Principles and requirements of Food Law; [Regulation \(EC\)178/2002](#)

[White Paper on Food Safety](#)

[The European Food Safety Authority](#)

[Documents and publications on food safety and health: Regular newsletter on sanitary and phytosanitary issues](#)

Animal Nutrition:

For the latest on the marketing of feed materials and compound feed, see [EC Regulation 767/2009](#)

For the new rules on the authorisation, supervision and labelling of feed additives, see [EC Regulation 1831/2003](#)

The Commission and the Member States discuss animal nutrition issues in the [Standing Committee on the Food Chain and Animal Health - Animal Nutrition](#).

[The Committee's agendas and reports](#)

[Organic farming - EU Policy](#)

[Genetically Modified Food and Feed](#)

Chemical Safety of Food; [Modus Operandi](#)

Biological Safety of Food:

- [Animal By Product](#) not intended for human consumption
- [Animal health and animal welfare](#)

Official Controls; [COM/2009/334/Final](#)

Food waste; [10 tips to reduce food waste](#)

Food Additives, Enzymes and Flavourings:

- [Regulation EC 1331/2008](#) - EU authorisation for food additives, food enzymes and food flavourings.
- [Regulation EC 1332/2008](#) - food enzymes
- [Regulation EC 1333/2008](#) - food additives
- [Regulation EC 1334/2008](#) - flavourings and certain food ingredients with flavouring properties

4. ISO, CEN and Other Standards IFOAM Standard (International Federation of Organic Agriculture Movements): currently under development.

ICS 65: International Standard Catalogue on Agriculture: Farming and forestry, farm buildings, bee keeping, fishery, hunting, fertilizers, pesticides, animal feeding, machinery and equipment, tobacco, etc.

ISO 22000:2005 Food safety management systems

ICS 67.020: Processes in the food industry

5. History of the Eco-efficiency Concept

Agriculture

Organic farming was the original type of agriculture, like the three field rotation system in Europe.

After the industrial and chemical revolution reshaped agriculture, a new organic farming movement came up and adapted to the industrial scale.

Food Industry

In Food processing automation, large scale production and rising energy prices led to a more efficient use of energy. Also new food conservation techniques such as vacuum bottling and pasteurization reduced food waste and therefore the efficiency over the life cycle.

The role of big stores is very controversial. On one hand they decreased traffic from their supply side, but on the other hand they increased necessary packaging and maybe more traffic from the demand side and maybe more food waste, due to full availability of the products.

6. Energy: Renewables and Efficiency

Since energy is needed all over the value chain, knowledge transfer of best practices is welcome in every part. Examples are: transportation, drying, heating of greenhouses in winter, cooling of milk right from the farm, autoclaves and pumps for irrigation.

Moreover since all over the value chain organic waste is generated, its use to meet the energy demand is very predestined (2nd generation bioenergy). Depending on the type of the biomass several methods are available: methane fermentation, ethanol fermentation, pyrolysis, gasification, oil extraction combined with transesterification and direct combustion.

Often the biomass can be used for co- or poly- generation.

If low temperature levels are available (geothermal energy, waste energy) heat pumps can be used to rise their level and make the energy more useful.

But before achieving a low-carbon production, where solar power and wind energy can play a role too, efficiency measures have to be undertaken to minimize the energy that needs to be replaced by renewable sources. The saving potential was estimated by one of our partners as follows:

- Heating and lighting of buildings: 15 %

- Steam systems: 15 %
- Motor and pump systems: 20 %
- Process cooling and refrigeration: 20 %
- Compressed air systems: 25 %

Also, organisational measures can be taken to increase energy efficiency. Usually between the steps of the value chain transportation is needed.

To be more energy efficient short transport distances and collaborations among producers to maximise used capacity are advisable.

7. Water Efficiency

Measures regarding water efficiency can be differentiated between their field of application: agriculture and the food industry. They are especially critical for hot regions where there is a risk of over-pumping the groundwater.

Agriculture

- Sprinkling and drip irrigation
- Water preparation, treatment and purification
- High pressurized water for cleaning,

There are also innovative measures, that are advancements of traditional farming knowledge and are compatible with large scale and mechanized agriculture:

- Alley cropping or agroforestry for shading of fields and therefore less water evaporation and also less erosion takes place. These methods can also help to balance nutrients in the soil.
- Holes in the ground for rain water collection, which can also be possibly filled with biodegradable waste for manure production.

