Transnational Learning Document #5

Training and capacity building in LCA

September 2021

Improved Environmental and Resource Efficiency through use of Life Cycle Instruments for implementation of regional policies of the European Union

LCA4Regions
Interreg Europe

European Union
European Regional Development Fund

There are many ways of planning for **regional development**.

Traditional methods of *'one issue at a time'* have produced some useful immediate results but have also sometimes had unfortunate side effects, as for example when infrastructure is planned without an 'end of life' component built in.

Life Cycle process

A more systematic way of thinking, taking into account the **entire life cycle of projects and products leads to more effective programmes**, and fewer unwanted secondary impacts. Citizens as well as organisations are increasingly interested in the **« world behind the product »,** something that life cycle methodologies based on key SDGs can reveal. Life cycle thinking is also the basis for the LCA4Regions project where learning life cycle methods from each other improves everyone's development policies and action plans.

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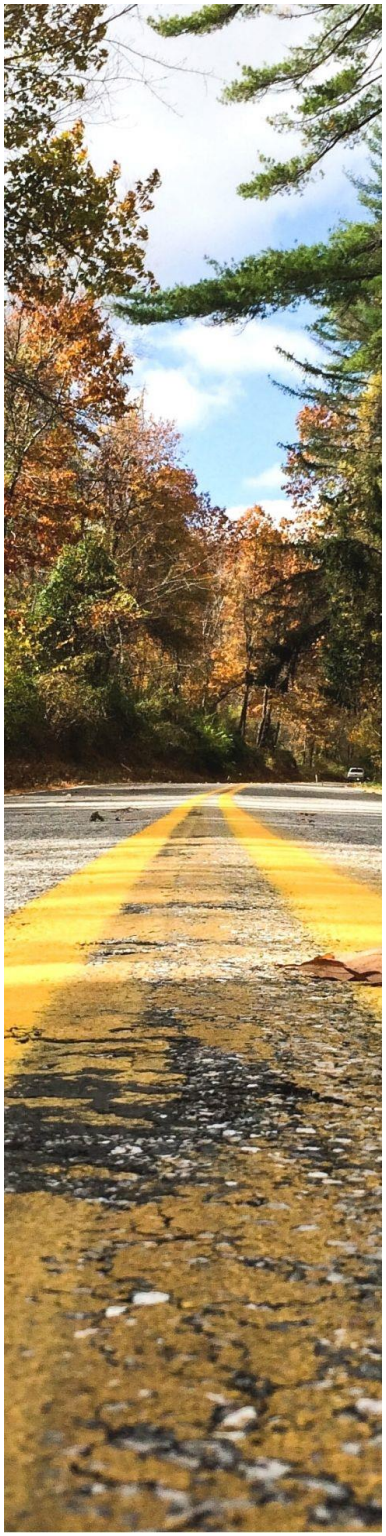


Purpose of the document

The document belongs to the series of TLJ Learning Documents which aim to provide an overview of the activities carried out during the Transnational Learning Journeys. It summarizes the practices discovered during the TLJ, the discussions held, the lessons learnt, and elaborates some inputs to be further explored by the project. It proposes some elements to be considered for improving the quality and effectiveness of the next TLJ. The present document is focused on the fifth Transnational Learning Journey that took place in September 2021 online (although originally planned to take place in the Lodzkie Region).

What is a Transnational Learning Journey?

Transnational Learning Journeys (TLJ) represent the core of LCA4Regions, an opportunity for dialogue on a key aspect of the project. Organised every six months by a different partner region, TLJs include thematic workshops, site visits and peer reviews and focus on one of the project's thematic pillars. **They bring together partners and stakeholders to share challenges, opportunities and good practices** to improve their regional policy instruments.

The first phase of the project, the "Interregional Learning", counts 7 TLJ:

- TLJ #1: Life cycle methodologies in environmental and resource efficiency policies and tools to apply LC into practice | Kaunas (LT), January 2020
- TLJ#2: Life cycle methods for resource-efficiency | Navarre (ES), June 2020
- TLJ3#: LCA for waste management and material flows | Satakunta (FI), October 2020
- TLJ#4: LCA in public procurement and materials | Slovenia, May 2021

The following meetings will be in Lombardy (IT), and Baixo Alentejo (PT).

Transnational Learning Journey #5

28-30 September, online/Lodzkie Region (PL)

OVERVIEW

The 5th TLJ took place online organised by the Lodzkie Region. This three-day event on spreading life cycle thinking included three different sessions:

- **LCA in the region; Training and capacity building:** this session started with a brief overview of the policy context of the region before moving to the question of LCA training need of the public and private sectors in Poland and the role of the academic sector and the cooperation between science and business.
- **LCA good practices on training and capacity building:** presentation of good practices from partners' regions - Navarre (SP), Kaunas (LT), Satakunta (FI), Baixo Alentejo (PT), Western Slovenia (SI), Lombardy (IT) and Lodzkie (PL) – followed by a sample of training projects for students and teachers.
- **Day 3: Case study & Peer review:** The peer-review session gathered ideas for developing the future action plan in Lodzkie. The session also included two presentations on LCA experiences.

The whole TLJ has been recorded and can be watched here.

AGENDA

DAY 1 – LCA in the region. Training and capacity building

28 September 2021 | 09:00 – 11:30

09:00 – Welcome | Representative of the Board of the Lodzkie Region

09:20 – The policy context of the Lodzkie Region - Department of Regional Policy

09:40 – LCA training needs of the public and private sectors in Poland | Czestochowa University of Technology (CUT)

10:00 – Q&A session

10:10 – The role of the academic sector in stimulating development in training and capacity building for LCA | Lodz University of Technology (TUL)

10:30 – Q&A session

10:40 – Cooperation between science and business for the development of LCA | Pietrucha Company (SiA Pietrucha Sp. z o.o.)

11:00 – Q&A session

11:15 – Summary of Day 1

DAY 2 – LCA good practices on training and capacity building

29 September 2021 | 09:00 – 11:30

09:00 – LCA good practices on training and capacity building (Part 1)

09:50 – Q&A session

10:00 – LCA good practices on training and capacity building (Part 2)

10:35 – Q&A session

10:45 – Life Cycle Thinking supports capacity Building for Green Competence dedicated to teachers & students

11:05 – Q&A session

11:15 – Summary of Day 2

DAY 3 – Case studies and peer review

30 September 2021 | 09:00 – 11:30

09:00 – LCA procedures and databases | Lodz University of Technology (TUL)

09:25 – Q&A session

09:35 – Current LCA training and capacity building experiences | LCA4Regions expert perspective

10:00 – Q&A session

10:10 – Case study | Lodz University of Technology (TUL)

10:30 – Q&A session

10:40 – Peer review session

11:25 – Summary of the meeting

LODZKIE REGION

Day 1 of the TLJ included a presentation of the policy context of the Lodzkie Region. While the recording of the day, the presentation itself, and an overview of the policy context shared beforehand with partners are available online, the main aspects are summarized hereafter.

Country: Poland

Capital of the region: Lodz

Population of the region: 2,400,000 inhabitants (2020)

National context:

Polish key document in the area of medium- and long-term economic policy is the **Strategy for Responsible Development** for the period up to 2020 (including the perspective up to 2030) which gives directions for changing the current approach, perceiving waste as a resource, and strives to implement an economic model based on circularity.

As the main goal for Poland, the Strategy indicates the development of a sustainable economy based on more efficient use of resources, respect for the environment and achieving higher competitiveness through the use of technology with lower demand for raw materials and energy and enabling the use of secondary raw materials and renewable energy sources. Among the proposed actions are the implementation of the principles of eco-design of products through the selection of appropriate materials: promoting materials with a significantly lower environmental impact through planning and monitoring tools often referring to LCA methodologies.

The 2030 National Environmental Policy further specifies Strategy for Responsible Development with regard to environmental protection. Its main objective is to develop the potential of the environment for the benefit of citizens and entrepreneurs. It diagnoses that there is still a low level of implementation of the concept of a circular economy in Poland, which should cover all stages of the life cycle and affect both the social and economic spheres. It also recognizes the need to go beyond traditional environmental management tools, which should support the development of new business models, the growth of the service sector and ways of substituting currently used raw materials, production and consumption.

