

# Good Practices Guide

Promoting life-cycle based approach in policy instruments through the introduction of the Life Cycle Assessment methodology

JANUARY 2022

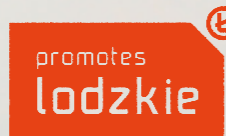
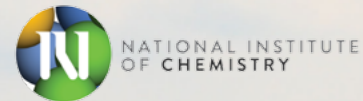
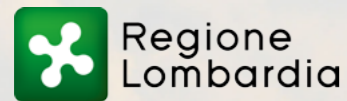


**LCA4Regions**  
Interreg Europe



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

This document has been written by the LCA4Regions partnership and reflects their views; the Interreg Europe programme authorities are not liable for any use that may be made of the information contained therein.



## Content Index

LCA4Regions project	.5
The Good Practices	.6
Life Cycle Methodologies	.8
Selected Good Practices for the Guide	.10
Map of selected Good Practices	.12
Good Practices for Resource efficiency	.15
Good Practices for Waste and material flows	.27
Good Practices for Public procurement	.37
Good Practices for Training and capacity-building	.47
Good Practices for Monitoring and evaluation	.57



# The LCA4Regions project



Nowadays, public policies are often implemented with no connection to other policies, increasing the risk of experiencing unwanted side-effects. To overcome this issue, life cycle methods as a holistic approach can be applied when conceiving and implementing public policies related to environmental protection and resource efficiency.

## THE CONTEXT

Life cycle is not a new field; however, its expertise resides mainly in the business sector whereas public authorities are less familiar with the techniques and their functioning. Therefore, to ensure a full success of policy implementation, it is necessary to transfer the expertise of the private sector to governmental authorities. The outcomes of improved public policy implementation brought by the use of life cycle methods are manifolds: greater concordance with stated sustainability objectives, fewer unwanted side-effects or greater transparency in the compromises and offsets that need to be made to move ahead on sustainable economic targets.

Each region of the LCA4Regions project has its own characteristics, methods of design and implementation of policies. Nevertheless, all of them face a common challenge: the adoption of a more efficient use of natural resources to reduce the non-desirable secondary effects (spill-overs) that generate negative economic and environmental impacts.

## THE LCA4REGIONS PROJECT

LCA4Regions is a European project, funded under the Interreg Europe programme, expected to contribute to the more effective implementation of environmental policy instruments by the application of Life Cycle Methodologies.

Since August 2019, **nine partners from 7 different regions across Europe** – Government of Navarra (ES), Industrial Association of Navarra (ES), Kaunas University of Technology (LT), Pyhäjärvi Institute (FI), Baixo Alentejo Intermunicipal Community (PT), Lombardy Region (IT), National Institute of Chemistry (SI), Lodzkie Region (PL), and ACR+ (BE) as advisory partner – are cooperating in this **four-year project**.

The project is organized in two phases:

- 1. Interregional learning (2019-2022): Transnational Learning Journeys** took LCA4Regions partners to thematic **workshops, study visits and peer reviews**, where they shared regional experiences, challenges, opportunities, and exchange good practices with the support of local **stakeholders and experts**. As a result, the seven regions involved have incorporated their learnings into concrete action plans.
- 2. Implementation (2022-2023):** Partners **implement** their Action Plans involving relevant stakeholders, **monitor** their results, **discuss the results** with the relevant regional stakeholders and beneficiaries, and **share solutions** with other European regions.



# The Good Practices

Five interlinked **thematic pillars** have been analyzed in the Transitional Learning Journeys, allowing project partners to identify and exchange relevant good practices existing on their territories. These Thematic Pillars, or areas of interest are:

LCA for resource efficiency

LCA in waste and material flows

LCA in public procurements

Training and capacity building in LCA

LCA in monitoring and evaluation



A total number of 57 Good Practices have been identified and shared throughout the project implementation. They are available on LCA4Regions website (<https://www.interregeurope.eu/lca4regions/good-practices/>), and are the following:

- Substitution of Hazardous substances in Process industry using results of Life-Cycle Assessment
- Environmental Impact Assessment of Renovated Multi-apartment Building using LCA
- Resource efficient land use to promote sustainable land design and development
- LCA for evaluation of construction works
- Awards: Mais Alqueva, mais Valor (More Alqueva, more value)
- An ongoing measure of energy retrofit and sustainable renovation of public housing building stock
- Energy and resource efficiency in hotel industry
- LCA in reducing CO2 emissions in the production of building components
- Environmental Product Declaration as an example of LCA application in construction
- Calculation of Carbon Footprint in services of the Commonwealth of the Region of Pamplona

- New district heating and biomass in the framework of the Efidistrict project
- Application of Life-Cycle Assessment in optimization of municipal waste management systems
- Lithuanian's deposit system
- Processing alternatives of biodegradable waste- anaerobic digestion, energy & biofuel
- Life cycle environmental impacts of construction wood waste and packaging waste processing methods
- Promoting the valorisation of material from pruning vineyards.
- Optimization of the regional management of Construction & Demolition Waste through the LCT approach
- Admixtures for bituminous conglomerates
- Cantiere Green Protocol
- GERLA project: Waste management in Lombardy – Life cycle assessment
- URSA - Alqueva by-products circulation units
- Life cycle assessment of different types of graveyard candles

- Comparative life cycle assessment of alternative packaging materials for beverage
- Redistribution of charges for environmental pollution into pro-environmental investments
- The carbon footprint of the activities of the Food Bank of Navarra (BAN)
- AgroPaper, a sustainable and biodegradable solution for the agricultural mulching technique
- Management of sustainable procurements at municipal level
- Execution of energy planning for building procurement
- Public Procurement for Innovation
- Purchase of operational leasing and other associated services for electric and hybrid cars
- Call for tender. "Environmental footprint" and "Environmental footprints project 2018"
- The Expo we learned – the legacy of a mega event in a circular economy perspective
- Green public procurement and LCC in practice – Green vehicles
- Green public procurement in Slovenia
- Active support of the contracting authority by the Public Procurement Office through LCC calculators
- Manuals of the Public Procurement Office for the dissemination of green procurement and the life cycle.
- Environmental clauses in the contract for Pamplona street cleaning services
- Healthy and sustainable menus in municipal schools of Pamplona
- Study module: Life Cycle Assessment
- KEINO Academy for sustainable procurement management

- E-learning course on construction and demolition waste: prevention and recovery
- Viticulture Impact Assessment on the Environment (VIVA)
- UNI CEI 11339 – Italian Certification Scheme for Experts in Energy Management
- Training and capacity building on circular economy and LCA in Slovenia
- Training and capacity building on LCA in Slovenia
- Capacity building in life cycle assessment - Lodz University of Technology
- Life Cycle Analysis (LCA) and Carbon Footprint (CF) training courses
- Course "Business Models in the Circular Economy"
- Master's Degree in Circular Economy - Campus Iberus
- Webinars and practical courses on carbon footprint
- Lithuanian Building Sustainability Assessment System
- Doing good: carbon handprints as assessing positive impacts of companies and the public sector
- Wines of Alentejo Sustainability programme - WASP
- LCA monitoring and evaluation in carbon footprint calculations using computer software
- National Registry of Carbon Footprint (CF), CO2 compensation, and CO2 absorption projects
- Regional Green House Gas (GHG) emissions Inventory
- Carbon footprint (CF) calculation of the Departments activity in Government of Navarra

# Life Cycle Methodologies

The LCA4Regions project is focused on expanding the use of life cycle methods as a holistic approach when conceiving and implementing public policies related to the environment protection and resource efficiency.

Life-cycle assessment is one of the methods that can be applied. It is a technique - widely used by businesses - to assess environmental impacts associated with all the stages of a product's life, from raw material extraction to waste management or treatment disposal.

**Life Cycle Tools, Procedures and Concepts referred in the Good Practices are:**

## Life cycle systems and concepts



**Circular economy:** The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended. (European Parliament)



**Industrial ecology:** Industrial ecology is the study of systemic relationships between society, the economy, and the natural environment. It focuses on the use of technology to reduce environmental impacts and reconcile human development with environmental stewardship while recognising the importance of socioeconomic factors in achieving these goals. (International Society for Industrial Ecology (ISIE))

## Life cycle assessment tools and methods

They generate information and understanding of life cycle impacts.



**Life cycle assessment LCA\* (materials, energy):** Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle. (ISO 14040)



**Carbon footprint (CF\*):** A total product carbon footprint is a measure of the direct and indirect greenhouse gas (GHG) emissions

associated with all activities in the product's life cycle. Products are both goods and services. (UNEP/SETAC, 2009)



**Materials flow assessment (MFA):** Systematic assessment of the flows and stocks of materials within a system defined in space and time. (Brunner and Rechberger, 2004)



**Environmentally extended input-output tables (EEIO):** The data presented by national statistical agencies as supply-use tables (also known as "make-use tables") and direct requirements tables. The environmental extension is an inventory of the elementary flows for each unit process in these tables. (Life Cycle Initiative)



**Social life cycle assessment (S-LCA\*\*):** A social and socio-economic life cycle assessment (S-LCA) is a social impact (real and potential impacts) assessment technique that aims to assess the social and socio-economic aspects of products and their positive and negative impacts along their life cycle. (UNEP/SETAC, 2009)



**Life cycle sustainability assessment (LCSA\*\*):** Refers to the evaluation of all environmental, social and economic negative impacts and benefits in decision making processes towards more sustainable products throughout their life cycle. (UNEP/SETAC, 2011)



**Organizational LCA (O-LCA\*\*):** Compilation and evaluation of the inputs, outputs and potential environmental impacts of the activities associated with the organization adopting a life cycle perspective. (ISO/TS 14072)



**Life cycle costing (LCC):** Compilation and assessment of all costs related to a product, over its entire life cycle, from production to use, maintenance and disposal. (UNEP/SETAC, 2009)

## Life cycle management tools

Actions that are taken based on the understandings (in some cases management actions can be taken without a prior LCA).