Food Industry

- Purification
- Closed cycle = reuse, recover, and recycle
- Mixing different qualities (water pinch analysis)
- High pressurized water for cleaning

8. Material Efficiency

The following materials are part of the food sector:

- Arable crops
- Animal products
- Pesticides
- Antibiotics
- Fungicides
- Growth enhancers (hormones)
- GMOs
- Plant nutrients
- Food additives (antidegradants, flavour, and about 20 other categories)

of E-numbers)

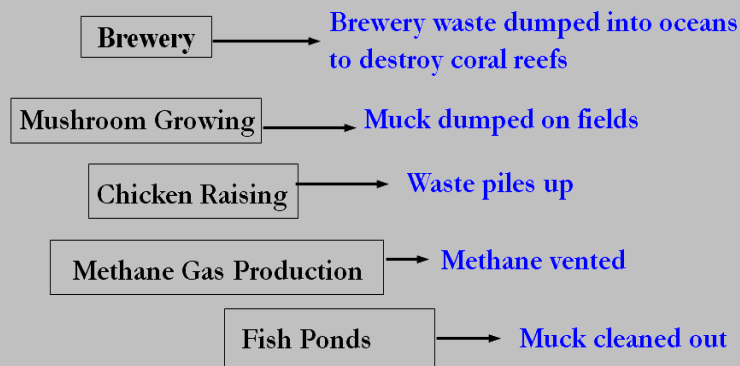
- Packaging materials.

When it comes to waste usage, a priority what method to apply first can be applied, after as much as possible was used for food production. Basically, the extraction of resources should start at the whole product, use parts from it afterwards, only, and also begin with the more complex molecules first. This is called the cascading of the material utilization. Only next there should be the energy utilization, where burning has the last priority. If the carbon-to-nitrogen ratio is still acceptable composting should be the final step to close the resource cycle.

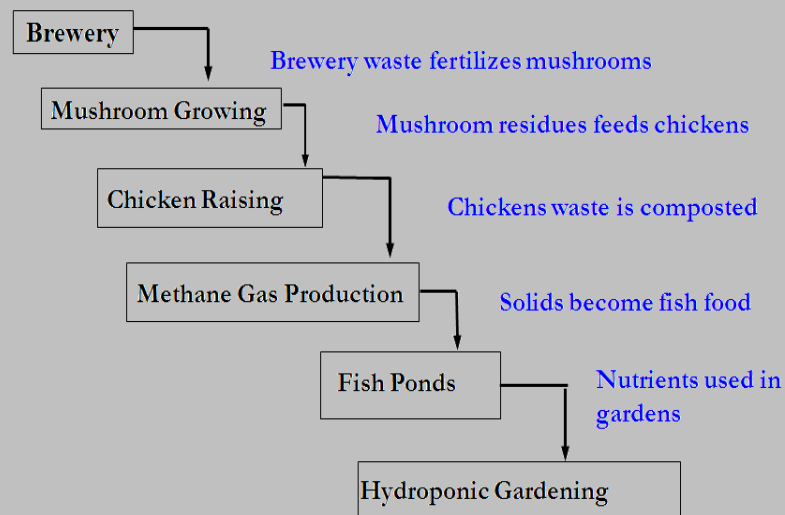
An example on how to use symbiosis/mutualisms was provided by the Powel Center for Construction and Environment in the paper: Ecological Systems as the Model & Industrial Ecology, 2006:

It can be easily transformed into an exercise for the trainees.

Bad practice:



Good practice:



Agriculture

Material efficiency and consistency start in agriculture right at the choice which seeds to sow. They affect which and how much additives have to be used, and the impact of both (growing plants and additives) to the soil. Therefore, it is essential for trainees to know about plant biology and botany (water demand, best conditions for growth, fertilizers, sun), elucidation on GMOs, and the usage of pesticides, antibiotics, and fungicides, and how they affect the health of organisms.

Recent research brought to light how important phosphorus is in terms of prompting plant growth. Due to its limited availability, emphasis is on a closed loop system.

A proven method for monitoring soil conditions are indicator plants. The knowledge transfer on that can perfectly be conducted during excursions.

Food Industry

As already mentioned in the energy consistency section, it is very important to have a closed cycle of waste for feeding or fertilizers. Thanks to nature closing the cycle should be feasible.