Waste management goals and actions are detailed in the **National Waste Management Plan 2022**, which is the primary planning document at the national level. It makes numerous references to LCA and identifies eco-design, i.e. the systematic consideration of environmental aspects in product design with the aim of improving the environmental performance of the product throughout its whole life cycle and the implementation of eco-design research projects, as one of the waste reduction measures.

Two additional documents dealing with waste, circular economy and LCA are the **National Waste Management Plan (2014-2022)** and the **Roadmap towards the Transition to the Circular Economy (2019-2023).** The former indicates

the necessity of introducing ecodesign principles and LCA analyses as a predicted and recommended direction in which changes in Poland in waste prevention should proceed. The later contains measures that will primarily contribute to waste reduction, in particular: diversified industrial production (including environmental life cycle assessment), sustainable consumption, circular bioeconomy and new business models.

The currently operating national **Operational Programme Infrastructure and Environment 2014-2020** concerns mainly projects of supra-regional nature and do not directly support LCA, although some references to circular economy are found in them.

Regional policies

All national legislation and strategies apply at regional level as well, but each region has its own more detailed strategy and its own regional operational programme. Lodzkie, as part of its regional development, focuses on smart specializations such as:

- Advanced construction materials (including design);
- Innovative agriculture & agri-food industry;
- Energy (including renewable energy sources);
- IT and telecommunications (ICT);
- Modern Textile & Fashion Industry (including design);
- Medical Industry, pharmaceuticals and cosmetics (including health resort medicine).

The Board of the Lodzkie Region acts as the Managing Authority for the Regional Operational Programme of Lodzkie 2014 – 2020 and the regional program European Funds for Lodzkie 2021-2027, co-financed from EFFR and ESF+. The region plays a key role in shaping regional policy by preparing and drafting important strategic documents.

Development Strategy for the Lodzkie Region 2030: this key document defines the vision and goals of the regional policy in the economic, social and spatial dimension, as well as the actions necessary to achieve them. The document

identifies circular economy as one of the development trends that should result in a more conscious and responsible consumption model. This may be an opportunity for business in the Lodzkie Region, but technological modernization is necessary for them to operate in a circular way. One of the measures is to increase the competitiveness of enterprises, among others through support for implementation of new business models and modern and pro-ecological solutions among SMEs, including in the field of circular economy, e.g. using the methodology of product life cycle assessment. Another measure assumes the development of infrastructure towards a circular economy, among others, through the adaptation of the municipal waste collection system (improvment of selectively collected waste collection points, repair points for damaged equipment, development of a deposit system for packaging,...).

The draft **Territorial Plan of Just Transformation of the Lodzkie Region** is a transformation plan for the Belchatow Basin, developed by the Lodzkie Region, and is linked to the launch of the Just Transformation Fund, which will support coal regions affected by negative socio-economic changes in connection with the transition to a climate-neutral economy and the end of coal mining. One of the operational goals of the plan is "a competitive, innovative and climate-neutral economy based on smart growth, diversified industry, advanced technologies and attractive jobs". Planned activities include the creation of new businesses related to the green low-carbon economy. The second objective of the plan provides for actions related to the reskilling and skills improvement of workers in the mining and energy sectors. It includes job placement and vocational training in renewable energy, the circular economy sector as well as in the professions of the future. This opens up opportunities to provide training in the implementation of environmental life cycle assessment and thus build the capacity of LCA.

The primary instrument of regional policy of the Lodzkie Region is the **Regional Operational Programme for Lodzkie Region 2014-2020**, which continues in 2021. Its aim is to improve economic competitiveness, social cohesion and

spatial accessibility of the region with sustainable use of specific features of the economic and cultural potential of the region and full respect for its natural resources. Although it supports activities aimed at implementing the circular economy model, it does not explicitly promote life cycle assessment methods.

LCA experience

The Lodzkie Region has pioneered a circular economy since the early 2000's. The development of the circular economy in Lodzkie is facilitated through international and regional cooperation and implementation of projects under INTERREG or Horizon 2020 programs. Lodzkie promotes the idea of a circular economy among entrepreneurs and in education.

Lodzkie and the Polish Energy Group have joined forces and created the Regional Center for Competence Development, which is to support the transformation of the regional coal basin in Belchatow from conventional to renewable energy. The center will provide a wide range of courses and trainings, e.g. in renewable energy, wind farms, circular economy and its main task is to improve the quality of vocational education to transform the labor market and respond to the needs of entrepreneurs.

Lodzkie Region, together with the strong regional academic sector, is actively involved in energy efficiency and LCA initiatives. It includes the participation of universities in numerous LCA-related projects and research, conducting special LCA subjects for students and numerous promotional activities. LCA is the most visible in the construction sector where companies are increasingly making use of LCA-based environmental product declarations.

Training system & capacity building

In the Lodzkie Region there are many nationally important higher education institutions which contribute to build awareness and competences of future LCA specialists. They count with specializations, subject courses, fields of study

linked to LCA. As an example, the Technical University of Lodz (a stakeholder of LCA4Regions) offers:

- Specialisation preparing students of commodity science to product life cycle assessment (LCA), environmental management, eco-design and working according to circular economy principles (since 2017);
- Optional subject “Fundamentals of Life Cycle Analysis” taught in many faculties (since 2019);
- Training in LCA;
- Specialization in the field of "Management and Production Engineering" (second-cycle master's degree studies): "products and processes in a circular economy" (2021)
- Second-cycle course "Sustainable Bioeconomy" which includes the following subjects: "Ecological Life Cycle Assessment", "Closed Circuit Economy" and "Environmental Assessments in the Bioeconomy" (2021).

Another university, the University of Lodz, offers since 2018 a new field of study called: EcoCity. This innovative and unique didactic offer aims to educate professionals prepared to manage cities in accordance with the idea of sustainable development, green economy and environmental protection.

Knowledge of LCA is also present among entrepreneurs in the Lodzkie Region. Several companies in the construction industry have decided to commission life cycle analysis for their products.

Despite a positive attitude towards environmental protection, the awareness of the real impact of consumers on the environment is still insufficient. There is a need for systemic strengthening of consumer awareness education at all levels of education (starting with early school education) aimed at changing consumer behaviour and increasing knowledge of rights in terms of access to product and producer information. Nonetheless, initiatives are undertaken to deal with ecological education of children and adults in the region.

The Lodzkie Region organises many events influencing capacity building and raising awareness of the circular economy, e.g. the Business and Sustainable Development Forum 2020 conference, the series of webinars: "Circulars in Business", or the cyclical International Bioeconomy Congress.

Public procurement

Public procurement in Poland is regulated by the Public Procurement Law of 11 September 2019. It introduces the possibility of using life cycle cost (LCC) criteria to evaluate offers. Life-cycle costing may to an appropriate extent include some or all of the costs incurred over the life cycle of a product, service or works. For several product categories, the Polish Public Procurement Office (PPO) has developed LCC calculators to calculate the life cycle cost of computers, monitors, indoor and outdoor lighting, and imaging equipment.

A SWOT analysis of the Lodzkie Region is available in the overview of its policy context.

Lodzkie Region

The Lodzkie Region is one of the most dynamically developing regions in Poland, located in the centre of the country. It is perfectly connected, at the crossroads of trans-European transport corridors north-south: Scandinavia-Adriatic Sea and east-west: Moscow - Berlin. Łódź, the capital of the region, is the 3rd largest city in Poland.

The region has a sectorally and spatially diversified economic structure in which industry and agriculture play the largest role. The favorable geographic location of the region is also a factor conducive to the development of the logistics industry. Łódź has a long industrial tradition (mainly in the textile industry). Currently, modern offices and commercial centers are developing in the places of former factories. Lodz is a large academic and science area with many colleges, universities and research institutes. As a Special Economic Zone (with over 230 companies, of which 98% are SMEs), it offers entrepreneurs opportunity for investment and innovations.

More: https://www.lodzkie.pl/

The team behind the Lodzkie Region

Bogumiła Grzelczak is a manager of the Lodzkie Region team, responsible for cooperation with international partners and regional stakeholders, as well as supervising of projects preparation and implementation.

Monika Zielinska is a chief specialist in the team of the Lodzkie Region, responsible for coordination and financial issues of international projects. She has many years of experience in international and domestic projects, in particular including CE issues.

Tomasz Gąsiorowski, a specialist in the international projects, works in the Promotion Department in the International Project Team of the Lodzkie Region. He is a member of teams in Interreg projects related to the circular economy and cultural heritage addressed to local governments.