**Eco-design:** Systematic approach, which considers environmental aspects in design and development with the aim to reduce adverse environmental impacts throughout the life cycle of a product. (ISO 14006)



**Eco-labels:** Label which indicates the overall environmental preference of a product within a product category, over life cycle considerations. (ISO 14024)



## Environmental Product Declarations (EPD\*)/ Product Environmental Footprint (PEF\*):

EPD: Environmental declaration providing quantified environmental data using pre-determined parameters, and where appropriate, additional environmental information. (ISO 14025)



PEF: It is the European Union recommended Life Cycle Assessment based method to quantify the environmental impacts of products (goods or services). (Commission Recommendations 2013/179/EU)



**Product-service system (PSS):** It is a competitive system of products, services, supporting networks and infrastructure. The system includes product maintenance, parts recycling and eventual product replacement, which satisfy customer needs competitively and with lower environmental impact over the life cycle. (UNEP)



**Circular/ Sustainable Materials Management (SMM):** Sustainable materials management is a systematic approach to using and reusing materials more productively over their entire life cycles. (UNEP)



## Circular public procurement (CPP) / Sustainable public procurement (SSP):

CPP: The process by which public authorities purchase works, goods or services that seek to contribute to closed energy and material loops within supply chains, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across their whole life-cycle. (European Commission)

SPP: A process whereby public sector organisations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organisation, but also to society and the economy, whilst minimizing, and if possible, avoiding, damage to the environment. (UNEP)



**Green Purchasing (GP):** A process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured. (Communication (COM (2008) 400))

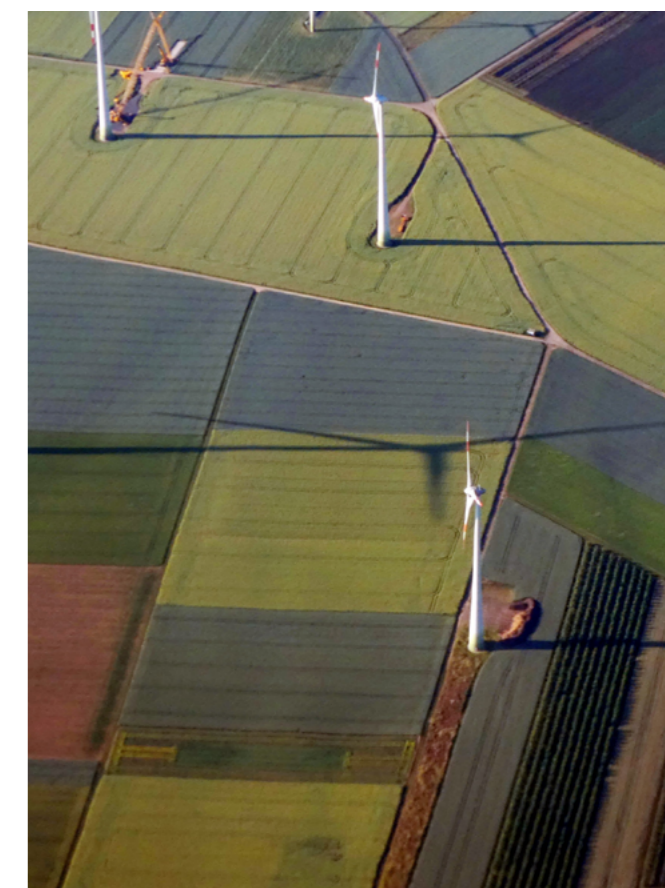


**Sustainability reporting:** Organization's practice of reporting publicly on its economic, environmental, and/or social impacts, and hence its contributions – positive or negative – towards the goal of sustainable development. (Global Reporting Initiative (GRI))

This is not an exhaustive list, but it includes those identified in the project's Good Practices.

(\*) Some of the above have become standardized procedures under international agreements or practices.

(\*\*) Some of these instruments are not yet so mature for addressing regional sustainability issues, and thus are less commonly used despite their potential value.



# Selected Good Practices for the Guide

This guide gathers a selection of 21 Good Practices chosen by the LCA4Regions partners, divided according to five themes following the Thematic Pillars (Resource efficiency; Waste and material flows; Public procurement; Training and capacity-building; Monitoring and evaluation).

The selection has been made according to the following criteria:

- Proven successful, tangible results
- Potential for learning and inspiration
- Use of life cycle tools and methods
- Replicability and the potential use in public policies

## Selected Good Practices

### LCA for resource efficiency

1. LCA for evaluation of construction works



2. Environmental Impact Assessment of Renovated Multi-apartment Building Using LCA



3. Environmental Product Declaration as an example of LCA application in construction



4. Calculation of Carbon Footprint in services of the Commonwealth of the Region of Pamplona



5. Resource efficient land use to promote sustainable land design and development



### LCA in waste and material flows

6. Optimization of the regional management of Construction & Demolition Waste through the LCT approach



7. GERLA project: Waste management in Lombardy – Life cycle assessment



8. URSA - Alqueva by-products circulation units



9. Application of Life-cycle assessment in optimization of municipal waste management systems



## Life Cycle tools

## Selected Good Practices

## Life Cycle tools

### LCA in public procurements

10. Green public procurement in Slovenia



11. Manuals of the Public Procurement Office on the use of green procurement and the life cycle



12. Active support of the contracting authority by the Public Procurement Office through LCC calculators



13. Green public procurement and LCC in practice – Green vehicles



### Training and capacity building in LCA

14. Training and capacity building on circular economy and LCA in Slovenia



15. Course "Business Models in the Circular Economy"



16. Capacity building in life cycle assessment - Lodz University of Technology



17. KEINO Academy for sustainable procurement management



### LCA in monitoring and evaluation

18. National Registry of Carbon Footprint (CF), CO2 compensation, and CO2 absorption projects



19. Wines of Alentejo Sustainability programme - WASP



20. Regional Green House Gas (GHG) emissions Inventory



21. Doing good: carbon handprints as assessing positive impacts of companies and the public sector



# A map of selected Good Practices

## LCA for resource efficiency

- 1 LCA for evaluation of construction works
- 2 Environmental Impact Assessment of Renovated Multi-apartment Building Using LCA
- 3 Environmental Product Declaration as an example of LCA application in construction
- 4 Calculation of Carbon Footprint in services of the Commonwealth of the Region of Pamplona
- 5 Resource efficient land use to promote sustainable land design and development

## LCA in waste and material flows

- 6 Optimization of the regional management of Construction & Demolition Waste through the LCT approach
- 7 GERLA project: Waste management in Lombardy – Life cycle assessment
- 8 URSA - Alqueva by-products circulation units
- 9 Application of Life-cycle assessment in optimization of municipal waste management systems

## LCA in public procurements

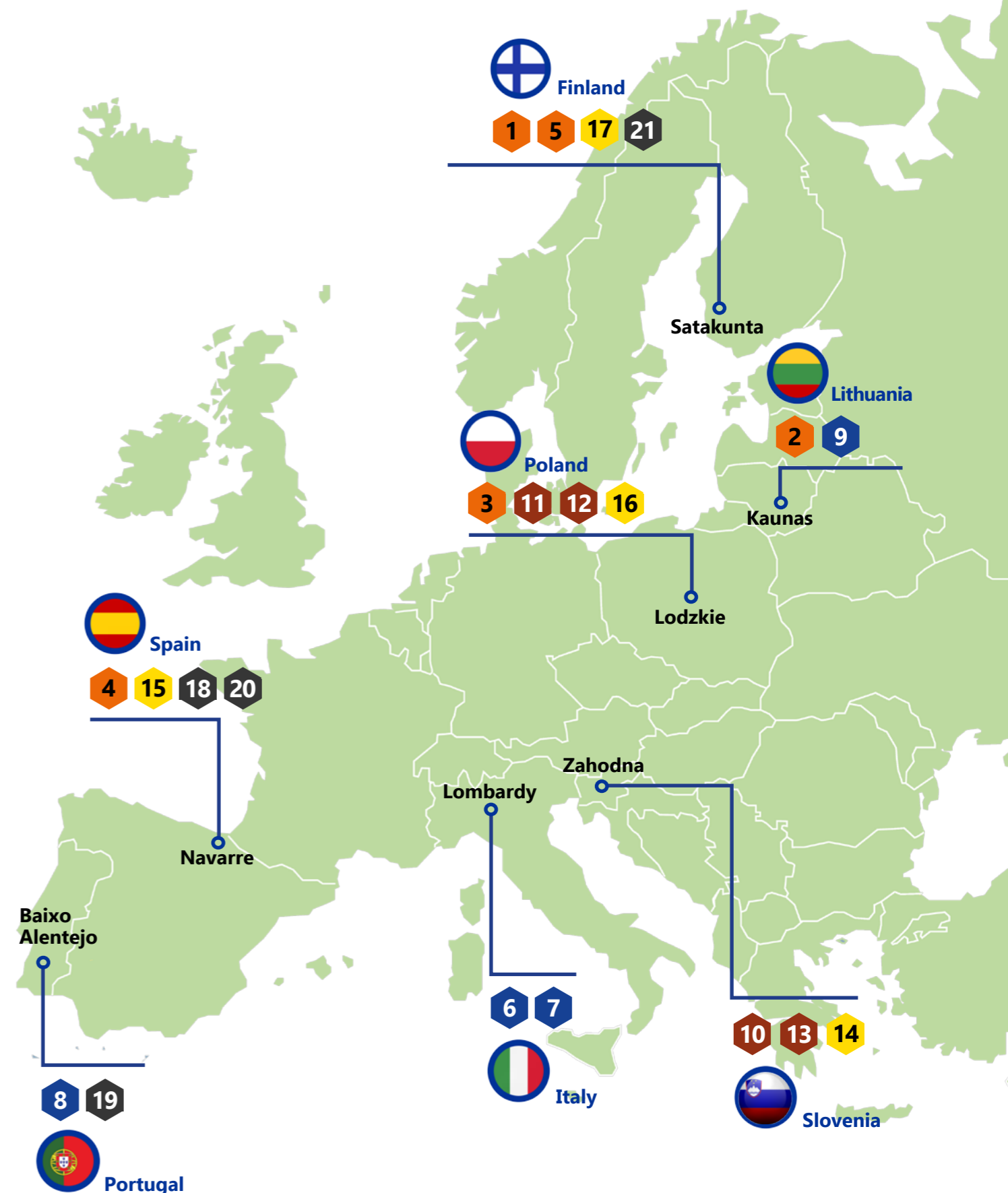
- 10 Green public procurement in Slovenia
- 11 Manuals of the Public Procurement Office on the use of green procurement and the life cycle.
- 12 Active support of the contracting authority by the Public Procurement Office through LCC calculators
- 13 Green public procurement and LCC in practice – Green vehicles

## Training and capacity building in LCA

- 14 Training and capacity building on circular economy and LCA in Slovenia
- 15 Course "Business Models in the Circular Economy"
- 16 Capacity building in life cycle assessment - Lodz University of Technology
- 17 KEINO Academy for sustainable procurement management