When it comes to waste, one has to distinguish between solid, liquid and gaseous waste.

Regarding the shelf life, several trade-offs have to be made. First the product on its own is of course the main factor. Also consumers' behaviour and expectations have a major influence. As a result, producers have to strike a balance between conservation measures (additives, cooling, and deep freezing), food safety, consumer's health, packaging and energy consumption over the life cycle. Since this is a very complex problem, no easy and one-fits-all solutions can be expected. Partly it's on the consumer's side but to some extent it lies under the philosophy of the producer.

In the field of packaging and design a lot of progress has been achieved in recent years. For example biodegradable packaging which is compostable came up. Its use can surely be spread to several other applications like food products for outdoor activities, which trainees can easily brainstorm. Also optimization of the weight of packaging materials like bottles, cans, barrels, plastics, paper and cardboard, and their recycling capabilities have an effect on transportation and waste generated .

Innovative concepts for direct reusing of the packaging by the consumer, like glass bottles can be worked out with regards to logistics and customer loyalty.

9. Methods

Distinguish between: methods for training/teaching and methods to be applied for eco-efficiency

Teaching:

Start with an experiment or video. Try to raise awareness and motivation. Explain the topic in a simple way. Let the trainees have a hands-on experience: laboratory, field work, literature search using internet, Wikipedia, etc.

Four generations of environmental technologies have been identified by the International Institute for Sustainable Development:

1. Remediation
2. Abatement
3. Pollution prevention
4. Sustainable technologies

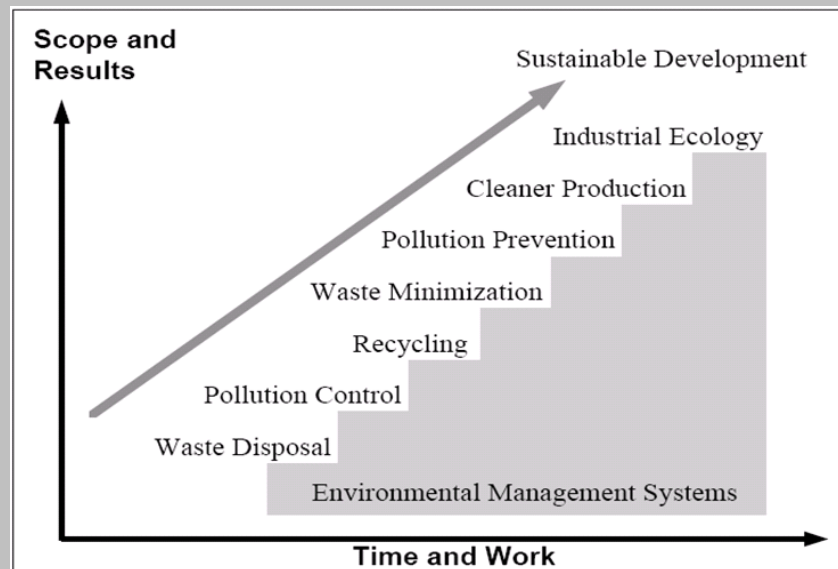
Methods used in eco-efficiency:

Material and energy balances. System analysis tools to be used: LCA (Life Cycle Assessment), LCM (LC Management), LCI (LC Inventory), LCIA (LC Impact Assessment).

The most frequent methods used: pollution prevention, cleaner production, zero waste, eco-innovation, design for environment (eco-design), design for sustainability, Deming Cycle of continuous improvements.

10. Management

Development of Environmental Management concepts:



Environmental management systems. Voluntary approaches, environmental accounting. Corporate social responsibility and ISO 26000. Environmental law and ethics: fair trade, food donations to social institutions and shops, hygiene. Environmental politics. Certifications: organic food, eco-labelling.

Environmental reporting and indicators. Explain the most important sustainability indicators like footprints (carbon, nitrogen, water, energy ones), specific usage of energy and materials, emissions per product.

Scenarios and answers to “what if” questions for food production system and policy options.