Adam Szymanski, an enthusiast of innovative, green technologies, gained his experience implementing pro-environmental and popularization projects at the Lodz University of Technology. He is a member of the INTERREG's REPLACE project team for Circular Economy implementation in Lodzkie.

GOOD PRACTICES on training and capacity building in LCA

During the 2nd day of the TLJ each territory presented a good practice on training and capacity building in LCA.

Capacity building in life cycle assessment - Lodz University of Technology | Lodzkie Region (Poland)

October 2017 – Ongoing

Lodz University of Technology focuses on the LCA approach in education, research and training.

In recent years, as a result of consultations with the local entrepreneurs, Lodz University of Technology (TUL) has introduced to its education offer programmes as well as modules addressing the issues of life cycle assessment (LCA). Good examples are Bioeconomy (a joint programme run by 3 universities) or a new specialization for students of commodity science - Product Design and Commercialisation, which prepares graduates for LCA, environmental management, eco-design and working according to principles of circular economy. In 2019, a compulsory module on LCA was added to all Bachelor programmes so that all students of TUL can implement strategies for sustainability and recycling in their design projects. Also, new postgraduate courses were designed such as Environmental Management in Organisations, offering a certificate of an internal auditor of the ISO 14001 environmental management system. The university regularly participates in international R&D projects with life cycle elements (e.g. INREP, INVITES, HIPERION). Thanks to these projects, doctoral students have the opportunity to further improve their qualifications in LCA. TUL also conducts open classes related to life cycle and environmental protection (e.g. a two-day open training course entitled "Municipal waste - rubbish or source of raw materials?). The main beneficiaries of the practice are the society, entrepreneurs and the public sector in the Lodzkie Region, including students, researchers, TUL employees.

The compulsory LCA module has been designed (sylabus + contents) and this year (starting October 1, 2021) will be taught to over 1200 students. 16 full-time teachers have been trained. The programme of Bioeconomy is a joint effort of TUL and Warsaw University of Technology and

Military University of Technology (also in Warsaw). So far, almost 3,000 graduates have been trained in the LCA subject. This practice is linked to Sustainable Development Goals 4, 9.

Raising students' awareness about how a product ends its life and how they can design for sustainability has a long-term effect for the local, national and global environment – it can change significantly future waste management and carbon footprint. In the aftermath of all the university's initiatives, new professions are emerging, such as environmental management and sustainability engineer or specialised consultants, and this shows that companies have started to take into account the principle of circularity and efficient resource management in their activities. It also has an impact on the policy of the region, which, stimulated by the activities of the university, will more courageously support solutions including LCA in its policy (promoting LCA-aware projects). This practice can be easily transferred to any other university although it does require some initial investments such as training academic staff or developing/updating teaching materials.

Life Cycle Thinking supports capacity building for green competence dedicated to teachers & students| Lodzkie Region (Poland)

October 2020 - ongoing

The Lodz University of Technology, together with a consortium of educational institutions, initiates a systemic change towards green education.

One of the challenges for the region is to strengthen the educational potential of vocational education (people aged 16-21), including the need to deepen knowledge in the field of design based on circular economy, LCA, and the principles of sustainable development. These expectations are met by the Design4Climate and High5 (Erasmus +) projects led by the Lodz University of Technology. In the era of the need to redefine the entire R&D process (especially in the context of CE and LCA), young designers, engineers, scientists, especially at the beginning of their educational or professional path, do not have sufficient knowledge. Taking into account the fact that pro-ecological educational activities must meet the needs of the economy - the Life Cycle Thinkig method becomes crucial. As part of the project, students will have the task of turning a traditional manufacturing process into a circular one, through the principles of design thinking in practical scenarios. Direct beneficiaries are teachers and students who, in the course of research, workshops and international exchange, effectively strengthen their teaching, educational and awareness potential. Thanks to this, potential candidates for studies will also be better prepared. Other beneficiaries are universities that include in their curricula such methodologies as LCA, Design Thinking, Problem Based Learning and Ecodesign. The labor market, which will be more competitive in the face of future challenges, will also benefit.

The evidence of success of this practice is conducting an effective didactic process for a group of 50 teachers and 220 students. A practical model of training courses on the redesign of production

towards the circural economy is being developed. The project builds the capacity for basic CE skills that are widely used in vocational education and training. This practice is linked to the SDG's goals # 4,8,9,12.

The developed model of education may be transferable. It is possible to use and adapt to regional conditions educational models and lesson scenarios that take into account, for example, elements of competition, stimulating the deepening of knowledge and involvement of students, as well as familiarizing them with the goals of sustainable development and LCA. An important element is the developed e-learning platform supporting the development of the assumed skills. It will be a place to easily find, share and use tools that will develop competences in the field of green economy among students. The implementation of similar projects will support the integration of design thinking methods and pro-eco aspects in the teaching process through good practice guidelines for teachers. An important aspect is also the conclusions of the survey audited simultaneously by all units participating in the project, which may be helpful in the process of adapting good practice.

Competence Development Centre - Capacity building to support RES development in the region| Lodzkie Region (Poland)

March 2021 – Ongoing

Lodzkie Region focuses on the circular economy. An expression of this is supporting education on this subject. Lodzkie and the Polish Energy Group (PGE) have decided to cooperate and establish the Regional Competence Development Centre in Rogowiec on 1.09.2021. The Centre is one of the components of the Belchatow Basin's transformation from conventional to renewable energy. It includes the creation of a number of investments by 2030 during the gradual decommissioning of the mine and power plant in Belchatow. The main task of the Centre will be to provide attractive training for people leaving the conventional energy sector. It will train staff in professions that will be needed in the area when the Belchatow mine and power plant cease to operate and throughout the transformation process. The Centre will be run by the local authority of the Lodzkie Region in cooperation with PGE. The Centre will develop professions of the future, with particular emphasis on specialists' education in renewable energy sources (e.g. in automation, analytics, IT, electro technology, biotechnology). The center will provide a wide range of courses and trainings, e.g. in renewable energy, wind farms, circular economy, LCA. The main task of the Center will be to improve the quality of vocational education to modify the labor market and respond to the needs of entrepreneurs. The main beneficiaries of the project will be residents and entrepreneurs of the city of Belchatow and the entire Lodzkie Region.

The biggest success is the cooperation between the regional authority and the main supplier of conventional energy in the region to prepare the region for the energy transition. This is an example of successful cooperation, which has provided support for a smooth energy transition

that is beneficial not only for the environment, but also in economic and social terms. This practice is linked to Sustainable Development Goals 4,7,8,12,13.

This initiative is an idea of how regions can support the transition of the conventional to circular economy model by means of a training and education system. It is also an example for regions how to use the existing potential of employees and to develop it and how to increase awareness among the society and public administration. The whole idea is based on education and training on concepts such as LCA, circular economy, renewable energy and equivalent. It is also an example of the region's initiative to undertake cooperation between public administration and enterprises for the common goal of building capacity for a sustainable economy system. The investment has a great transfer potential, especially for regions based on conventional, e.g. coal, energy. Thanks to this initiative, it will be possible to build competences of young people who will work in the circular economy system in the future.

KEINO academy for sustainable procurement management | Pyhäjärvi Institute (Finland)

January 2019 – Ongoing

For successful and sustainable public procurement, KEINO Academy offers competence enhancing activities for public purchasing authorities.

Many skills are required for successful public procurement such as substance competence, budget and pricing expertise, operational procurement competence, expertise in procurement law and communication skills. In addition to higher education in Finland that provides some degrees and courses on public procurement, KEINO Academy, as part of the KEINO Competence Centre, annually offers competence enhancing activities (events and courses online and offline as well as guidance through email) for public purchasing authorities.

KEINO Academy includes free of charge tools for analyses of purchases to evaluate the procurement sustainability, e.g. maturity of the management, analysis of sustainability and carbon neutrality of procurements (tool “hankintapulssi”), as well as impact assessments (tool Upright Impact model).

KEINO Competence Centre is part of the implementation of the Finnish Government Programme and its operations are steered and funded by the Ministry of Economic Affairs and Employment. KEINO supports and helps Finnish public contracting authorities with the development of sustainable and innovative procurement. By implementing life cycle thinking and life cycle management skills in everyday procurement processes, sustainability goals will be much easier achieved. In Keino Academy, public authorities are networked, thus offering important peer support for learning process.