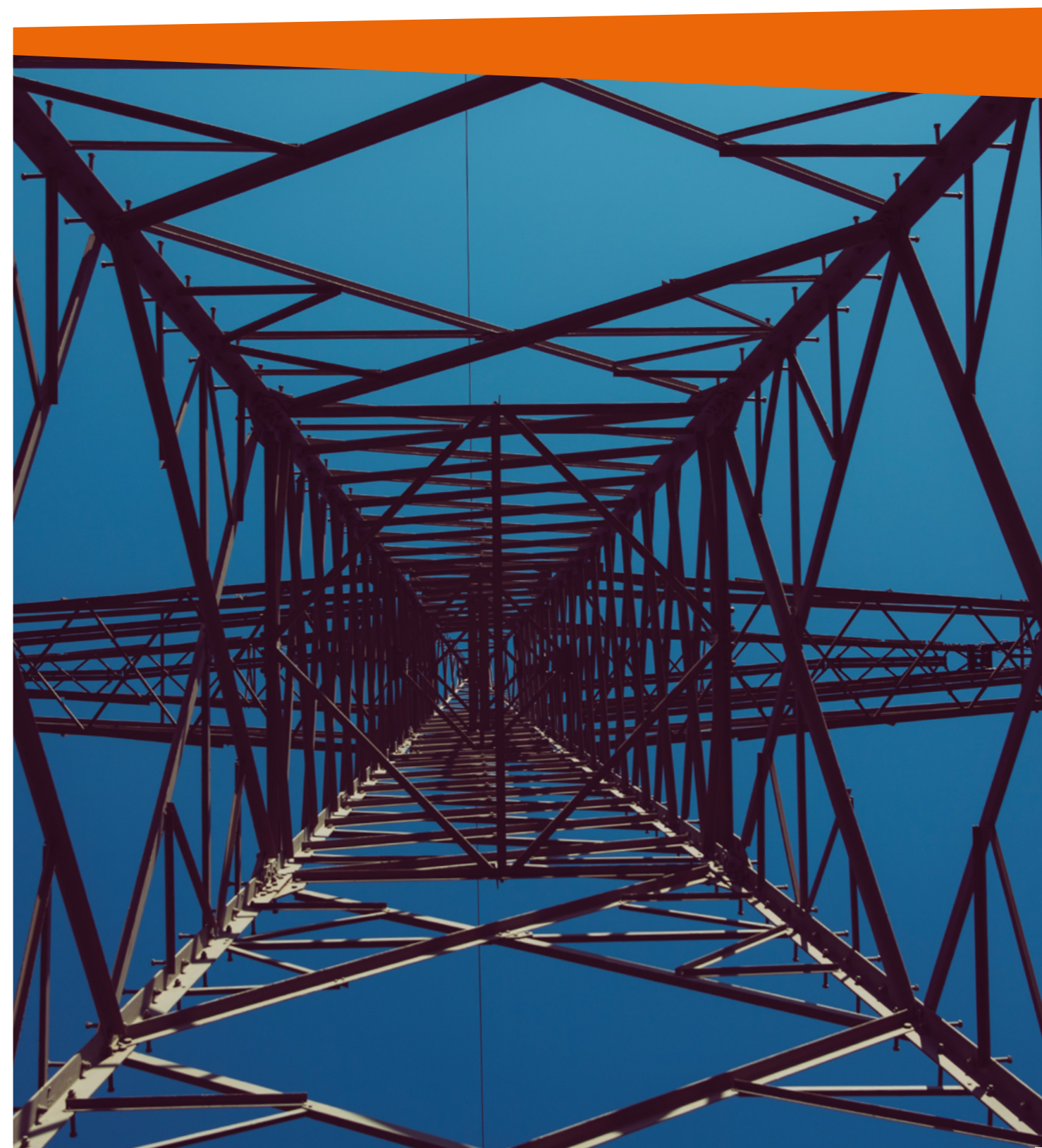
## LCA in monitoring and evaluation

- 18 National Registry of Carbon Footprint (CF), CO2 compensation, and CO2 absorption projects
- 19 Wines of Alentejo Sustainability programme - WASP
- 20 Regional Green House Gas (GHG) emissions Inventory
- 21 Doing good: carbon handprints as assessing positive impacts of companies and the public sector



Thematic pillar

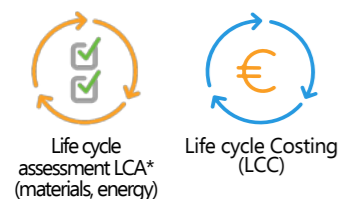
# **LCA for resource efficiency**







## Good Practice n° 1 LCA for evaluation of construction works



### THE PRACTICE

City of Helsinki implements the carbon footprint roadmap for Finnish construction industry as an approach to become carbon neutral city by 2035 (Carbon neutral Helsinki 2035 Action Plan). Sustainability issues are proactively implemented here.

LCA and LCC exercise (time 100 years) were conducted to obtain high quality and comparability from data of similarly designed, sized, and with similar energy efficiency criteria but with different materials. LCA started from design, and data is continuously collected. Demolition phase was also evaluated.

The Housing Finance and Development Centre of Finland (ARA) assigned Bionova Ltd for calculations. Target housing projects were at the same location (address Taidemaalarinkatu 4 & 6), thus enabling accurate calculations and comparisons.

Information models, construction plans & material indexes were used. Level(s) reporting framework method was used for calculations according to EN 15978 (Report: <http://urn.fi/URN:ISBN:978-952-361-032-3>). App "One Click LCA"

Multi-storied buildings were constructed by concrete or wood materials. LCA and LCC were used to obtain comparable data for the time span of 100 years.

**THE HOUSING FINANCE AND DEVELOPMENT CENTRE OF FINLAND (ARA)**  
Helsinki-Uusimaa, Finland (Suomi)

**Date: February 2018 - Ongoing**

(Finnish produce) was used as a calculation tool using emission profiles prior calculated for Finnish construction materials and Helsinki Energy Ltd. Potential re-use of demolition materials was evaluated. Construction companies, municipalities are the main stakeholders.

### RESOURCES NEEDED

Bionova Ltd made calculations. Two persons involved, approximately 4 months work.

### EVIDENCE OF SUCCESS

The set-up enabled reliable comparison from LCA perspective. Several comparisons were made. Wood-based building showed 20 % less emissions, when materials were assessed. When total emissions for 100 y. were compared, wood-based building produced 6% lower emissions, due to lower energy efficiency of the building. Energy use is the main contributor of emissions in constructions.

### DIFFICULTIES ENCOUNTERED

The standardized emission calculation tool does not take into account lowered energy emissions during examined time period.

### POTENTIAL FOR LEARNING OR TRANSFER

LC calculation tool development is essential to evaluate GHG emissions. The practice guides constructions for sustainability. Setting targets in construction projects is necessary.

This practice was designed for social housing sustainability development and used guiding document "Using building information models (BIM) in for social housing sustainability development".

The practice showed that emissions can be cut in construction works. It can be utilized easily for all kinds of construction projects, where GHG emissions calculations and reductions are targeted.

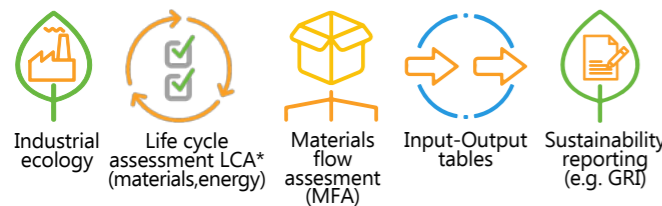


Further information





## Good Practice n° 2 Environmental Impact Assessment of Renovated Multi-apartment Building Using LCA



### THE PRACTICE

Lithuanian multi-apartment buildings were studied for the environmental impact assessment using Life cycle approach, as these buildings were built during 80's where the energy consumption was much higher than in the average EU member states. In recent times, the old buildings were revised by Governmental agencies through the modernization process. However, the process of renovation and the materials used during the process inclined to speculate its sustainability. Therefore, renovated buildings in Kaunas city were evaluated for the environmental impact using the Life Cycle Assessment.

The environment impact study of the identified buildings using LCA was carried out following the procedure and recommendations indicated in the European standards series – ISO 14040 and ISO 14044. This assessment covers the impact of construction materials, and the assessment of the heat

The Life cycle has shown that renovation measures for multi-apartment buildings could reduce the impact on the climate change from 12% and 48%.

**KAUNAS UNIVERSITY OF TECHNOLOGY**  
Lietuva, Lithuania (Lietuva)

**Date: January 2018 - May 2018**

energy use pattern. It is said that the renovated buildings using conventional materials without any renewable measures have a great impact on climate change.

Moreover, the potential savings in thermal energy used for space heating and domestic hot water preparation are 25% and 40% after conventional renovation and renovation with renewable measures, respectively. It was concluded that the total climate change potential could be reduced from 12% and 48% by retrofitting combined with renewable energy measures.

The main stakeholders and beneficiaries are owners of apartments and its communities and Kaunas city.

### RESOURCES NEEDED

The LCA was performed by a group of scientists (3 scientists were involved for 6 months) from the Institute of Environmental Engineering of Kaunas University of Technology. The LCA based on data provided by renovation manager.

### EVIDENCE OF SUCCESS

This assessment covers the impact of new materials added, and the operational energy use. The

study reveals that renovation stage accounts for 19% CO2 emission. The renovated buildings with renewable measures have a significant positive impact over climate change than conventional renovation measures.

Moreover, the potential savings in thermal energy used for space heating and domestic hot water preparation are 25% and 40% after conventional and renewable measures renovation, respectively.

### DIFFICULTIES ENCOUNTERED

European buildings are responsible for 40% of energy consumption and 35% of CO2-eq emissions. EU has set target for 2030 to cut down emissions at least by 32.5%. Data availability in construction sector, as well as persuasion of local decision makers regarding the LCA methodology benefits.

### POTENTIAL FOR LEARNING OR TRANSFER

In fact, renovation will be the key strategy to reduce the environmental impacts from the existing buildings in coming years. Life Cycle Assessment (LCA) is a versatile tool, used for different assessments, such as embodied impacts, emissions, usage of natural resources of a product or service for their entire life cycle, would be very useful for the environmental impacts assessment.

The GP could help other regions from the lessons learned during its implementation in our region. After implementation of the GP it was concluded



that the total climate change potential could be reduced from 12% and 48% by retrofitting combined with renewable energy measures. Various financial schemes have undertaken to modernise the buildings to ensure energy efficiency.

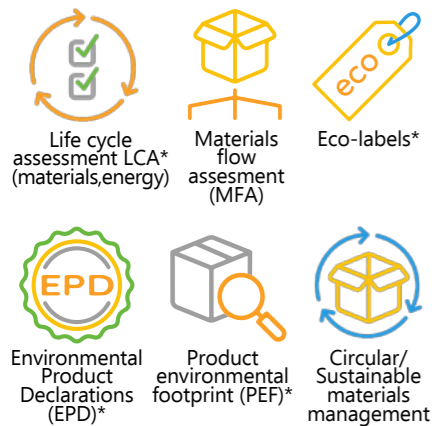
Integrating LCA at regional level could improve the decision making, consumer/builder's awareness in selecting the materials during construction, help to improve the standardization of the policies and with procurement.

Further information





## Good Practice n° 3 Environmental Product Declaration as an example of LCA application in construction





### THE PRACTICE

This is an example of how one of the largest producers of construction chemicals in Poland used LCA in construction products. The company obtained a type III environmental declaration (EPD) based on the LCA for the thermal insulation system intended for thermal insulation of external walls of buildings with polystyrene. The insulation system consists of many elements, incl. adhesive mortars, thermal insulation, plasters.

In Poland, effective energy insulation of new buildings is mandatory but EPDs are not mandatory. The EPD initiative in the firm resulted from following global trends and the willingness to meet future EU requirements on the commercial market.

### Development of Environmental Product Declaration using LCA analysis for thermal insulation systems in the construction industry.

 **ATLAS Sp. z o. o**  
Łódzkie, Poland (Polska)  
 **Date: March 2014 - Ongoing**

The company developed the EPD in 2014 for the first time (<https://bit.ly/3orK75A>) and renewed in 2019 (e.g. <https://bit.ly/3hbYH31>). In the process of obtaining EPD used LCA frameworks such as: ISO14044: 2006; ISO14025: 2006; ISO21930: 2017; EN15804: 2012; PN-EN15942: 2012. Calculations were made for the "cradle-to-gate" approach, taking into account the supply of raw materials, transport and production.

The EPD was issued by the nationwide institution: Building Research Institute in Warsaw which conducted an LCA analysis based on data provided by the construction company (data collection: 6 months).

The analysis included parameters defining the basic environmental impacts, parameters describing resource consumption and the amount of waste. The beneficiary of this practice is the company, its customers and the region.

### RESOURCES NEEDED

Three people were involved on the company side: technical employee, coordinator and graphic designer. The EPD was issued by the Building Research Institute in Warsaw (<https://www.itb.pl/en>), which performed the LCA analysis based on data provided by the company.