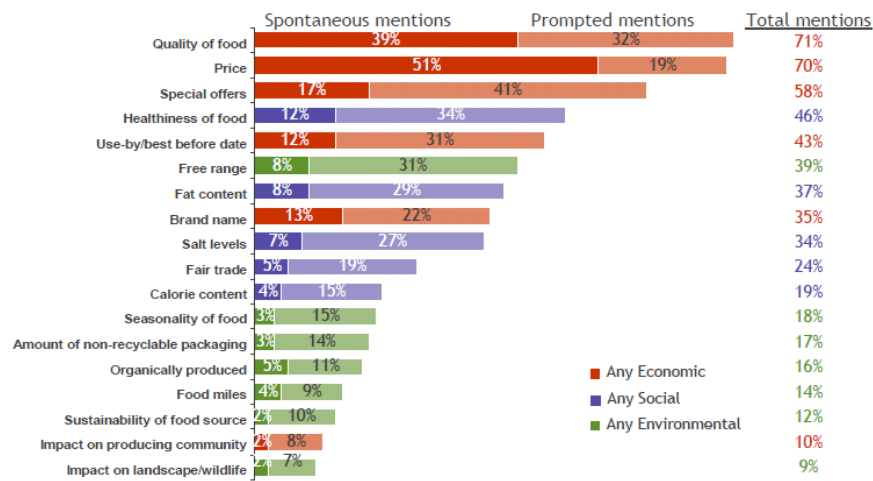
11. Sustainable Consumption

Consumers have to decide on the level of sufficiency. Teach on proper choices what to eat: organic, seasonal and locally grown food, non-bottled water if adequate. Awareness-raising regarding: pesticides, antibiotics, fungicides, genetically modified organisms (GMO), biodiversity and animal welfare. Mis-, over- and under- consumption: provide for healthy diet (eco-efficient according to EEA: meet human needs within carrying capacity; 1/7 of population hungry, 2/7 too fat).

30% of food is wasted by consumers and distributors⁹ - behavioural change is necessary: conservation measures.

Still a long way to go¹⁰:

Issues of Importance When Buying Food - All Issues



12. Organisations

- United Nations (UNEP, UNIDO): Human Development Index, Intergovernmental Panel on Climate Change (IPCC)
- International Organisation for Standardisation (ISO)
- Environmental (Protection) Agencies (European EEA, US EPA)
- EFSA: European Food Safety Authority
- FSA: food standards agency (government department in the UK)
- IFOAM: International Federation of Organic Agriculture Movements: This umbrella organisation of more than 750 organisations worldwide introduced a “family” of accredited organic farming standards in 2011 and made them comparable among each other
- FDA (Food and Drug Administration, USA)
- Knowledge exchange, also in inter-industrial networks
- Sustainable and socially responsible universities and schools
- NGOs: alliances, federations, associations, networks (PREPARE, ERSCP,

⁹ UK Cabinet Office, 2008: Food Matters: Towards a Strategy for the 21st Century

¹⁰ FSA (2008). Consumer Priorities for Sustainable Development

RECP)

13. Laboratory

- Testing Laboratories to find out food safety, nutrients and ingredients
- Different test methods exist
- Creating biodiesel from waste oil, biogas production from food wastes with the use of mini laboratory digester

14. Problem-Solving

Basically the process of problem solving consists of the following steps:

- Problem definition
- Fact finding and analysis
- Idea generation and solution finding
- Solution(s) evaluation and implementation

There are several supportive methods for each step, like the cause and effects analysis, FMEA, creativity methods and value analysis. Most of them work with pencil and paper and in teams.

Nevertheless it is critical to run experiments and learn from the results as a “trial and error” approach, since the food sector, especially agriculture, is a very complex system with lots of interconnection that can hardly be taken into consideration during the analytical phase. Also for the trainees the learning effects are higher if they can have their hands on.

15. Field Work

- Company visits (excursions)
- Internships, voluntary work
- Student projects with companies and coaching by teacher
- Quality testing: comparison of conventional and organic goods: optic, taste

16. Textbooks

- Background Information: Department for Environment, Food and Rural Affairs UK (DEFRA) (2006): [Food Industry Sustainability Strategy](#)
- [Handbook of Water Use and Conservation](#): Homes, Landscapes, Industries, Businesses, Farms; Author: Amy Vickers, Massachusetts, USA
- [Industrial Water Reuse and Wastewater Minimization](#) Author: James G. Mann, Y. A. Liu, McGraw-Hill, 1999

17. Teach the Students

Truly, the whole outline of this sector specific course is about teaching, its possible content and useful methods. Nevertheless this section is to emphasise the importance of enquiring the needs of students and also implementing them at short notice.