Since starting of the Academy, almost 50 public organizations and municipalities have utilised the education and networking services provided by KEINO Academy. Currently (by August 2021) 96

examples are described at KEINO website, including many with KEINO Academy services included. The amount of procurement strategies has increased. The attention of sustainability criteria and innovativeness have increased significantly within procuring strategies.

This good practise can readily be replicated in any region. It is based on existing KEINO platform that provides information and networking about public procurements. Within this platform, participants for KEINO Academy are selected by specialists each year to maximise efficient learning and support opportunities. Academy practise has been able to combine both the procuring personnel and the management responsible bodies of an organisation, which has increased management coherence as well as knowledge-based procurement management within an organisation. In Finland, generally procurement strategies exist by 61% of organizations, whereas among KEINO Academy participant organizations, 81% had created procurement strategies. For functionalisation of the procurement strategy, plans existed among 73% of the Academy participant organisations, compared to 48% in general.

Study Module: Life Cycle Assessment| Kaunas University of Technology (Lithuania)

September 2016 – Ongoing

The study module “Life cycle assessment” is a part of the MSc program “Sustainable management and production”.

The main aim of the module: To acquire and gain knowledge about the environmental impact of technological processes, products or services throughout their life cycle, i.e. from extraction of raw materials to waste management. Also, to understand the economic life cycle cost and social life cycle assessment.

LCA is one of the most important preventive and sustainable development measures for resource efficiency, waste reduction and the circular economy. Different life cycle assessment methodologies and softwares can also assess the impact of technologies, processes or services in the context of sustainable development: environmental life cycle assessment (LCA), life cycle costing (LCC) and social life cycle assessment (social LCA).

In the Master's program "Sustainable Management and Production", the LCA methodology is one of the main ones in assessing the potential impact of industrial facilities, environmental systems on the environment and environmental efficiency. The module “Life Cycle Assessment” is also relevant for other study programs at various levels of the university. The main users and beneficiaries of the good practice is the students from the Master's program "Sustainable Management and Production" and Phd students of the study program “Environmental Enginering”.

Research at the KTU Institute of Environmental Engineering related to Life Cycle Assessment of Processes, Products and Services has been carried out since 2002. Recently, the Life cycle assessment has been applied in many different areas: for dairy products, metal processing,

plastics, textile production companies, electric vehicles, waste, packaging, waste management etc. Benefits to the public sector through trained students, some later finding employment in public sector institutions.

Aim of the proposed module: To provide knowledge about Life Cycle Assessment (LCA) as a method and tool for analyzing the environmental impact of technological processes, services and products, highlighting the main strengths and weaknesses of LCA. This module is designed to get acquainted with and analyze in detail the life cycle assessment methodology, to reveal the advantages and disadvantages of the application of the life cycle assessment method, focusing on the most promising and fastest growing industries.

Educational or other training institutions will provide the necessary competencies for the experts, which are willing to make the life-cycle assessment, which can then be used both in industry and in institutional decision-making. Benefits to the public sector through trained students, some later finding employment in public sector institutions.

E-learning course on construction and demolition waste: prevention and recovery | CIMBAL (Portugal)

December 2020 – Ongoing

The e-learning course was organized under the (De)construct for Circular Economy project and aimed to promote education/awareness actions aimed at the various agents along the CDW associated chain, supporting their interaction in order to promote a more sustainable value chain organization, in line with the principles of the circular economy.

The (De)construct for Circular Economy project aims to promote a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW), thus reducing the environmental impact of construction and promoting its circularity. The project, whose promoter is CIMBAL, has partners from Portugal, Romania, Norway and Czech Republic.

The online course covered the 13 municipalities that integrate CIMBAL´s region and the target audience were municipal technicians and other regional entities that develop their activities in the field of construction and demolition waste.

The course works online (without classes in line with the principles of economy), and the trainee studied autonomously the materials provided. With a duration of 4 weeks, the course is composed of 4 learning modules. The study of the modules is done in phases and at your own pace.

The e-learning course can be further developed by adding an LC assessment in the future and can provide additional environmental and resource efficiency value.

The (De)construct for Circular Economy project has a global budget of 587,801.60 euros, benefiting from a co-financing from EEA Grants at a rate of 85%, totalling 499,631.58 euros of support, for the 24 months of its execution. Staff resources and training is a key aspect to deliver this project.

This course had 69 trainees and supported their interaction in order to promote a more sustainable value chain organisation, in line with the principles of the circular economy. This initiative enabled the training of partners involved in issues related to the management of CDW.

The on-line course was a success and a new edition is being considered since the legislation is changing. Additionally, the course can better achieve its objective using a life cycle approach in what regards CDW.

This type of capacitation actions could benefit from a life cycle analysis since it presents a structure based on an efficient use of resources, contributing to accelerate the transition to the circular economy and is in line with the principles of this new paradigm. Thus, this good practice is applicable in every country and region that face problems regarding CDW.

Expert workshop "introducing circular changes in the economy through product Life Cycle Analysis| National Institute Of Chemistry - NIC (Slovenia)

December 2019

Product life cycle analysis (LCA analysis) is an internationally established method that allows the evaluation of environmental impacts that occur throughout the life cycle of a product, service or process in a transparent manner.

LCA analysis helps us in assessing environmental impacts or decisions on the use of a newly developed product (services, process, ...), and compare it with competing products and identify the key stages at which changes would reduce environmental impacts.

Environmental management - life cycle assessment - principles and frameworks are defined in ISO standard 14040.

The use of LCA analysis is also supported by the European Commission. The results of LCA analyses are of interest to the economy / industry and to consumers / users, as the protection of the environment and the rational use of resources are the most important priorities of any society.

The above was presented to participants of the expert workshop "Introducing circular changes in the economy through product life cycle analysis (LCA)", which was organized by the Chamber of Commerce of Styria and held on 12th December 2019 in Maribor, Slovenia. The presentations were given by experts from the Slovenian academic institutions (University of Maribor, University of Ljubljana).

The workshop described was intended for entrepreneurs interested in the circular economy, other entrepreneurs and future entrepreneurs interested in new business opportunities, and other interested parties. The participants of the event were able to get knowledge on:

- characteristics of the circular economy,
- basics of LCA analysis and examples,
- ways to carry out and undertake LCA analysis in companies, and about
- the complexity of life cycle evaluation in energy conversion processes.

The described workshop provided an opportunity to the participants to get new knowledge and expertise on the use of product life cycle analysis that they can use while introducing new products into production.

Expert workshop "process planning and multi-criteria decision making in a circular economy" | National Institute Of Chemistry - NIC (Slovenia)

June 2021

Circular economy projects differ from conventional development projects in several aspects:

- technologies are little researched, so as a rule, demanding research and development of new technological processes and products are needed,
- generally high investment, and
- the obtained results are not highly profitable, so classical economic indicators are often unfavourable.

For the planning of processes in the field of circular economy, it is necessary to introduce multi-criteria decision-making, where, in addition to economic criteria, we also take into account environmental and social impacts, which can be addressed by life cycle analysis (LCA). Among the alternatives, we choose the one that represents a balanced compromise between all three factors, i.e. economic, environmental and social.

The above was presented to participants of the two-day event entitled "Process planning and multi-criteria decision making in a circular economy", which was organized by the Chamber of Commerce of Styria (https://www.stajerskagz.si/en/) and Competence Center on Circular Economy (https://koc-krozno-gospodarstvo.si/), and held on 29-30 June 2021 in Maribor, Slovenia. The presentations were given by experts from the University of Maribor, Faculty of Chemistry and Chemical Technology.

The two-day workshop described above was intended for participants from companies interested in the circular economy, other entrepreneurs and future entrepreneurs interested in new business opportunities, and other interested parties. The participants of the event were able to get knowledge on:

- the concept of the circular economy and sustainable development,

- methods and metrics for preliminary assessment of processes and technologies for the circular economy,
- LCA analysis as a tool for environmental design of products and processes,
- reduction of heat and water consumption through integration,
- evaluation of circular economy projects, and
- examples of sustainable production of different processes.

The described workshops provided an opportunity to the participants to get new knowledge and expertise on the use of product life cycle analysis that they can use while introducing new products into production.

Webinars and practical courses on carbon footprint | Government of Navarre & AIN (Spain)

October 2020 - ongoing

Training on how to calculate an organization, product, service or event carbon foot print for the elaboration of CO2 reduction plans

Seeing the need for training that exists to promote energy efficiency and de-carbonization of the different production sectors, the Navarra Employment Service (SNE) and the National Reference Center in Renewable Energies and Energy Efficiency (CENIFER) organized a cycle of webinars on the topic of carbon footprint (CF).