### EVIDENCE OF SUCCESS

Thanks to the implementation of the EPD, CO<sub>2</sub> emissions to the atmosphere were reduced by 128,000 tons (it concerns 40,000,000 m<sup>2</sup> of insulation made in 2014-2019). Many production and resource efficiency indicators improved. SDGs addressed SDG#12, SDG#13, SDG#7. Using the data collected for EPD, the company also implements a project co-financed by ROP 2014-2020. "Development of an innovative ETICS thermal insulation system with a low carbon footprint and minimized environmental impact".

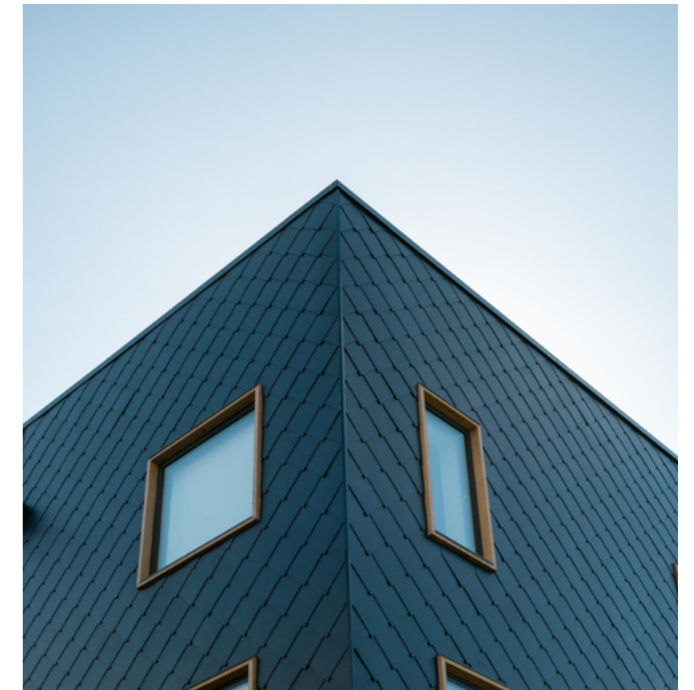
### DIFFICULTIES ENCOUNTERED

Relatively high costs of LCA and its implementation. Problems with databases and their comparability, a complex process of implementing a new business model related to EPD, temporary competition from lower costs companies (in the future, regional mitigation preferences may be possible).

### POTENTIAL FOR LEARNING OR TRANSFER

The potential of this practice is related to environmental impact in the region, building LCA awareness in society and among entrepreneurs, and leads to better public policy.

The company's EPD initiative resulted from following international trends. Now it inspires the region. The region supports such activities and intends to disseminate similar initiatives (regional social media, website, facebook). Such companies are good examples for others. The next activity of



the region will be to create preferences for such companies in regional public procurement or in the form of more accessible funding from the ROP.

The guidelines in this regard are planned to be implemented in the regional action plan. EPDs can be used in many companies operating in this industry, depending on their capabilities and needs. The company has published its analysis results and estimated impacts as an example for others in the branch journal Building Materials (<https://bit.ly/34RKDSL>).

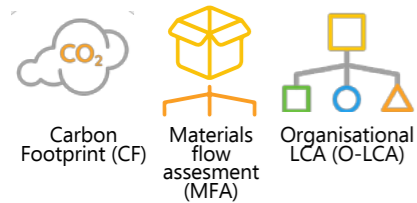
(\*) <https://sdgs.un.org/goals>

Further information





## Good Practice nº 4 Calculation of Carbon Footprint in services of the Commonwealth of the Region of Pamplona



### THE PRACTICE

Since 2014, MCP/SCPSA annually performs a complete analysis of all its facilities in order to calculate the volume of greenhouse gas emissions generated each year by the provision of its services:

- Integral Water Cycle.
- Collection and Treatment of Municipal Solid Waste.
- Regional Urban Transport.

One of the objectives of MCP/SCPSA is the improvement of the urban environment in the Pamplona (Navarra) Region. So, the carbon footprint is an effective factor to take into account the impacts of the provided services, applying a life cycle approach and identifying measures to climate change mitigation. MCP/SCPSA has approved a Strategic Plan, in which one of the more relevant targets is to be Carbon neutral in 2030.

Annually carbon footprint calculation of services provided by Commonwealth of the Region of Pamplona (MCP/SCPSA), reduction and compensation of GHG.

**MANCOMUNIDAD DE LA COMARCA DE PAMPLONA (MCP/SCPSA)**  
Comunidad Foral de Navarra, Spain (España)

**Date: July 2020 - Ongoing**

In addition, the calculation of the Carbon Footprint allows MCP/SCPSA to know and monitor the emissions sources, and, therefore, the possibility of obtaining economic savings derived from energy efficiency measures.

As a complementary measure to the emission reduction, MCP/SCPSA compensates its Carbon Footprint by purchasing emission rights. These rights are acquired in certified reforestation projects.

It is also worth mentioning that Carbon Footprint calculation improves transparency and credibility in the report to third parties and stakeholders (Citizens, Navarra Community Government, Employees, Suppliers and Clients of MCP).

### RESOURCES NEEDED

Human resources: Director of Climate Change and strategic projects, Environmental manager, Quality assurance manager and Technicians from all the departments of the company.

Economic resources: EUR 58.000 first calculating and reporting (consulting company) + EUR 4.000/year for certification.

### EVIDENCE OF SUCCESS

Carbon footprint calculation, and the knowledge of the main emission sources, allow MCP to implement efficiency measures. These measures have resulted in the reduction of its emissions by 20.7% between 2014 and 2018, which is a first step forward in the MCP's commitment to be carbon neutral by 2030.

Since 2018, MCP has the "I calculate, reduce, compensate" label for the management of the carbon footprint, being the first public commonwealth in Spain obtaining this label.

### DIFFICULTIES ENCOUNTERED

The biggest difficulty was facing this task for the first time in a complex organization that provides 3 public services. The difficulty in obtaining the necessary data and calculations was solved establishing a sound cross-departments cooperation and a collaboration with an external provider.



### POTENTIAL FOR LEARNING OR TRANSFER

This good practice could be applicable in every country and region. It may be accomplished either with the support of an external assistance, or by own resources.

It would be necessary to define the scope of the study adapted to the specific entity, and gather needed data. It is easy to adapt to the different services provided by each entity, including other services such as health admin, housing, health, education.

Photos: MCP

Further information





Good Practice n° 5

## Resource efficient land use to promote sustainable land design and development



### THE PRACTICE

In Finland, over 50% of all consumed raw materials are various mineral or soil materials. Since 2015, Finland started to develop an initiative for sustainable land design (so called KESY model). This initiative lists several goals to improve and maintain sustainable environment operations and land use design. Later, a toolbox for operators was published. Public sector is an important contributor in green constructions.

City of Vantaa had started a reconditioning work of Ankkapuisto Park in 2016. Waterways in the area were dredged among other landscaping work. 1500 m<sup>3</sup> dredge spoil was formed. This and other side stream materials (leftover rock and soil from other local construction sites etc) that were present in the area were planned for the second phase of the reconditioning work. As the scope, City of Vantaa Roadmap to resource wisdom was used. Without this re-use, virgin, commercial market products would have been used. Risk assessment was essential.

Sustainable land use was applied with LCA to convert dredge spoil and other residual land materials and sanding into novel materials with new park design.

**RAMBOLL**  
Helsinki-Uusimaa, Finland (Suomi)  
Date: August 2018 - May 2019

All analyses were based on CEN/TC 350 standard for sustainability for construction works. This standard defines rules for the development of scenarios, includes the rules for calculating the Life Cycle Inventory and the Life Cycle Impact Assessment (based on ISO 14040:2006) underlying the EPD (for calculation of emissions), including the specification of the data quality to be applied. In total, 9900 tonnes of lands were re-utilised. The main impact categories were GHG (CO<sub>2</sub> eq.) and toxic components in the (used) soils.

### RESOURCES NEEDED

Objective was to clarify effects of the use of re-used soils and rocks. One person from Ramboll, a consulting company. Approximately 35 hours of calculating and reporting work for LCA. LIPASTO unit emissions database (created by VTT, Finland) was used. Product-based EPD documents were also used.

### EVIDENCE OF SUCCESS

Created novel growth media were further utilised at other municipal sites. Project was carried out with courage and was kept in good control. Exploited LCA indicated 23000 kg cut of CO<sub>2</sub> emissions and 56000 € savings of virgin material costs. Additional

environment and health benefits due to reduced mining and land borrow areas. Mines and borrow areas may contain risk factors, eg. loss of ecosystem services, groundwater pollution, landslides and loss of arable land. 9900 t of waste was avoided.

### DIFFICULTIES ENCOUNTERED

Soil & rocks transfer and material formulations are energy-intensive processes, due to difficulties to anticipate land availabilities and lack of storage. Need for longer term integrated planning. On site material prep challenged fuel consumption estimates for LCA. Later correct values were obtained.

### POTENTIAL FOR LEARNING OR TRANSFER

Land materials as waste are among the major components of waste residues globally. Their efficient management depends on both the public policy of land use and design to maximize the re-use of waste soil, with forward planning according to well established guidelines.

Greater understanding of the benefits of soil re-use can occur by sharing more widely results of the potential of emissions cuts, and cost efficiency. Use of LCA provided necessary measurable data for municipal stakeholders, to provide info for political decision-making system. The case provided concrete



evidence where potential focus points for improvements in cost efficiencies and sustainability issues can be noted.

Here, as an example, formulation of new materials on site was energy intensive. Current LC procedures under ISO 14 040 and as encapsulated in the CEN/TC 350 standard for sustainability for construction works are mature methodologies that are easily available to public authorities.

Further information

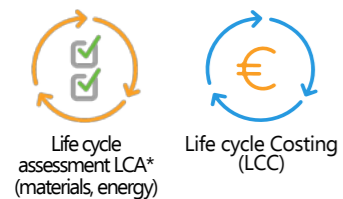


Thematic pillar  
**LCA in waste and  
material flows**





## Good Practice n° 6 Optimization of the regional management of Construction & Demolition Waste through the LCT approach



### THE PRACTICE

Construction & demolition waste (CDW) was identified as a priority waste due to its large amount (30-35% waste in EU) and recyclability. Currently, the 70% target set by the directive 98/2008/EC and more recent programs aiming at fostering the transition towards circular systems (COM2014, COM2015) have pushed local authorities to identify solutions for enhancing the CDW management. In this context, Regione Lombardia chose the Life Cycle Assessment (LCA) as a tool to assess and optimize its own CDW management system from an environmental point of view.

The LCA encompassed all waste management steps, and the savings of virgin minerals due to the use of the recycled aggregates (RAs) (i.e. the secondary materials). It included 13 environmental mid-point impact categories, an energetic indicator (CED) and an "ad-hoc" indicator for mineral resour-

The AWARE Group adopted the life cycle thinking approach (LCA and LCC) to maximize the resource-efficiency of the regional CDW management.

**LOMBARDY REGION**  
Lombardia, Italy (Italia)

**Date: April 2016 - Ongoing**

ces. Coupled with the environmental assessment, a Life Cycle Costing (LCC) is performed to investigate the costs (preliminary, acquisition, operation and disposal costs) borne by the different stakeholders of the CDW value chain starting from the demolition step, and evaluate the most effective solutions from an economic perspective.