Moreover teaching should not only focus on raising the students’ professional expertise but also on their role as citizens, consumers and multipliers.

For instance: Teaching the students what they can do to limit food waste is strongly recommended. [10 Tips to reduce food waste](#)

18. Teach the Teachers

In the research on existing training courses many specific offers on universities have been identified. They provide high level education which still needs to be applied by each individual trainer first to gather practical experience. In this

sense trainers are advised to have a lifelong learning thinking.

19. Guides and Manuals

- [Guide: Eco-Efficiency for Queensland Manufacturer: Food Processing Industry. 4 steps pathway to sustainability](#)
- A more general guide: [Australian Industry Group \(2006\): Saving Money through Resource Efficiency](#)
- [Cool Farm Tool](#) (open source agricultural GHG calculator)
 - Made by: Unilever, used by Pepsico, FritoLay, Sysco, McCain, etc.
- [Field to Market/Keystone Alliance Fieldprint Calculator for Soybeans/Corn/Wheat/Cotton](#)
 - Five part radar plot: Land Use, Soil Loss, Water Use, Energy Use, and Climate Impact
 - The Fieldprint Calculator is a free online tool for growers to voluntarily and securely analyse how their management choices impact natural resources and operational efficiency
- [UN Global Compact \(2008\): Guide to Private Sector Action on Global Food Security Crisis](#)
 - Water management
 - Agricultural inputs and infrastructure
 - Financial mechanisms and risk management instruments
 - Nutrition
 - Energy and biofuels
 - The role of Information and Communication Technology
 - Job opportunities for rural low-income populations

20. PowerPoints and Videos

- [Sustainable food cities](#)
- [Global food system: Choices and consequences](#)- Patrick Mulvany
- [The Hidden Cost of Food](#)
- [Teacher resources](#)
- Seminar: [Living Rainforest, Sustainability and the food supply chain](#)
- Seminar: [Sustainable Energy, Food, and Sustainability](#)

21. Quizzes

Quizzes are a playful method to determine:

- What knowledge is already there and what needs to be taught
- The progress in learning

Examples:

Quizzes on organic farming:

- http://organic.lovetoknow.com/What_is_Organic_Farming
- <http://curiosity.discovery.com/topic/sustainable-agriculture/sustainable-farming-quiz.htm>

Sector: Transport and Mobility

1. Introduction

- Concept of mobility, function of mobility for society
- Key modalities
- Key environmental impacts
- Quantification of environmental impacts

2. Motivation

The motivation for participation in a VET course on eco-efficiency focusing on transport and mobility are:

- Minimizing emissions and with it improving the local living conditions
- Forcing and supporting the implementation of processes using best available technique to care about innovation and with it promoting region/regional companies
- Saving resources and with it costs

3. EU Directives and Other Documents

With the white paper [European transport policy for 2010: time to decide](#) developed by the European commission in September 2001 the process of a strong integration of sustainable aspects within the transport sector on European level was initiated. In following years different regulations were developed:

- Commission White Paper of 28 March 2011: [Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system](#)
- [Directive 2009/33/EC](#) of the European Parliament and of the Council of 23 April 2009 on the promotion of clean and energy-efficient road transport vehicles
- [Regulation \(EC\) No 1692/2006](#) of the European Parliament and of the Council of 24 October 2006 establishing the second Marco Polo programme for the granting of Community financial assistance to improve the environmental performance of the freight transport system (Marco Polo II) and repealing Regulation (EC) No 1382/2003
- [Regulation \(EC\) No 1382/2003](#) of the European Parliament and of the Council of 22 July 2003 on the granting of Community financial assistance to improve the environmental performance of the freight transport system (Marco Polo Programme) amended by [Regulation \(EC\) No 788/2004](#) of the European Parliament and of the Council of 21 April 2004 amending Council Regulation (EC) No 2236/95 and Regulations (EC) No 1655/2000, (EC) No 1382/2003 and (EC) No 2152/2003 with a view to adapting the reference amounts to take account of the enlargement of the European Union
- [A sustainable future for transport](#) European Parliament resolution of 6 July 2010 on a sustainable future for transport (2009/2096(INI))
- Opinion of the European Economic and Social Committee on [Sustainable development of the EU transport policy and planning for TEN-T](#) (exploratory opinion at the request of the forthcoming Polish presidency)