4 webinars (1h each) were carried out that are available on the YouTube channel of the SNE.

- 1st: about greenhouse gas emissions, its problematics, international, European and national initiatives to fight against global warming, the CF concept and the standards for its calculation
- 2nd: How to calculate an organization CF: scope and calculation methodologies (GHG Protocol, ISO 14064, ISO 14069)
- 3rd: How to calculate a product and service CF: standards for the calculation (PAS 2050, GHG Protocol, ISO 14067), product category rules (PCR), definition of functional unit, scope and quantification of emissions
- 4th: How to calculate an event carbon footprint: scope, methodologies, actors involved, certification and its benefits. IPCC guidelines. Practical cases.

The webinars were a success and after its execution, it was decided to expand its content with a complementary practical course (3 sessions of 2h).

The ultimate goal of the course is to stablish a CO2 reduction plan in an organisation, product, service or event. To achieve this, it must first be known and calculated the CF. This course teaches on different methodologies to calculate CF with real practical examples.

1880 visualization of the 4 webinars and 30 persons trained on the 2 practical courses, mainly from private companies.

There has been a lot of interest in the courses and a large number of people have not been able to attend due to the limitation of participants. It was planned a course of 15 people for the first semester of 2021, but due to the big number of applicants, it was carried out two courses (15 people each). The practical courses will be held again during the second semester of 2021.

The SNE supported training in online format; hence, the impulse of its own YouTube channel that has acquired a high number of followers.

The webinars have been viewed by very diverse profiles. Furthermore, they have been used as training materials and resources at different educational levels. They are open to the general public interested in viewing them.

The dissemination has been carried out through the channels that both CENIFER and SNE have established. In addition, the Department of Environment presents a budget line for the dissemination of this and others courses, with the aim of raising awareness and training companies and citizens on adaptation and mitigation to climate change.

Free open online webinars, financed with public funds, are an easy way to train a big number of people in any subject and a feasible initiative to transfer to any region.

Course "business models in the circular economy" | Government of Navarre & AIN (Spain)

November 2020 – March 2021

Concept of life cycle is not well known within professional community neither companies in general. So then, this course lands life cycle concept, explaining the needs to perform life cycle assessment to know economic, environmental and social impact of a product or service.

The training course introduces the circular economy and sustainability concepts applicable to a company, a business model and for the development of products and services. It describes the different European strategies, legislation and sector trends related to circular economy and sustainability implementation. In addition, it provides the methodology From Linear To Circular (Sustainn L2C), developed by a circular economy consulting firm, to help companies and organizations in their transition from a linear model to a circular model.

During specific sessions, life cycle concept and different methodologies are described to analyze the life cycle of products and services regarding the environmental impacts, costs impacts and social impact.

The concept Life Cycle Sustainability Assessment is developed following a consulting own methodology, combining 3 known methodologies:

- LCA, Life cycle assessment
- LCC, Life cycle cost assessment
- SLCA, Social life cycle impact assessment

Different practical exercises are carried out to understand the barriers and potential outcomes oriented to identify opportunities to improve competitiveness, sustainability and credibility for a company, business model, product or service.

10 private enterprises trained in circular models, life cycle thinking and a methodology that integrate the economic, environmental and social aspects of products and services along its whole life.

The Navarre Chamber of Commerce and Industry organises the course that is taught by a consultancy. The course is 100% financed by the Navarre Employment Service thanks to a scheme of subsidies for the execution of training programs linked to the Smart Specialization Strategy of Navarra.

Navarre Chamber, consultancy and Government of Navarre have collaborated in the development of pilots, guides, awareness and training actions to make the concepts of circular economy and life cycle reach companies.

Life cycle concept is a key aspect mentioned in directives and strategies in order to know and measure the real impact of product and services. Training courses and materials related to life cycle assessment should be implemented in any region in order to develop skills and professional to analyse life cycle of products and services and, furthermore, to integrate these skills and knowledge at the time of conceiving and developing more sustainable products and services in the future.

Life Cycle Analysis (LCA) and Carbon Footprint (CF) training courses| Government of Navarre & AIN (Spain)

April 2013 - ongoing

These courses are aimed at improving knowledge and professional skills related to the use of life cycle tools in organizations.

Life cycle thinking is a key subject considered in EU policies, giving relevance to different approaches. With the aim of bringing closer to these approaches to companies, and specifically to industrial companies, three different short training schemes have been developed in Industrial Association of Navarra (AIN) from 2013:

1. Carbon footprint (12 hours): the program is designed for participants to understand the impact of organizations, services and / or products on the environment, in particular on global warming impact category, and to know the methodologies, regulations and standards related to the emission and control of greenhouse gases. They are introduced in the calculation of the Carbon Footprint of organizations, services and / or products.
2. Life Cycle Assessment and Carbon footprint (7 hours): the course allows to know the regulatory framework, the methodology and applications of LCA and the determination of the carbon footprint. LCA as a tool that allows organizations to evaluate the environmental impacts generated by products, processes and services, and that facilitates decision-making
3. ISO 14001:2015 life cycle approach (3 hours): to identify the environmental aspects of the organization from a life cycle perspective, to develop methodologies to evaluate the environmental aspects of the organization from a life cycle perspective, to identify risks and opportunities and to control direct and indirect environmental aspects from a life cycle perspective.

37 private companies have been trained in life cycle approach, life cycle analysis, and carbon footprint. Main profile of participants was people responsible for Health, Security and Environment (HSE) in their organizations, but also from engineer and commercial departments, and general directors.

The overall assessment of the trainings was 8 over a total of 10 points, and main suggestions consisted of demanding more specific courses. Examples shown were one of the most interesting points.

Courses are scheduled again in this year.

Considering EU policies and strategies, and the role of life cycle approach in sustainable development, training courses related to life cycle thinking and life cycle methodologies are particularly interesting, with the aim of spreading the concept, facilitating the knowledge and developing professional skills regarding the use of these kind of techniques at all relevant levels. AIN, being an industrial association, has the opportunity of reaching companies, not only associated companies, but other private companies.

Training and capacity building on life cycle approaches for companies could boost eco-innovation and helps to achieve environmental regional policy targets.

Master's Degree in Circular Economy | Government of Navarre & AIN (Spain)

October 2019 - Ongoing

Integration of life cycle thinking and methodologies as part of the program of an official master´s Degree in Circular Economy.

The recent emergence of academic interest in circular economy is a clear fact, and the master gives answer to this interest. One of the specific competences to achieve with this master consists of "understanding the life cycle and the eco-design basis".

Contents related to life cycle thinking and methodologies are included in the following subjects of the master:

1. Introduction to circular economy: carbon footprint, environmental footprint, water footprint, life cycle analysis, cradle to cradle.
2. Ecoinnovation and sectorial management: life cycle analysis tools, analysis of material flows between sectors, material cycle closure.
3. Designing for circular economy: Life cycle analysis. Quantification of the environmental impacts of the life cycle of a product / industrial process and subsequent redesign. Modeling of the product / process life cycle in the software. ISO 14040. Definition of functional unit. Selection of recommended environmental indicators in the European Union. Characterization factors for the transformation of life cycle inputs and outputs to environmental indicators. Life cycle inventory and computer software databases. Reliability in databases. Analysis and interpretation of the results obtained with the software. Modeling sensitivity analysis. Normalized and weighing of the results. Ecolabelling.
4. Industrial ecology and logistics: analysis tools in industrial ecology: material flow analysis, life cycle analysis (products, processes and infrastructures).

This is a new master launched in the course 2021-2022. 15 people have enrolled this first promotion, out of which 13 have previous work experience. 3 come from social sciences, 4 from environmental sciences, 3 from Chemistry, 5 from engineering.

It is hoped that the training of experts in circular economy will allow the promotion of sustainable technologies in the Ebro Valley and, therefore, innovation and research for the adaptation of companies and institutions to the circular economy.

The purpose of the master is to train experts, raise awareness of the complexity of the management of material and energy flows and provide them with the skills to implement the principles of circular economy in companies and public and private institutions. Soon it will be necessary to have experts with extensive training capable of identifying all the complexity of the present environmental problems. Currently, there are very few specialists of this type in the world, so it is necessary to develop quality multidisciplinary training.