AWARE group collected updated primary data from constructors, demolition workers, waste logistics managers, and recyclers. The LCA has highlighted current bottlenecks of the system still preventing closing materials loop, allowing to identify effective solutions.

### RESOURCES NEEDED

The LCA was financially supported by Regione Lombardia.

The research involves two young researchers, a Ph.D. student, two MSc students, and a supervisor. The LCA-software SimaPro was used for the impact assessment.

### EVIDENCE OF SUCCESS

The applied approach proved to be useful in disclosing the hotspots in the current CDW manage-

ment system of Lombardia. The analysis allowed to identify the most effective solutions for enhancing the sustainability of the CDW management by quantifying their effects on the environmental, energetic and economic performances of the entire system. Some recommendations were provided to the regional government, that may help them in upgrading the regional waste management plan.

### DIFFICULTIES ENCOUNTERED

Complex processing of waste database (MUD).

Economic data are confidential, rarely available.

Collecting plant data was time-consuming. Making such data easily available for both local authorities and constructors is pivotal to enhance useful interconnections and for easier monitoring.

### POTENTIAL FOR LEARNING OR TRANSFER

- A procedure for MUD data elaboration to make available disaggregated CDW data.

- An evidence-based methodological framework to support regions in improving the sustainability of their waste management policies or in monitoring waste plan, that can be extended to other regions or waste types.



- Recommendations to improve the whole CDW value chain. E.g. to favour profitable interconnections between CDW recyclers and constructors, Regione Lombardia in collaboration with ARPA Lombardia has re-structured its informative waste system to allow recyclers declare the type and amount of RAs annually produced. The LCC may also help Regions to direct incentives to favour the use of RAs. To promote knowledge dissemination on technical performances of RAs, Regione Lombardia with ANCE has promoted training courses for local institutions and operators.



Further information







Good Practice n° 7

## GERLA project: Waste management in Lombardy – Life cycle assessment

**Application of the LCA methodology to evaluate the environmental performance of the municipal solid waste (MSW) management system implemented in Lombardy.**

 Politecnico di Milano, Department of Civil and Environmental Engineering; Gruppo di Ricerca AWARE - Assessment on WASTE and REsources  
Lombardia, Italy (Italia)  
 **Date: November 2010 - July 2012**



Life cycle assessment LCA\* (materials, energy)

### THE PRACTICE

In the GERLA project, the LCA methodology was applied to analyse the environmental performance (global warming, acidification, human toxicity, photochemical ozone creation, Cumulative Energy Demand) of the current MSW management system implemented in Lombardy region as of 2009.

The focus was on MSW, in particular six packaging materials separated at the source (glass, aluminium, steel, paper, plastic and wood), organic waste separated at the source and residual waste.

Based on the interpretation of the results of the current situation, four alternative management scenarios were proposed for the year 2020 (a business-as-usual scenario, two scenarios that reach an overall level of separate collection of 70% and 75% respectively by increasing the kerbside mono-material collection system, a last scenario with an overall level of separate collection thanks to the increase of the multi-material collection).

These future scenarios were subsequently evaluated with the LCA methodology to verify and quantify the improvements associated with the various actions implemented. This has provided Regione Lombardia with useful indications for the drafting of the new Regional Waste Management Program. For the first time in Italy the outcomes of a detailed LCA of a current waste management system implemented in an extended area such as that of Lombardy region were utilised to address future policies pursuing the improvement of the environmental performances of the system itself.

### RESOURCES NEEDED

The LCA was financially supported by Regione Lombardia through CESTEC - the regional energy agency. The research involves the full-time work of one researcher, part-time work of another researcher, four MSc students. The LCA-software SimaPro was used for the environmental impact assessment.

### EVIDENCE OF SUCCESS

The LCA study was included in its entirety as one of the chapters of the new waste management plan and was used for the definition of the plan waste management scenarios.

LCA results can provide a basis for local governments to measure the potentiality of the MSW management sector to contribute to achieving the UN's Sustainable Development Goals (e.g. SDG\*11, SDG12).

### DIFFICULTIES ENCOUNTERED

The study highlighted the complexity of this evaluation extended to a broad geographical area as that of Lombardy (i.e. 10 million inhabitants): the need to acquire huge amounts of data, preferably primary data, and the assessment of their quality were the main challenges.

### POTENTIAL FOR LEARNING OR TRANSFER

The applied methodological approach described in this good practice can be extended to other regions or at national level as well as to other types of waste.

This may be relevant for other regional governments since it may guide them in improving the sustainability of their waste management policies or supporting the monitoring of their own waste management plan, based on well-established and standardized procedures. It may allow to improve regional competitiveness in successful economic and policy development.

(\*) <https://sdgs.un.org/goals>



Further information







Good Practice nº 8  
**URSA - Alqueva by-products circulation units**



## THE PRACTICE

The promotion of soil fertility and the efficient use of irrigation water are basic principles of EDIA in the context of the environmentally sustainable management of Alqueva irrigation. The valorisation of organic by-products from agriculture and their return to the soil presents itself as the strongest and longest lasting possibility to recover soil quality, protect water and promote the efficient use of resources.

Some soils although deep, are poor in organic matter, reducing its capacity to retain water and nutrients, making the soil gradually more susceptible to erosion and desertification. Intense agricultural activity in areas of degraded soils results in the degradation of downstream water bodies, namely as a result of the entry of sediments and nutrients.

The URSA Project - Alqueva by-products recirculation units, a constellation of units at the service of the irrigation territory, which produce an organic fertilizer by composting, returned to farmers by exchange with the agricultural by-products delivered, for crop fertilization, contributing to the increase

**Promotion of soil fertility and efficient use of water as a basic principle for a sustainable management of irrigation water .**

**EDIA - (ALQUEVA INFRASTRUCTURE AND DEVELOPMENT COMPANY)**  
 Alentejo, Portugal  
**Date: January 2017 - December 2019**

of soil fertility and its rehabilitation as a filtering barrier, which promotes downstream water quality and long-term sustainability of irrigation. A project like URSA can be developed further by adding an LC assessment in the future and can provide an additional environmental and resource efficiency value.

## RESOURCES NEEDED

Project URSA relies on partnerships between EDIA and local farms.

Economic resources: 250 000€ financed in 70% by the National Environmental Fund.

## EVIDENCE OF SUCCESS

URSA project responds to the problem of low organic matter content in soils, which translates into a reduction in fertility and capacity to retain water and nutrients. This objective could be better achieved using a life cycle approach that consider the incorporation of organic matter into the soil in a systematic way, being compatible with irrigation and a modern and intensive agriculture.

## POTENTIAL FOR LEARNING OR TRANSFER

This project could benefit from a life cycle analysis but presents a structure based on a efficient use of resources, namely in the protection of soil and water, and the valorisation of waste / by-products, contributing to accelerate the transition to the circular economy, through an agriculture in line with the principles of this new paradigm. Thus, this good practice is applicable in every country and region where sustainable agriculture is a priority and where there are large irrigated agricultural areas.

Photos: David Catita



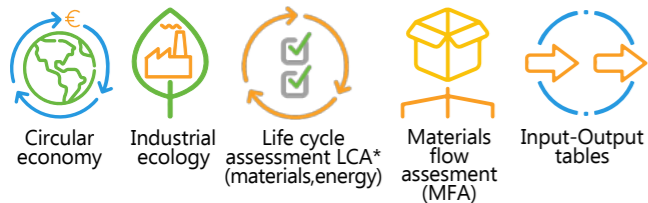
Further information





Good Practice n° 9

## Application of Life-cycle assessment in optimization of municipal waste management systems



### THE PRACTICE

In the EU, regions have the responsibility to organize solid waste management. It is not uncommon that smaller municipalities lack a clear understanding of environmental and economic implications of different elements of municipal solid waste (MSW) management, which sometimes leads to sub-optimal strategic decisions.

The GP reveals use of the Life cycle assessment (LCA) methodology based on the procedure and recommendations indicated in the European standards series – ISO 14040 and ISO 14044 to build a model and test different waste management scenarios in order to see whether the waste management hierarchy is influenced by regional conditions.

The study also tests to which variables in waste management systems the results of the LCA are most sensitive. The discussion is built around a case study in Alytus (Lithuania) where several waste manage-

Application of Life-cycle assessment in optimization of municipal waste management systems and presentation of the Lithuanian case study.

**KAUNAS UNIVERSITY OF TECHNOLOGY**  
Lietuva, Lithuania (Lietuva)

**Date: January 2010 - December 2012**

ment scenarios have been analyzed and compared in the LCA framework.

The GP educates several methodology related issues and discusses what implications waste related policy intervention would have on the environmental outcomes of different waste management scenarios.

The analysis included parameters defining the basic environmental impacts and the amount of waste. The purpose of the Good practice (GP) is to help local decision-makers in designing integrated waste management solutions that are optimal from the environment point of view. The GP is based on a case study, where several waste management scenarios were analyzed.

### RESOURCES NEEDED

The research work and analysis was performed by a group of scientists (3 scientists). Main author dr. Jūratė Miliūtė-Plepienė. The data were provided by the regional waste management company Alytus RATC (Lithuania).

### EVIDENCE OF SUCCESS

The use of an LCA approach in modelling the waste management systems provided also a good oppor-

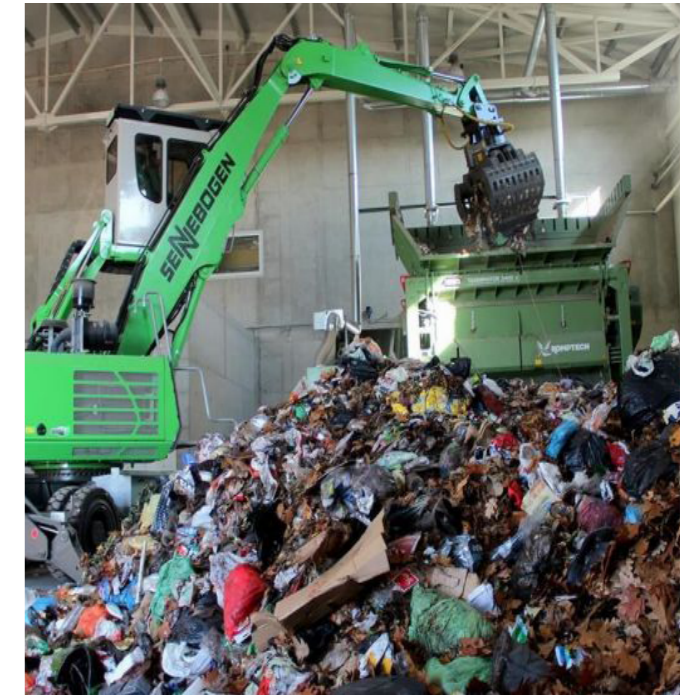
tunity to map the entire system in its entirety and makes it possible to assess the data quality requirements. The GP helped local decision-makers in designing integrated waste management solutions that are ecologically optimal. The discussion is built around a case study in Lithuania where several waste management scenarios have been analyzed and compared in the LCA framework.

### DIFFICULTIES ENCOUNTERED

Data availability in the waste management sector is still challenging. In addition, to convince the local waste managers and local municipalities regarding the LCA methodology benefits.