4. ISO, CEN and Other

- ISO 20121:2012 Event sustainability management system including transport and mobility processes/actions

Standards	<ul style="list-style-type: none"> • ISO 22628:2002 Road vehicles - Recyclability and recoverability - Calculation method • ISO 30000:2009 Ships and marine technology - Ship recycling management systems - Specifications for management systems for safe and environmentally sound ship recycling facilities
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5. History of the Eco-efficiency Concept Historical attempts to improve eco-efficiency

- Fuel savings
- Recycling of ELV waste
- Improvements of emissions to air (catalysts for NO_x, VOC, PM10, etc.)

Programs and incentives to move to more environmental benign modalities (e.g. car sharing, public transport).

Concept of mobility in relation to spatial planning.

6. Energy: Renewables and Efficiency	<p>Various approaches</p> <ul style="list-style-type: none"> • Regulation limiting CO₂ emissions and promoting energy efficiency • Inclusion of biofuels and targets with regard to biofuels • Fuel efficiency incentives and fuel efficiency labelling <p>See also material efficiency: options using less material usually are also energy-efficient</p>
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7. Water Efficiency Water is used in connection with transportation mainly by 2 ways:

1. As transportation way
 - a. Options to minimize the impact on the water are:
 - i. Organizing training for ship's crew and ship's passengers how to avoid water pollutions
 - ii. Use techniques which can decrease the direct pollutions of water
2. As cleaning source to clean transportations and transportation ways
 - a. Options to minimize the use of water for cleaning are:
 - i. Use techniques which can save water (like nanotechnology for cleaning cars which can more than 100 litres of water per treatment)
 - ii. Optimize with the aid of guides the car washing techniques to reuse water and to use as less water as possible

8. Material Efficiency	<p>Current practice: legislation demanding end of life management of vehicles with stringent material recycling targets (EU End of life directive).</p> <p>Other options (in practice not yet stimulated by government):</p> <ul style="list-style-type: none"> • Smaller and lighter cars • Cars using less critical materials
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- Cars using more uniform materials (e.g. similar types of plastics)

At a higher level:

- Prevention of mobility (e.g. stimulating working at home, flexible workspaces)
- Car sharing schemes
- Other incentives to reduce car ownership and use and using mixes of public transport and sharing systems as well
- Differentiated taxation of transport modalities, or taxing car commuter compensation schemes of employees
- Logistical centres that support multi-modal freight transport

9. Methods

- Design for Sustainability/Sustainable Product Services/Sustainable Behaviour
- Business modelling & business model analysis
- Cleaner production
- Life Cycle Management & assessment
- Fuel efficiency assessments
- External cost assessments
- Spatial planning tools, scenario tools that predict traffic flows in relation to spatial planning of work and living

10. Management

ISO 14001 Environmental management (continuous improvement)

ISO 26000 guidelines on Social Responsible

11. Sustainable Consumption

Relevant end consumer of transport services are all people using directly transport services to come from point A to point B and all people buying a product.

To use directly transport services in a sustainable way the consumer should:

- Use sustainable transport methods like walking, cycling, transit oriented development, green vehicles and carsharing and
- If possible, avoid motorized transportations for short-distance-ways

Buying a sustainable product the consumer should be aware about:

- The emissions resulted out of the transport of the product from the production location to the selling location
- Other general aspects like life cycle analysis or product footprint

12. Organisations

- Swiss Mobility Car sharing (Switzerland)
- GreenWheels (Netherlands)
- International association of public transport (IUTP)
- World Business Council for Sustainable Development
- European Cyclist's Federation
- European Environment Agency