UNI CEI 11339 – Italian certification scheme for experts in energy management| Lombardy Region (Italy)

December 2009 - Ongoing

This Italian certification scheme for energy management experts is mandatory since 2016 to sign official documents on energy efficiency.

The EU Energy Efficiency Directive introduced in 2012 – among other prescriptions – the obligation for large enterprises to carry out an energy audit every four years. In Italy, that obligation was implemented by D.Lgs. 102/2014, which required energy audits to be carried out by certified energy experts including Energy Service Companies (ESCO) and Experts in Energy Management (EGE – Esperto in Gestione dell'Energia).

To be allowed to sign energy audits, since July 2016 EGE need to be certified by a third-party accredited body according to UNI CEI 11339 technical standard.

A professional can be certified as EGE provided that he/she has a minimum experience in the energy sector of 3-10 years (depending on the degree owned) and needs to undergo a process that includes:

- initial review of documents (training, work experience, specific activities completed, etc.)
- two written exams (a multiple-choice test and an open-question);
- one oral exam (five open questions);
- annual verification of activities performed.

A professional can be certified as EGE for the Industrial and/or the Civil sector; in case of certification for both sectors, the three above steps are carried out for each sector.

The availability in the consulting market of certified EGE increased the level of quality of produced documents (energy audits and other reports), generating on one hand an increased access to market for certified experts, and on the other hand providing clients more reliable data to invest in energy efficiency.

As of 2021 there are in Italy 1,674 EGE, certified by one of the 16 accredited certification bodies. According to a survey carried out by Accredia, EGE reported that following the certification they have achieved:

- better professional reputation (48%);
- increase in market visibility (32%);
- improvement of competencies (11%);
- easier access to tenders (10%).

Only for the compliance with the Italian implementation of the EU Energy Efficiency Directive, 25,000 energy audits were carried out so far, most of which by EGE.

This certification scheme is considered a good practice because it might constitute the reference for the creation of a new international certification scheme for LCA experts, in order to guarantee a high-quality of the LCA studies and create new opportunities for skilled professionals working in the LCA sector.

The proposed certification scheme could be articulated similarly to EGE scheme into different macro-sectors (e.g. Buildings, Industry, Transport, etc.) and require a minimum number of years of experience and of similar projects delivered as well as to undergo an exam with written and oral tests.

Viticulture Impact Assessment on the Environment (VIVA): the sustainability of viticulture in italy| Lombardy Region (Italy)

2011 – Ongoing

Calculation of product's footprint and company's environmental, social and economic impact supported by capacity building initiatives on sustainability in the supply chain

It is essential to improve the sustainability approach for companies working in agri-food production for its dependence on the natural resources use and its account of 70% of total freshwater withdrawals and 30% of anthropogenic GHG emissions.

VIVA methodology uses 4 indicators to measure the company/product impacts:

- AIR: carbon footprint based and compliant with ISO 14067:2018, ISO 14064-1:2018, ISO 14040, 14044
- WATER: water footprint based on Water Footprint Network and compliant with ISO 14046:2016
- VINEYARD: agronomic management practices based on Directive 2009/128/EC on sustainable use of pesticides and the OIV guidelines (CST 2008 guide)
- TERRITORY: socio-economic-cultural based on ISO 26000:2010, Social LCA (UNEP/SETAC 2015) and Sustainability Reporting Guidelines (GRI 2014)

According to these, the product is evaluated "from cradle to grave" through the phases:

- Agricultural (field)
- Production (cellar)
- Distribution
- Consumption and disposal

VIVA sets a training program to promote new professionalism in the agri-food system:

- Training course by the Italian Ministry of Ecological Transition in collaboration with "Università Cattolica del Sacro Cuore of Piacenza" given every six months to contribute to firms' know-how improvement and create new "green job"

- Theoretical lessons and practical workshop on available database, technical requirements on the four indicators
- E-Learning platform on:
    - social-economic-environmental impacts of wine activities monitoring
    - common standards identification for evaluation and certification of sustainability performance
    - sustainability protocols/features of verification process identification
- "Wine Observatory on Sustainability" networking web platform to share experiences, tools and best practices

The voluntary agreement signature is for free. The company costs are related to the assessment (if the service is outsourced) of VIVA indicators independently or with external consultants and the third-party certification procedure to publish the results and apply the product's label

The environmental scientific journal "Science of the Total Environment" has recognized the scientific validity of the calculation methodology underlying the analysis of the Air, Territory, Water and Vineyard Indicators. Finally, more than 90 Italian companies since 2014 have joined the VIVA program.

The project represents a starting point for a systematic integration of sustainability in wineries, to design new strategies and identify fragilities/opportunities.

To recognize the validity of VIVA certification abroad and to let the Program become a rewarding criterion for the choice of suppliers, a letter of intent has been signed together with Foreign Trade Association, Business Social Compliance Initiative-Sustainable Wine Program, supplier of the most important North-European chains of distribution and monopoly.

VIVA promotes sustainability through specific courses/workshops to consultants, verification bodies, technicians and experts in viniculture field, containing theoretical and practical parts, based on case studies. The lessons aim at providing participants information to receive VIVA certification and at giving them an essential overview of the four indicators based on the LCA approach: interpret, evaluate LCA studies, understand strengths/weaknesses of this tool and provide knowledge and methodology of performing a complete LCA. For example, the three-day course covers topics as the phases of an LCA and how to collect data, useful tips and tricks to calculate the Indicator, available data and data exchange with product/organization systems, result analysis and interpretation, allocation and system expansion, end-of-life modelling, data quality.

Training courses are given every six months and contribute to firms' know-how improvement and to create new "green job" opportunities.

PEER REVIEW

The peer review is an essential part of the exchange of experience process. Each Transnational Learning Journey foresees a peer review session focused on the local policy instruments. Before the TLJ, partners received a document presenting the context and main policy instruments of the Lodzkie region, also summarized in page 6 and following of this report. It includes the following SWOT analysis:

STRENGTHS	WEAKNESSES
• active participation in a number of international projects on circular economy; • management by the Board of the Lodzkie Region of the Regional Operational Programme; • ongoing contacts with the business community, stakeholders and the regional community - consultations with the public; • access to various statistics and databases helpful in diagnosing circular economy and potential opportunities for LCA e.g. Database on products and packaging and waste management, structural funds; • inclusion of green criteria in public tenders conducted by the Lodzkie Region in order to promote products and services with a lower environmental impact during their life cycle and to encourage entrepreneurs to apply environmental criteria; • large number of existing legal acts and documents at the national level (laws, resolutions, strategies, programmes) referring to circular economy and sustainable development, which directly affect the regions or constitute guidelines for policy-making by regional governments; • possibility of direct influence on regional policy by the Marshal's Office through Regional Programme co-financed from EU funds; • the capital city of the region is a strong academic and scientific centre.	• complex and long-lasting process of introducing changes in the regional policy instruments due to the division of competencies and participation of decision-making entities other than the Marshal's Office of the Lodzkie Region; • currently there are no specific provisions referring to LCA in the regional policy apart from the criteria for green public procurement and references in SRWŁ2030 (the main regulations referring to LCA are in national documents and they also cover regions).

OPPORTUNITIES	THREATS
• promoting EU policies in favour of environment and resource efficiency; • promotion of social activities and attitudes that favour bioeconomy and RES development in the region; • implementation of national policy concerning the introduction of a circular economy model; • openness to changes and new ideas thanks to the recruitment of young staff in LR; • creation of a regional development strategy by LR (e.g. Regional Development Strategy), which may include provisions concerning LCA; • the region authorities' efforts to introduce modern and innovative regulatory instruments; • consider including provisions relating to LCA in the criteria for awarding projects under of the regional programme for 2021-2027; • Increased introduction of topics and subjects concerning LCA at universities, especially at the Technical University of Lodz.	• vulnerability to political change and consequent possible changes in staffing, pace, direction or priorities of regional policy development; • limited allocation for LCA support activities or existence of other current or future urgent environmental needs for which the allocation can be re-allocated.