### POTENTIAL FOR LEARNING OR TRANSFER

The potential for learning of the GP is related to the Environmental impact assessment in the region regarding the waste management scenarios selection using Life cycle approach. The LCA approach has already been used for more than 30 years for systematic evaluation of products, services and complex socioeconomic systems, including energy, water supply, transportation, and waste management. Several studies have shown the potential of LCA as a decision-support tool in evaluating different waste management scenarios and highlighting environmental 'hot-spots'. The LCA approach and study was done in cooperation with Alytus Region Waste Management Centre (Alytus RATC).



The helpful inputs and ideas in the work came from the RATC and the study of Municipal waste management was presented to the RATC administration.

The study results showed the importance of conducting an LCA study, and the shortcomings of the existing waste management strategy in region.

Further information



Thematic pillar  
**LCA in public  
procurements**





## Good Practice n° 10 Green public procurement in Slovenia



This practice describes the implementation and use of green public procurement legislation in Slovenia. The latter also considers the use of LCA methodologies.

**NATIONAL INSTITUTE OF CHEMISTRY**  
Zahodna Slovenija, Slovenia (Slovenija)

**Date: January 2011 - Ongoing**

### THE PRACTICE

On 8 December 2011, the Government of the Republic of Slovenia adopted a Decree ([https://www.uradni-list.si/\\_pdf/2011/Ur/u2011102.pdf](https://www.uradni-list.si/_pdf/2011/Ur/u2011102.pdf)) on Green Public Procurement, which would aid all contracting entities when launching a contract award procedure. The Decree stipulated that for 11 products (as of 2011) and service groups, public buyers would have to consider minimum and extra environmental requirements, as well as award criteria. It identified a number of statements or declarations, which can serve as proof of these requirements.

The relevant area of green public procurement in Slovenia has undergone further development. Today's regulation on green public procurement covers 20 public procurement subjects, for which environmental considerations are mandatory (<http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7202>) (Uredba o zelenem javnem naročanju (Uradni list RS, št. 51/17 z dne 19. 9. 2017)).

The Green Public Procurement Regulation sets targets for individual items in each contract award that contracting authorities must complete when awarding a single green contract. Environmental requirements may be incorporated by contracting authorities in a number of ways, as technical specifications, as a reason for exclusion, as a condition of participation, as a criterion for the award of a contract or as a specific contractual provision.

The relevant green public procurement regulation also allows the use of life cycle methodologies (e.g. life cycle costing - LCC) in tenders.

### RESOURCES NEEDED

To evaluate compliance with the specifications and award criteria, e.g., declarations from the suppliers would be required. In cases where public procurement involves the use of life cycle costing (LCC) methodologies, the use of appropriate databases or directives is required.

### EVIDENCE OF SUCCESS

In 2018, subscribers awarded 16,865 contracts worth 2,918,594,609 euros. At least one environmental aspect was included in 5771 contracts, representing 34.22 % of all contracts awarded.

The value of these orders is 559,393,716 euros, which represents a 19.17 % share [2].

Of these, 4539 contracts were awarded, for which environmental requirements are laid down in the Green Public Procurement Regulation. The share of these amounts to 26.91 % in number of all contracts awarded in 2018.

### POTENTIAL FOR LEARNING OR TRANSFER

When administering contracts, it's necessary to foster competitiveness among contractors to deliver good economic and environmental performance. High priority should be given to surveying the market and ensuring that the procurer has up-to-date information in order to set and achieve appropriate standards.

The presented example of good practice represents the legally regulated area of green public procurement in Slovenia, which can be to our opinion successfully transferred to other regions and countries.

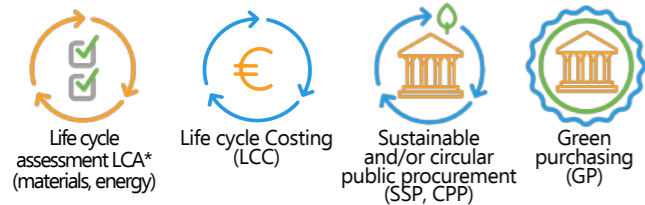


Further information





## Good Practice n° 11 Manuals of the Public Procurement Office on the use of green procurement and the life cycle





### THE PRACTICE

The publishing activity of the PPO is important for shaping the public and private sector awareness as well as identifying opportunities and encouraging the use of environmental aspects and life cycle methodology in public procurement. The office issued several instructions, including:

- Green Public Procurement Volume 1 - describes the importance and possibilities of using Life Cycle Assessment (LCA) and Life Cycle Costs (LCC) in green public procurement, methodology, legal regulations in the light of EU and national law, designations awarded products, services and environmental management systems and the conditions to be met for this purpose. The manual aims to encourage institutions to include environmental criteria in their tendering procedures.
- Green Public Procurement vol. 2 - discusses the government regulation on the obligation to use

Manuals of the Public Procurement Office (PPO) are an example of promotion and training in the field of green procurement and the LCA approach in public tenders.

 **POLISH PUBLIC PROCUREMENT OFFICE**  
Mazowieckie, Poland (Polska)  
 **Date: January 2009 - Ongoing**

the energy and environmental impact factor when purchasing motor vehicles. Presents methods for calculating the cost of environmental impact (pollutant emission).

- Good practices in the field of sustainable public procurement (2 parts) - a collection of good practices describing the local activities and policies of regions and public entities in Poland. Selected examples of provisions in the tender documentation concerning sustainable public procurement were also presented. It addresses the aspects of green public procurement, emissions and recycling. The manuals are intended for contractors and contracting authorities.

### RESOURCES NEEDED

Own resources of the Public Procurement Office and, if necessary, external experts for specific issues.

### EVIDENCE OF SUCCESS

It is difficult to estimate or provide data directly showing the success of this practice. Such data is simply not collected. The manuals are publicly available on the internet for all interested parties. Anyone can download them for free. They are a valuable help as they contain detailed information on

LCA issues in a friendly manner. Every day the PPO websites are visited by several dozen people. The SDGs\* concerned Nos.7,9,12,13.

### POTENTIAL FOR LEARNING OR TRANSFER

This good practice may be applicable in any country or region where there is a national or regional procurement body. It does not come with any specific resources or costs. It is easy to adapt. Manuals presenting the issues of sustainable development and approaches such as LCA or LCC are a real help for entities participating in public procurement process. In addition they contain detailed information given in a friendly manner.

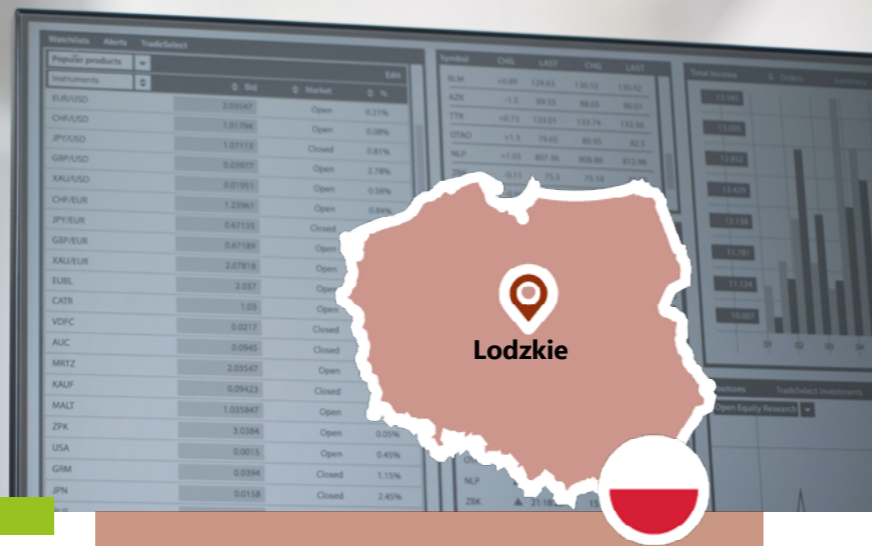


This practice therefore has not only marketing potential, indicating the direction in which public procurement is currently heading, but also raising awareness and disseminating the issues of circular economy and environment, sustainable development and life cycle methodologies.

(\*) <https://sdgs.un.org/goals>

Further information





Good Practice n° 12

## Active support of the contracting authority by the Public Procurement Office through LCC calculators





### THE PRACTICE

The Polish Public Procurement Office provides life cycle cost calculators (LCC) on its website. The calculators are designed for 3 product groups: computers and monitors, external lighting and traffic signals, interior lighting. It is an initiative to take into account the life cycle and its costs in public procurement. The calculators are a practical tool to facilitate the application of the life cycle criterion (as a criterion for the evaluation of bids) in public procurement, in accordance with the possibilities offered by the national Public Procurement Law.

They were developed in the form of simple MS Excel tools and practical user guides. These tools make it possible to include purchase and installation costs, operating costs, service costs and optional environmental costs in the calculations.

The application of the life-cycle costs in a public procurement procedure allows not only to assess

The Polish Public Procurement Office provides life cycle cost calculators on its website and thus promotes the life cycle approach in public tenders.

 **POLISH PUBLIC PROCUREMENT OFFICE**  
Łódzkie, Poland (Polska)  
 **Date: January 2020 - Ongoing**

the economic efficiency of the purchase but also to make an environmentally friendly purchase and reduce the negative impact on the environment. The calculators were developed on behalf of the European Commission (documents in English are available on the website of the European Commission's Directorate-General for Environment).

The versions of calculators in Polish have been developed by the Polish PPO. The main stakeholders and beneficiaries are public bodies which, as contracting authorities, deal with procurement procedures.

### RESOURCES NEEDED

The Public Procurement Office translated the operating instructions and developed the Polish version of the calculators based on the English version with its own resources. No additional resources were required.

### EVIDENCE OF SUCCESS

The number of views and probable downloads of the LCC calculators from the PPO website (from March 2020 to March 2021) amounted to approximately 300 (based on web analytics). Calculators are free. The PPO does not research the use of calculators by entities and does not have more detailed

statistics. Since 2021, the PPO has been promoting calculators as part of a nationwide training course in public procurement (129 people trained in February). The SDGs\* concerned: Nos.12 and 13.

### POTENTIAL FOR LEARNING OR TRANSFER

The benefit of this national practice is to promote the use of life cycle methodology in the regions and to encourage local authorities to use it in public procurement. The message is addressed to all public institutions involved in public procurement.

It does not require any specific resources or costs, so it is easy to adapt in any conditions. It shows the direction in which current instruments for sustainable regional policies are heading but also popularizes the life cycle methodology. Most importantly, however, the calculators are practical tools designed for specific applications almost immediately.



In addition to it calculators expose the "iceberg paradox" in which the bidders not taking into account the costs of use and disposal (e.g. IT products). Low price can bind the customer - preventing him from purchasing modern, energy-saving solutions, therefore they also have awareness-building potential.

(\*) <https://sdgs.un.org/goals>



Further information





Good Practice n° 13

## Green public procurement and LCC in practice – Green vehicles



### THE PRACTICE

Slovenia's National Action Plan on green public procurement (GPP) covered the period 2009-2012. It set a target for 50% of all procurement by central government authorities in eight product groups to include GPP criteria by 2012. The strategy also included training on GPP, pilot projects and assisting public authorities in attaining third-party certified environmental management systems.