-
- 13. Laboratory**
- Crash test facilities
 - Various standards for measuring fuel efficiency and emissions; see the appropriate legislation such as:
 - Commission Directive 2001/116/EC of 20 December 2001 adapting to technical progress Council Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.
 - [Technical harmonization for motor vehicles](#)
- 14. Problem-Solving** See under methodologies.
- Corporate social responsibility
 - Use PBL (Problem Based Learning) approach
- 15. Field Work** Visiting and evaluation of interesting pilot projects, for instance those part of the [EU CIVITAS program](#)
- Visiting car sharing organisations and doing practical evaluations or student projects
- Study of implementation of sustainable mobility in urban planning in specific cities, etc., or supporting businesses in developing a sustainable transport plan (for instance with regard to the commuting needs of their workers)
- 16. Textbooks**
- The Business of Sustainable Mobility. From Vision to Reality
 Edited by Paul Nieuwenhuis, Philip Vergragt and Peter Wells
 June 2006 256 pp 234 x 156 mm hardback
 ISBN 978-1-874719-80-9
- Transitions Towards Sustainable Mobility. New Solutions and Approaches for Sustainable Transport Systems
 Nunen, Jo A.E.E. van; Huijbregts, Paul; Rietveld, Piet (Eds.)
 1st Edition., 2011, XVI, 317 p. 62 illus.
 ISBN 978-3-642-21191-1
- System Innovation for Sustainability 2: Theo Geerken, Mads Borup
 Greenleaf Publishing. Published: January 2009 Pages: 184
- [Sustainable Mobility: 100 Investment Ideas](#)
- <http://www.sustainable-mobility.org/news/news-feed/zen-car-brussels-launches-ev-sharing-system.html>
- <http://www.mobilityweek.eu/>
- 17. Teach the Students**
- Adapt the knowledge gained in the course to your specific problems in your region/company, how you can effectively and practically plan/realize/optimize mobility processes
 - Raise awareness about daily problems and barriers
-

18. Teach the Teachers

- Give examples of up-to-date cases, best practices and the latest researches/analyses
- Include meetings between the students and the businesses
- Include the use of the web-based learning tools (e.g. e-learning platforms, e-labs)

19. Guides and Manuals http://www.civitas-initiative.org/index.php?id=70&sel_menu=6&proj_id=2
See under Textbooks.

20. PowerPoints and Videos N/A

21. Quizzes Quizzes can be used to assess the level of knowledge in a specific area. This can be done as a self-assessment for course participants or as an ex-ante or ex-post-test organized by course organizer/teacher.

Examples of transport/mobility relevant quizzes for eco-efficiency are:

[Sustainable transport quiz from “the full wiki”](#)

[Transport quiz from European Commission](#)

Sector: Buildings

Areas:

- Technical secondary schools
- Post-secondary (specialised)
- Secondary vocational school

Vocational training courses provide by VET centres for workers (should be licensed, meet certain requirements)

1. Introduction

Resource efficient building is, in general, a result of a combination of architectural design, the selection of materials, equipment, HVAC technology, and the energy source. Energy and resource efficient building conditioning uses alternatives to conventional heating and cooling sources and conventional water supply systems. The course applies a holistic approach by bringing together different aspects of energy efficient urban planning down to details of construction.

Buildings cover:

- 50% of direct and indirect resource consumption
- 40% of heat consumption
- 25 % of CO₂ emissions
- 35% of all waste generated

2. Motivation

Need for a holistic approach for energy efficient buildings (planning, renovation and exploitation)

3. EU Directives and Other Documents

The main legislative instrument to reduce the energy consumption of buildings is Energy Performance of Buildings Directive 2010/31/EU (EPBD)

4. ISO, CEN and Other Standards

More than 35 CEN standards on building performance, HVAC systems in buildings, etc.

5. History of the Eco-efficiency Concept

The eco-efficiency concept in buildings comprises at least four major components: performance, conformity, life cycle cost and environmental impact. There are several variations of the eco-efficiency concept in buildings: green buildings, bioclimatic design, eco-construction, etc. There are also several certification systems on the topic developed over the last 20-30 years: Leadership in Energy and Environmental Design (LEED); BRE Environmental Assessment Method (BREEAM); Passive House Standard, etc.

At European Union level there are several directives that establish regulations in the sector: Energy Performance Building Directive, Promotion of Renewables, etc. Methodologies for building certification has been developed, as well for inspection of boilers and HVAC systems

Since 2000 criteria and standard development

6 Action programme on Environment

CEN TC 350 Sustainable construction

- LCA approach (ISO 14 025 EPD and ISO 14040 and 14042 LCA) – pre-set parameters
- Health & comfort
- Life Cycle Costing