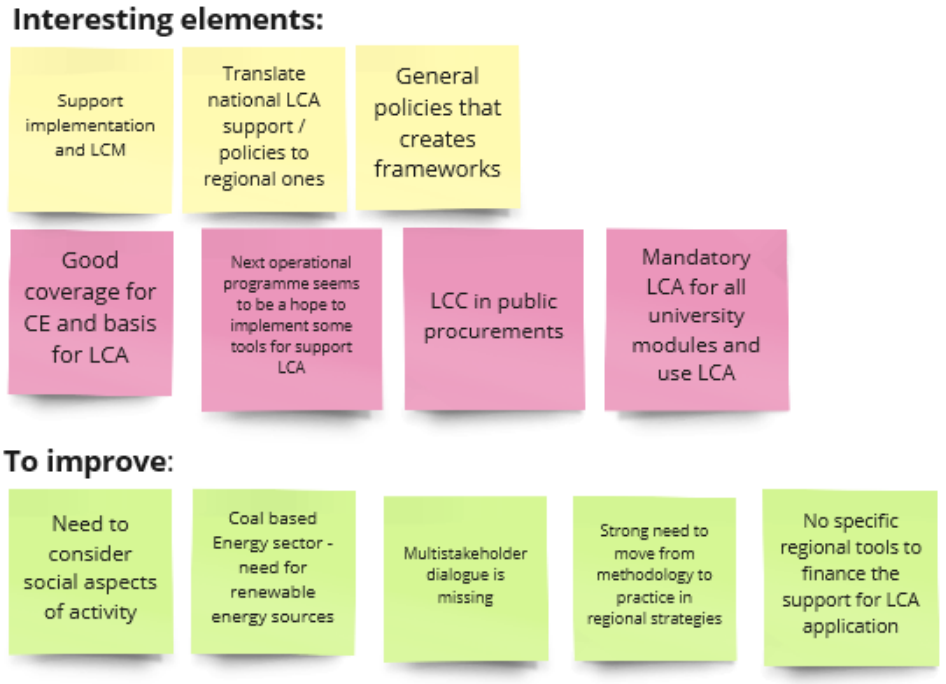
For the peer review session, participants were split into two breakout rooms, each with a local expert facilitating the peer review process. The participants were asked to provide their opinions on the regional context following three observations:

1. adequacy of policy instruments to enhance resource efficiency and environmental protection;
2. use of LCA in the application of the policy instruments
3. if the experiences presented could be replicated in their region.

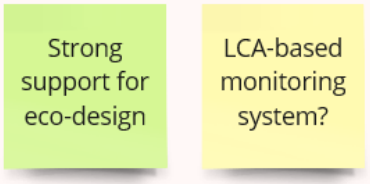
A recording of the session (excluding the breakout rooms) is available here.

The following graphics present the key elements that emerged from the peer review sessions for each of the three considerations.

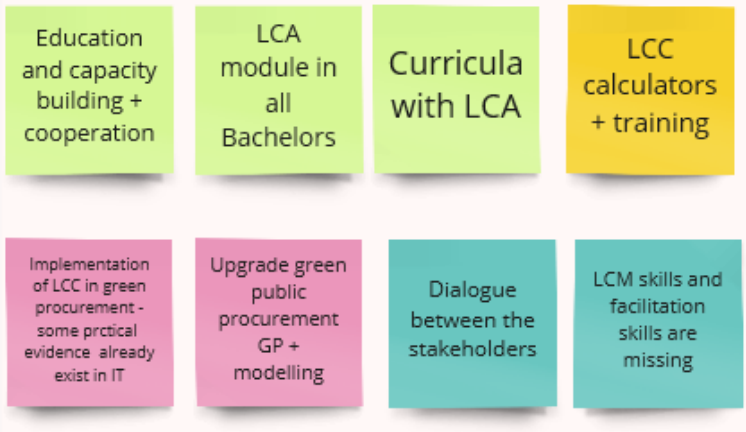
Adequacy of policy instruments to increase the use of LCA in the region



Use of LCA in the application of the policy instruments



Replication of experiences



CASE STUDIES

This TLJ included a case studies session during which students of the Lodz University of Technology presented their innovative projects.

Biodegradable disposable tableware from food waste

This project offers an innovative way to solve the food waste issue while proposing a biodegradable solution for packaging (currently 1% of the packaging on the world market). The team developed biodegradable disposable tableware using food waste as a material. From one tonne of waste, 5-16 thousand of packaging items can be produced (depending on the size). Some steps still need to be completed: sanitary inspection, appropriate storage conditions and ensuring consumer taste testing issues.

Appleather

The objective is to create a new type of vegan leather which is free of harmful plastics and based on recyclable materials. To produce it, apple waste products are used and Symbiotic Culture of Bacteria and Yeast (SCOBY) cultivated to produce bacterial cellulose. After treatment, a material with high tensile strength that can withstand a lot of stress while being pulled or stretched before breaking is obtained. The so-called Appleather is easy to dye, making it an attractive alternative for the production of consumer articles.

More in the presentation on the LCA4Regions website.

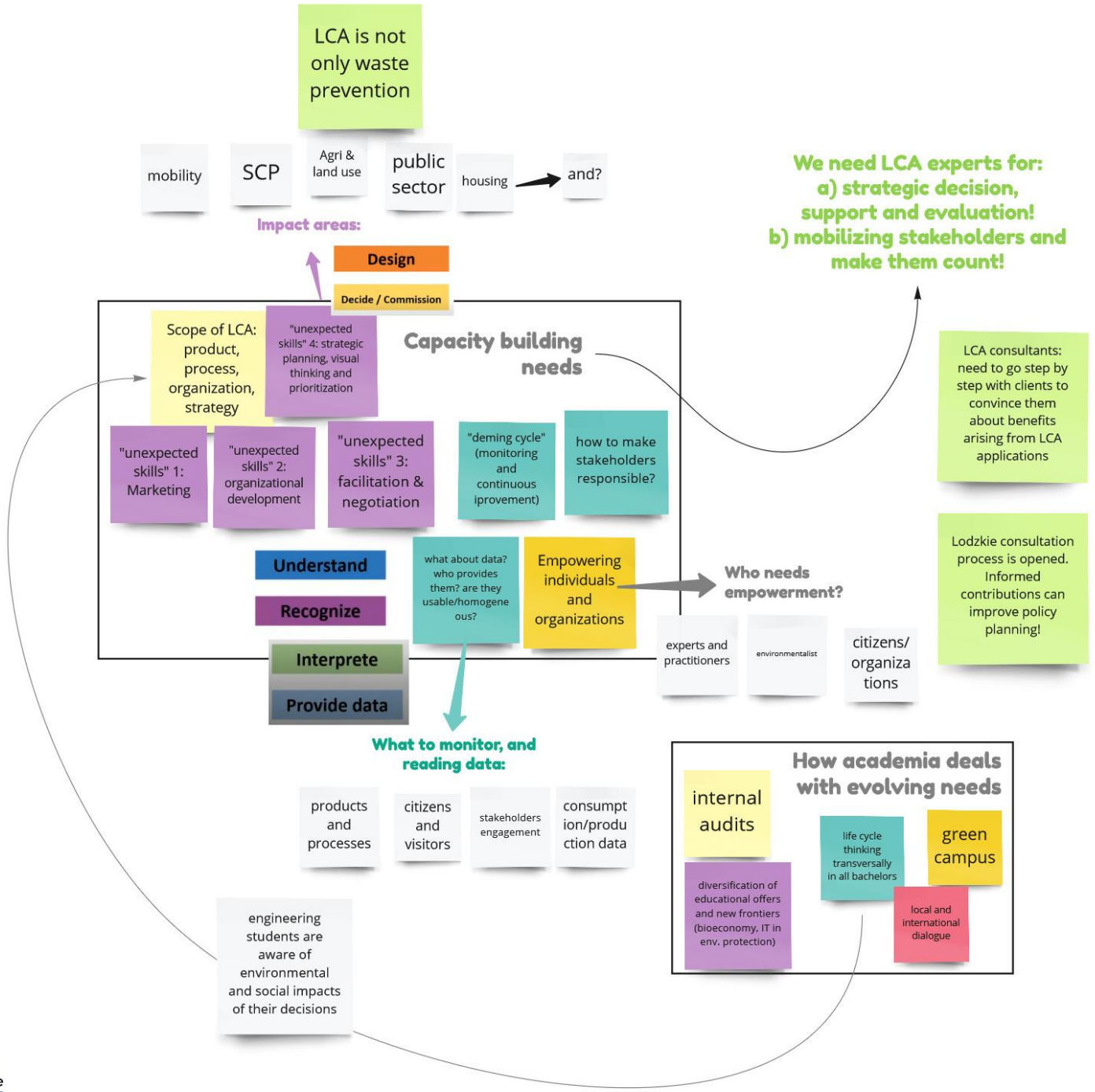
TLJ #5 Lessons learnt

Starting from the idea that LCA experts are needed for strategic decision, support and evaluation, and to mobilize stakeholders, partners came to the conclusion that more training would be beneficial not only in the academic or scientific sectors but also more transversally, at different functions and levels. It is important to empower individuals and organisations, in particular practitioners and citizens who need to understand and be convinced of the benefits arising from LCA applications. When it comes to universities, participants praised the offer available in the host region, where LCA is taught across different programmes and curriculum. In general, green skills should be made more appealing for students and life cycle thinking as an approach should be included transversally in all bachelors. Engineering students need to be aware of the environmental and social impact of their decision. In addition, training opportunities are spread out so networking should be enhanced. The UNEP Life Cycle Assessment Training Kit and Life Cycle Thinking e-learning package, the FSLCI summer schools, the UNESCO LCA centre in Barcelona, and the EU Platform on Life Cycle Assessment count among examples of international training and source of information.