The Public Procurement Agency in Slovenia was established in 2010 and went into operation in January 2011. It was responsible for carrying out the strategy and joint procurements for Slovenian public authorities for a number of product and service groups. In the period 2011-2012, the Agency purchased on behalf of about 130 authorities across the public sector.

In this particular practice, subject matter of the contract was road vehicles. All vehicles (all lots except cargo vans) must meet the EURO 5 emissions standard or equivalent. The received tenders were evaluated in terms of the following award criteria:

This example of good practice describes successful use of life cycle costing (LCC) methodology in the field of green public procurement.

**NATIONAL INSTITUTE OF CHEMISTRY**  
Zahodna Slovenija, Slovenia (Slovenija)

**Date: January 2011 - Ongoing**

- Operational lifetime costs.
- Service network.
- Safety and environmental equipment.
- Gear shift indicator.
- Warranty period.
- Delivery time, and tire pressure monitor.

Operational lifetime costs were calculated applying the following formula:

$$[\text{Expected lifetime mileage (=200 000 km)} \times \{(\text{Energy needed per km in MJ} \times \text{price of Energy per MJ}) + (\text{emissions of CO}_2 \text{ kg/km} \times 0.03 \text{ EUR/kg}) + (\text{emissions of NO}_2 \text{ g/km} \times 0.0044 \text{ EUR/g}) + (\text{particulate matter g/km} \times 0.087 \text{ g/km})\}]$$

### RESOURCES NEEDED

The energy content of fuels, in accordance with the Clean Vehicles Directive (2009/33/EC; <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0033>) was taken as 36 MJ/litre for diesel and 32 MJ/litre for petrol.

### EVIDENCE OF SUCCESS

Applying operational life-cycle costing (LCC) as a part of award criteria on one hand, and setting requirements for maximum levels of CO2 released on

the other, has led contractors to submit offers for vehicles with lower CO2 emissions. The outcome of taking CO2 emissions and other pollutants into consideration can be seen by comparing the emissions of the vehicles tendered the previous year. The decrease in emissions varied from 3 g/km to 45 g/km per vehicle, depending on the Lot.

### POTENTIAL FOR LEARNING OR TRANSFER

When administering contracts, it's necessary to foster competitiveness among contractors to deliver good economic and environmental performance. High priority should be given to surveying the market and ensuring that the procurer has up-to-date information in order to set and achieve appropriate standards.

On 8 December 2011 the Government of the Republic of Slovenia adopted a Decree on Green Public Procurement, which will aid all contracting entities when launching a contract award procedure.



The Decree stipulated that for 11 products (as of 2011) and service groups, public buyers will have to consider minimum and extra environmental requirements, as well as award criteria.

The relevant area of GPP in Slovenia has undergone further development. Today's regulation on green public procurement covers 20 public procurement subjects, for which environmental considerations are mandatory.



Further information



Thematic pillar

# **Training and capacity building in LCA**

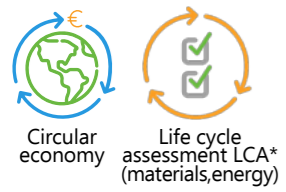






Good Practice n° 14

## Training and capacity building on circular economy and LCA in Slovenia



### THE PRACTICE

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",

This example describes GP on LCA training and capacity building based on workshop "Process planning and multi-criteria decision making in a circular economy".

**NATIONAL INSTITUTE OF CHEMISTRY**  
Zahodna Slovenija, Slovenia (Slovenija)

**Date: June 2021 - June 2021**

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.

### RESOURCES NEEDED

Presentations made by invited speakers / experts.

### EVIDENCE OF SUCCESS

The workshop was intended for entrepreneurs interested in the circular economy, other entrepreneurs interested in new business opportunities as well as participants from the public sector. The participants 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, etc.

### POTENTIAL FOR LEARNING OR TRANSFER

The described expert 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, as well as to those coming from the public sector to obtain insight and experience on creating new policies.



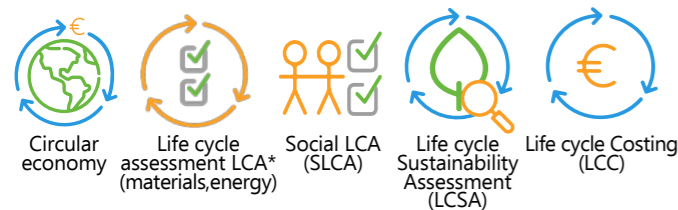
Further information





Good Practice nº 15

## Course “Business Models in the Circular Economy”



### THE PRACTICE

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.

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.

**It develops the concepts of circular economy and methodologies for the analysis of the life cycle regarding the environmental, competitiveness and social impact.**

**CÁMARA NAVARRA DE COMERCIO E INDUSTRIA**  
Comunidad Foral de Navarra, Spain (España)  
**Date: November 2020 - March 2021**

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.

### RESOURCES NEEDED

- 6400€ for the development of the course.
- 2 persons involved from Sustainn to develop and implement the training course, spending:
  - 80h teaching hours.
  - 240h preparation hours.
- 2 persons from Navarre Chamber of Commerce and Industry to organize and monitoring the course implementation.

### EVIDENCE OF SUCCESS

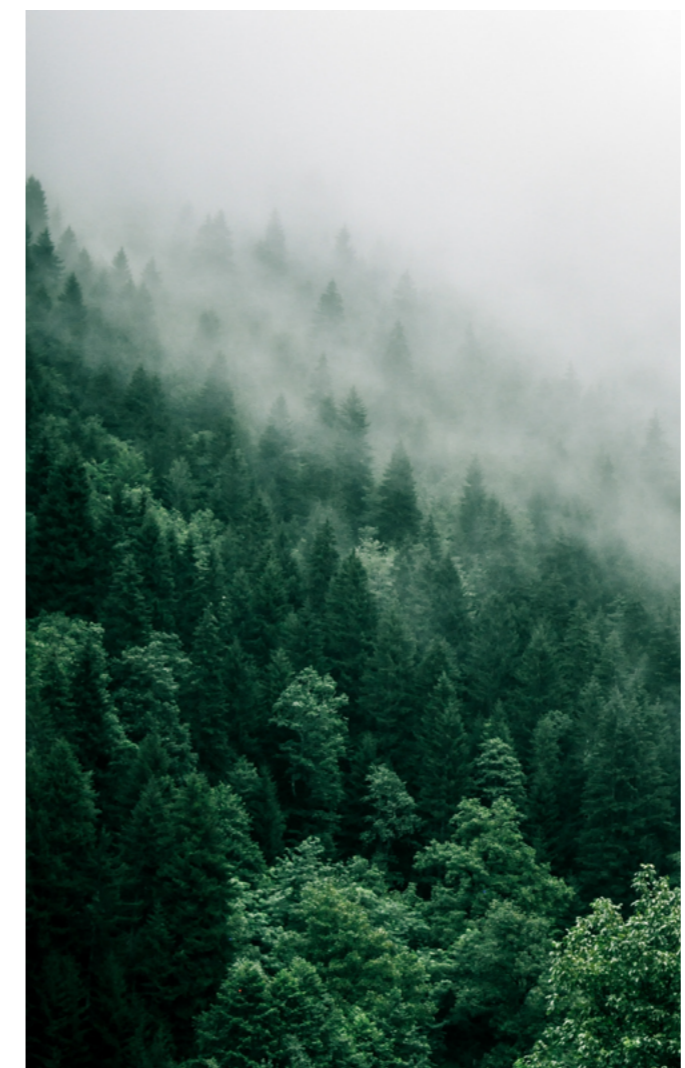
10 private enterprises trained in circular models, life cycle thinking and a methodology that integrate the economic, environmental and social aspects of products and services along its whole life.

### DIFFICULTIES ENCOUNTERED

The course is addressed to different professional profiles, so heterogeneous profiles are attending to the training course with diverse knowledge about circular economy and sustainability and almost not knowledge about the life cycle concept and the existing methodologies to analyse the life cycle.

### POTENTIAL FOR LEARNING OR TRANSFER

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.



#### Curso “Modelos de Negocio en la Economía Circular”

Noviembre 2020 - Marzo 2021



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.

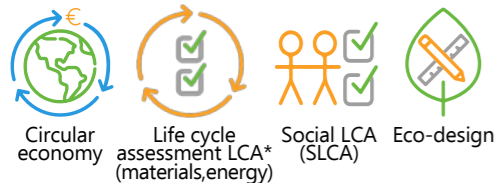
Training courses and materials related to life cycle assessment should be implemented in any region in order to develop skills and professional to analyse life cycle of products and services and, furthermore, to integrate these skills and knowledge at the time of conceiving and developing more sustainable products and services in the future.

Further information





## Good Practice n° 16 Capacity building in life cycle assessment - Lodz University of Technology



### THE PRACTICE

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 post-graduate 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, HIPE-

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

 **LODZ UNIVERSITY OF TECHNOLOGY**  
Łódzkie, Poland (Polska)  
 **Date: October 2017 - Ongoing**

RION). 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.

### RESOURCES NEEDED

TUL's own funds (public funds, EU funding). Curricular changes for the LCA module in Bachelor programmes were introduced as part of a ministerial project – Integrated University Programme (a team of 3 experts worked on the contents and teacher training, all Programme Councils involved).

### EVIDENCE OF SUCCESS

The compulsory LCA module has been designed (syllabus + 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 Mi-

lity 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.

### DIFFICULTIES ENCOUNTERED

Performing professional life cycle assessment requires professional tools/software, which generates extra costs for the university. However, there are some open sources such as OpenLCA, which offer good quality performance.

### POTENTIAL FOR LEARNING OR TRANSFER

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 fu-



ture 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.



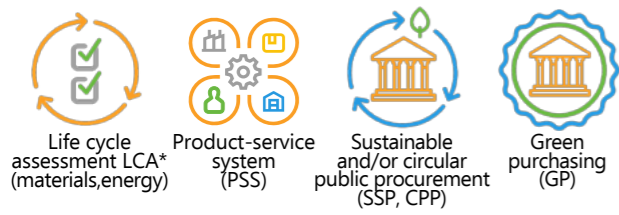
Further information





Helsinki Uusimaa

Good Practice n° 17  
**KEINO Academy for sustainable procurement management**



**THE PRACTICE**

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 contrac-

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

**ASSOCIATION OF FINNISH LOCAL AND REGIONAL AUTHORITIES**  
 Helsinki-Uusimaa, Finland (Suomi)  
**Date: January 2019 - Ongoing**

ing 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.

**RESOURCES NEEDED**

Each Academy season provides about 10 teaching days and self-educational tasks. Human resources (specialists) required for education (materials, time).

**EVIDENCE OF SUCCESS**

Since starting of the Academy, almost 50 public organizations and municipalities have utilized 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.

**Training and capacity building in LCA**

**POTENTIAL FOR LEARNING OR TRANSFER**

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.



**Further information**



Thematic pillar

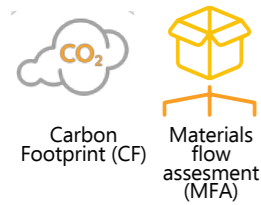
# **LCA in monitoring and evaluation**





Good Practice nº 18

## National Registry of Carbon Footprint (CF), CO2 compensation, and CO2 absorption projects



Carbon Footprint (CF)

Materials flow assessment (MFA)

### THE PRACTICE

The Registry, created by Royal Decree 163/2014, includes the efforts of Spanish organizations in the calculation and reduction of greenhouse gas (GHG) emissions generated by their activity. Individually, it is a good tool to help organizations to monitor and reduce GHG emissions.