CEN TC 351 Hazardous substances in building products

Published from 2012 and further

6. Energy: Renewables and Efficiency	<p>Definition of energy efficiency and indicators; energy sources; renewables; energy supply and demand at building level; consumption models and others.</p> <ul style="list-style-type: none"> • Passive house and Plus energy house concepts • Active houses • Climate Envelope
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7. Water Efficiency	N/A
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8. Material Efficiency	<ul style="list-style-type: none"> • Eco-materials, life cycle assessment, cost-benefit analysis • Relation to indoor quality (dangerous substances) • Cradle to Cradle concept • Life Cycle Management • LCA focus on renewable and non-renewable resources • Focus of the Lego brick principle in the construction stage. • Focus on water and energy consumption in the use stage • Reuse of building component and recycling of demolished building materials (roads and foundation of new buildings)
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9. Methods	<p>The training methods will be lectures with discussions, laboratory exercises, field measurements, computer simulations, project groups</p> <ul style="list-style-type: none"> • Life Cycle Management • Including of potential residents in planning phase • Eco- innovation and design for sustainability due to long life time of buildings • Involvement of residents in apartment blocks and engagement of residents in private house at district level
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10. Management	<p>The course could be led by a university or a life-long learning training institution (vocational training centre).</p> <ul style="list-style-type: none"> • ISO 50001 Energy management systems • ISO 14001 Environmental management (continuous improvement) • ISO 26000 guidelines on Social Responsible • OHSAS 18001
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11. Sustainable	N/A
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Consumption

- 12. Organisations** The involvement of several types of organizations (lecturers) could be beneficial for the course:
- Training institution
 - University
 - NGOs – environmental, dealing with energy and resource efficiency
 - Professional unions (chambers of architects, civil engineers, installers)

Select from CEN TC 350 member list

13. Laboratory

Blower-door test:

Measuring instrument for quantifying the airtightness of a building. Air temperature and humidity levels are important issues for occupant health and comfort. A professional design and examination of the building's air barrier protects from draughts and dry indoor

Air resulting from air leaks through joints and gaps. Construction damages like mould caused by moisture finding its way into the insulation can be avoided. An airtight envelope protects from energy losses and takes care of the environment and the economy.

Demonstration of other measurement equipment:

Thermography camera for detecting thermal losses; radial thermometers; measurements of humidity and others related to the thermal comfort in buildings.

Analysis of energy performance of buildings:

Demonstration software

(or other fulfilling the requirements of [EN ISO 13790:2008 Energy performance of buildings - Calculation of energy use for space heating and cooling](#))

14. Problem-Solving

Several problem solving techniques could be used at stage of design of energy efficient building and rehabilitation of existing one by using of software and computer simulations. The problem approach is good also for homework and tasks for the trainees.

Use PBL Problem Based Learning approach

15. Field Work

- Analysis with thermography camera imaging the heat losses of a building envelope (from outside or inside)
- Demonstration of eco-materials and construction systems, others
- Visit best practise passive and energy plus houses, and best practise in renovation
- Visit green roof solutions

16. Textbooks	<p>A number of textbooks can be applied on the different topics: green architecture; renewables; eco-materials, etc.</p> <p>Use You Tube – lots of good examples and demos of sustainable building etc. and use TED vision lessons</p>
17. Teach the Students	N/A
18. Teach the Teachers	N/A
19. Guides and Manuals	<p>Holistic energy efficient planning + construction</p> <p>http://www.intense-energy.eu/handbook-holistic-energy-efficient-planning-construction/</p> <p>National resource institutes, and universities, secondary technical schools have lots of relevant literature.</p>
20. PowerPoints and Videos	<ol style="list-style-type: none">1. Legislation2. Quality control3. Settlement planning and design principles4. Energy carriers and renewable energy sources5. Ecological materials6. Cost-benefit assessment7. Building physics8. Construction of elements9. Systems engineering
21. Quizzes	<p>Quizzes on resource efficiency, legislation, ecological materials, and other topics could be applied.</p>

DISSEMINATION PLAN

The information generated within the TRUST IN partnership will be available through the [website of the PREPARE Network](#). All documents are available either on the front page of the partnership or through the calendar where documents are attached to the specific partnership meetings.

Apart from the dissemination of the knowledge from the TRUST IN, which has already been carried out through newsletters, participation in conferences and workshops, partners are urged to disseminate the knowledge generated in the project, to their local networks.

Finally, CEDEFOP will be contacted by the Danish partners (Aalborg University) in order to ascertain whether it is possible to obtain exposure of the TRUST IN project through this medium.

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http://ec.europa.eu/education/lifelong-learning-programme/ldv_en.htm