Good Practices identified by the LCA4Regions partners abound in the same direction: there are trainings being organised, more than thought, but interlinkages should be reinforced to promote cooperation. Often, they are aimed at business or academic not so much at public administrations and focus on how to undertake an LCA rather than how to implement the results (life-cycle management). However, these Good Practices provided inspiring examples of how to cooperate with and involve stakeholders from private sector in the conception of LCA trainings as it is done in the life cycle training organised by Navarra (in Spain) or by the KEINO Academy for sustainable procurement management in Finland. The recommended inclusive approach that emerged from the discussions is already experimented by the Kaunas

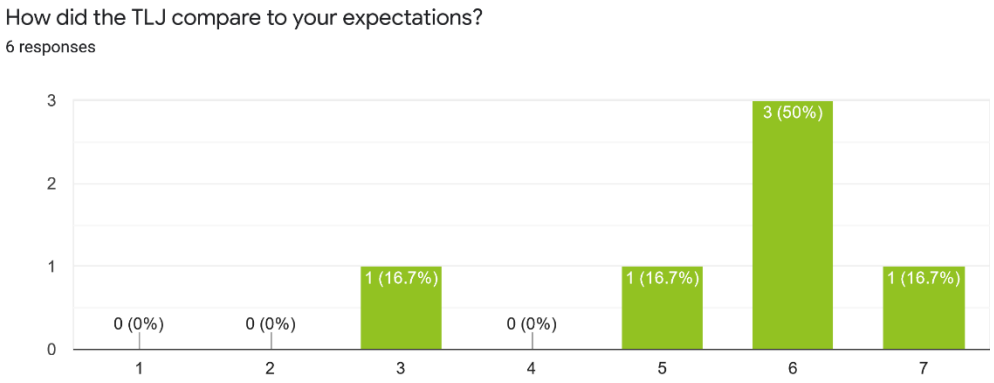
University of Technology (Lithuania) where sustainability is embedded in the university values, through transversal actions, and where eco-design and sustainable development modules are included in various bachelor, master, and doctorate programmes. In general, partners agreed that the good practices and study cases presented could usefully be transferred to their territory.

A visual summary of the TLJ discussions and outcomes is provided in the image below.

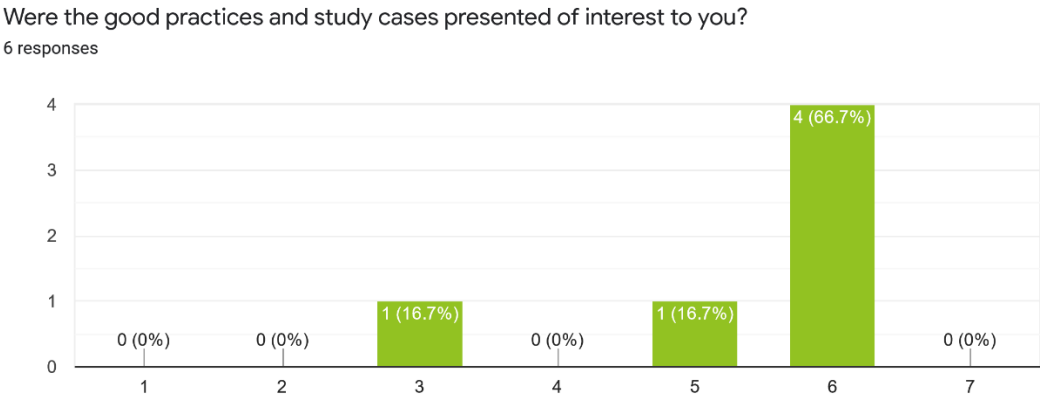


Participants' feedback

The overall evaluation of the TLJ is highly positive, although it seems that it satisfied a little bit less participants than the other TLJs did.



This being said, participants highlighted the improvments made during this TLJ in terms of content with more relevant case studies and presentations but also with a smoother organisation (in particular the peer review session) and more balanced structure.



To improve the agenda of the next TLJ, participants recommend to look for as many examples of good practices as possible and to provide a summary of the presentations beforehand. There is also a suggestion to dedicate some time to discuss the good practices the day after their presentation so a deeper analyse is possible with "fresh minds".

Regarding the peer review, participants shared mixed feelings. This specific session was successfully organised, participants appreciated the preparation before the TLJ, on the side of the Lodzkie Region but also of the regions sharing their evaluation, and the presentation of the policy context. Nonetheless, it is not clear if the feedback shared (and received) was satisfactory. Doubts are also arising regarding the usefulness of the exercise in general. One of the participants explained that "the process of applying for an LCA locally or regionally is a very complex process. Thus, which good practices could benefit from what is chosen depends on the policy makers, and with them the processes become even more complex when it comes to coordinating the operational programs between the institutions".

In the event that the next TLJ will once again take place online, the following advices are to be taken into consideration for the next peer review session:

- divide the session to offer deeper analysis on certain aspects and give a better structured feedback;
- discuss more concrete questions;
- present and discuss not only the regional policy instruments but also possible improvements that could be brought to implement life cycle thinking on a specific policy instrument so partners can share feedback also on theses;
- continue to prepare more in advance, for example by sending comments and questions on the policy instruments some days before the TLJ for the host region to have time to prepare the answer.

Stakeholders' involvement is always a tricky point of the TLJ in its online version as it is difficult to involve stakeholders in online events when they are not presenting (e.g. a good practice) resulting in an uneven representation of these key actors of the project. For this TLJ, stakeholders from three partners actively joined the session and good practice presentation while others only listened. This lack of active participation might be due to a fatigue of online events or lack

of resources (humand and time). This is another point to be again improved as having online event is also an opportunity for more stakeholders to take part in the exchange of experience and for partners to learn directly from the owners initiatives. Maybe more dissemination targeting stakeholders could be done.

Following this TLJ, partners will share the main outcomes with their stakeholders and analyse the topics deeper. One partner will work on awareness raising among different stakeholders group while another is planning to make LCA more transparent and accessible to university students (after having noticed that citizens' awareness on sustainable issues need to be increased and that training students from school and university is needed).

And to finish, the TLJ in one word, as defined by participants:

Educative! | Excellent :) | Nice ! | eye-opener | Awareness | Good

Conclusion

This TLJ enabled the LCA4Regions partner to explore a topic often set-aside in the discussion about LCA. It comforted them that the decision to focus one of the TLJs on training and capacity building in LCA, made at the genesis of the project, was right. Indeed, transversal skills and vocational training for LCA should be explored to accelerate the integration of LCA in public policies.

At the end of the three days, partners concluded that training opportunities exist but are spread out. In addition to increasing the cooperation between LCA training providers, they recommend widening the scope of these trainings to focus also on how to implement the results of an LCA. Another way to mainstream LCA would be to train not only experts and researchers but also those who benefit from it like citizens, organisations, and environmentalists. These conclusions, similarly to those already made, will be helpful in the elaboration of the Action Plans.

The progressive return to a "normal life" and physical meetings brings the hope that the remaining TLJs will take place in person in the host territory. Nonetheless, the LCA4Regions partners can now say that they have found an adequate and effective manner to carry on their exchange of experience online.

The next TLJ will take place in November 2021, organised by the Lombardy Region. It will tackle the topic of evaluation and monitoring for LCA.