At the same time, it facilitates the possibility of offsetting all or part of their CF, through a series of forestry projects located throughout the national territory. These projects integrate numerous environmental and social benefits, among which are the absorption of carbon dioxide from the atmosphere, also known as carbon sequestration.

It is organized in 3 sections:

A. CF and GHG reduction commitment section: organizations calculate and reduce their carbon footprint every year.

**Registry to promote the calculation and reduction of CF of organizations, and encourage projects to improve sink capacity and become a tool to tackle climate change.**

**MINISTRY FOR ECOLOGICAL TRANSITION AND DEMOGRAPHIC CHALLENGE**  
Comunidad de Madrid, Spain (España)

**Date: March 2014 - Ongoing**

B. CO2 sequestration projects section: forestry projects that increase CO2 sequestration.

C. CF offsetting section: organizations offset by acquiring CO2 sequestered by forestry projects.

The organizations who calculate their CF and establish a reduction plan, can register in section A. In the same way, if these organizations wish to offset their CF, it can be done through agroforestry carbon-sink projects in Spain, that would be registered in section B of the Registry. Finally, section C checks such offsetting and gives institutional backing.

The organizations registered in the CF section and reduction and / or compensation commitments may use a seal of ownership of the Ministry.

### RESOURCES NEEDED

Inscriptions in the Registry are free. The creation of the Registry does not imply an increase in spending, nor it requires an increase in provision, or remuneration, or other personal expenses. Electronic communication systems are provided for the resolution of doubts about the registration.

### EVIDENCE OF SUCCESS

The number of inscriptions in the different sections of the voluntary Registry at the end of 2020 was: 3.241 in Section A, with 1.389 organizations registered; 63 in Section B; 146 in Section C. Total number of inscriptions: 3.450.

Total absorptions available at the start of projects: 36.360 tCO2.

CO2 tons offset: 6.244.

Number HC in the register by type of seal: "I calculate" 2.666; "I calculate and I compensate" 63; "I calculate and I reduce" 442; "I calculate, I reduce, I compensate" 70.

### DIFFICULTIES ENCOUNTERED

At the beginning of the initiative, the number of registrations was low. This could be because the registering process was unknown. However, an increase in the number of requests received can be appreciated in the three sections every year. The information presented by organizations is more complete.



### POTENTIAL FOR LEARNING OR TRANSFER

This good practice may be applicable in every country/region. The register may be created by a legal instrument, to gather, on a voluntary basis, the efforts of national/regional companies, administrations and other organizations in the calculation, reduction, and compensation of GHG emissions generated by their activity. It also can gather a portfolio of forestry projects with which these organizations can offset their footprint.

The seals that organizations get to join this initiative could be used as award criteria for public procurements.

Further information





## Good Practice n° 19 Wines of Alentejo Sustainability programme - WASP



### THE PRACTICE

WASP aims to support economic agents in improving the environmental, social and economic performance of the region's winegrowing activity and to promote the recognition of the sustainability performance of the region's wines and to articulate the entire wine chain in the Alentejo within a philosophy of social, environmental and economic well-being at a local and regional level, with emphasis on the incorporation of eco-efficiency principles with the aim of promoting a more efficient use of resources, encouraging the reduction and reuse of coproducts by reducing internal operating costs.

WASP is voluntary and in order to begin implementation, it is compulsory to carry out a self-assessment. This was developed to be a standardised method to be completed with a performance levels assessment organised into different chapters applied to viticulture, cellar and viticulture&cellar and with primary and secondary intervention chapters with different criteria. After completion of the self-assessment, an overall ranking called the 'General Sustainability Category' is established. The 11 Primary Intervention Chapters integrate 108 crite-

A programme to support economic agents in improving the environmental, social and economic performance of the region's winegrowing activity.

**VINHOS DO ALENTEJO**  
Vinhos do Alentejo

**Date: March 2015 - Ongoing**

ria. In a second phase the evaluation method adapted 7 more chapters and 63 criteria. The criteria are included in chapters such as grape production, water, waste and energy management, packaging, etc.

WASP is a certifiable programme and a member can obtain a recognition in sustainability for the productive process by the use of the WASP stamp.

### RESOURCES NEEDED

This project was financially supported by the European Union through the Alentejo Regional Operational Programme. Staff resources and training is a key aspect to deliver this project.

### EVIDENCE OF SUCCESS

This strategy showed almost immediate results, with the Programme counting 93 members at the end of 2015, a number that has been increasing every year reaching, nowadays, 460 members. At the moment 3 members are certified.

The programme was also been award with several awards during the last years. On December 2019, it was awarded with the title of 2019 European Ambassador for Rural Innovation for the LIAISON project.

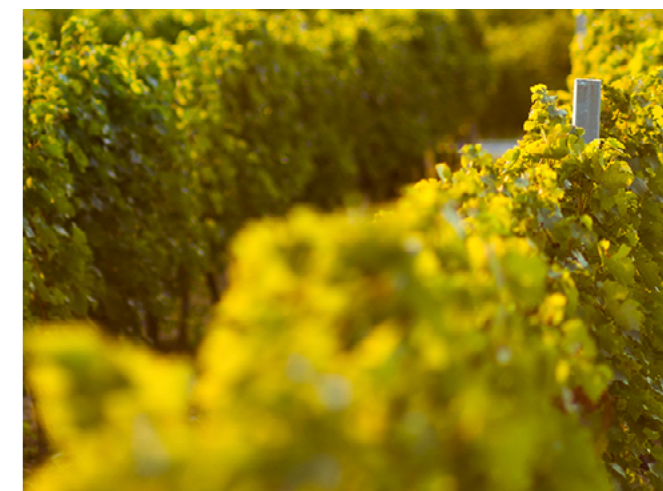
### DIFFICULTIES ENCOUNTERED

The major challenges encountered were related to the necessity of funding, the need to have the support and adhesion of public and private institutions and the need to performed a strong communication campaign.

### POTENTIAL FOR LEARNING OR TRANSFER

This good practice may be applicable in every country/region that want to support economic agents in improving the environmental, social and economic performance of a region's winegrowing activity and to promote the recognition of the sustainability performance of the regions. The certification methodology can be applied to other regions since the chapters and criteria can be easily adapted.

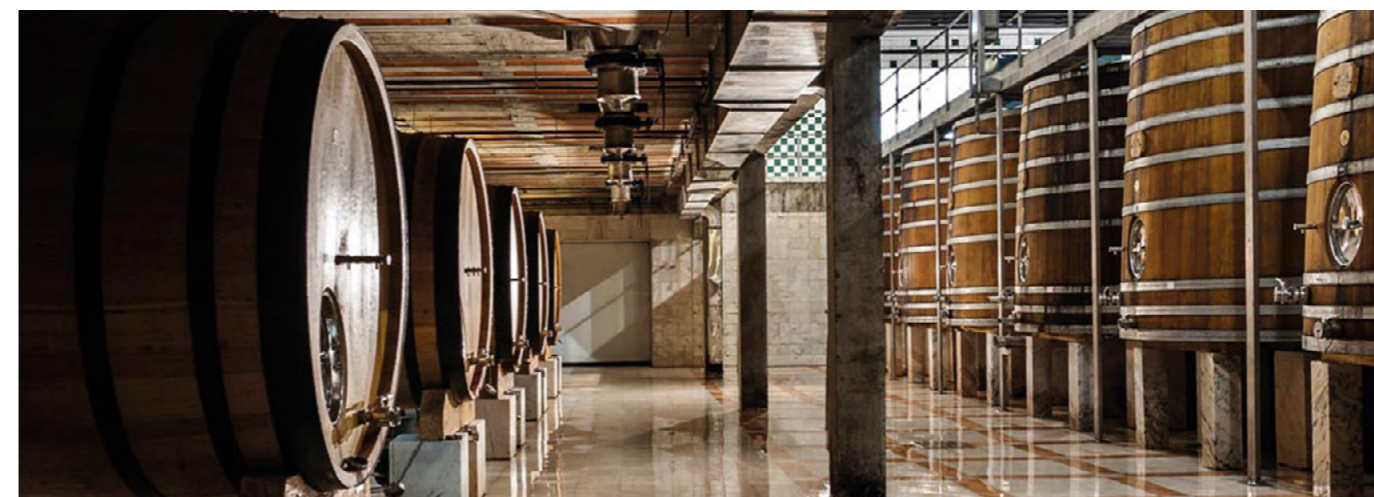
Also, this programme gives its certified members the benefit from communications actions dedicated to them as examples of "working together" for innovation and for sustainability through the use of the programme stamp.



It is also an exercise that shows the commitment to the enormous sector challenges that should be assumed by every public and private administration and the response to the European challenges and strategies in what regards sustainability and environment.

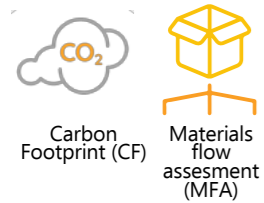
Photos: Vinhos do Alentejo

Further information





## Good Practice n° 20 Regional Green House Gas (GHG) emissions Inventory



### THE PRACTICE

The GHG emissions Inventory (GHG emissions) is a voluntary initiative that collects the quantity of gases emitted into the atmosphere during a period of one year in Navarra, and therefore monitors the mitigation of emissions to address climate change:

- It provides information on the activities causing the emissions, and the methods used to make the calculations and estimations.
- It allows to know the sectors that contribute the most to emissions and their specific contributions, and so, to evaluate compliance with mitigation of emissions - globally and by sector – against climate change.

The inventory assesses GHG emissions in the sectors that originate them: Energy, Industrial Processes and other Products Use, Agriculture and Wastes. It is formulated based on IPCC methodology, in Common Reporting Format. Likewise, emissions are reflected in relation to the so-called traditional sectors: Electricity Generation, Industry, Transport, Residential and Services, Primary Sector and Wastes.

**Annually Inventory of the GHG emissions generated in Navarra in order to get an exhaustive information on the scope and their distribution, and monitor them.**

**GOVERNMENT OF NAVARRE**  
Comunidad Foral de Navarra, Spain (España)

**Date: January 2007 - Ongoing**

Both direct emissions, and emissions linked to electricity imported and exported to meet the annual electricity demand are considered.

It establishes the emissions comparison taking as reference both 1990 and 2005. The methodology used for the inventory is the established by IPCC in 2006. This initiative is a tool to monitor the Navarra Climate Change Roadmap (KLINA).

### RESOURCES NEEDED

The Inventory is carried out by the Circular Economy and Climate Change Service of the Rural Development and Environment Department on Navarra Government, with the support of a technical assistance (Navarra Industrial Association (AIN)). Approx. 15.000€/year for the technical assistance.

### EVIDENCE OF SUCCESS

The inventory has been carried out continuously since 2007. Before that, in 2000, 2003 and 2005. It provides knowledge to the regional government to establish and monitor mitigation measures to face climate change. In the case of Navarra these measures are established in the KLINA.

Considering the last Inventory published, which is

the one for 2018, a decrease of 21.07% with respect to the reference year of 2005 in the direct emissions can be seen. 14,74% in the case for total emissions.

### DIFFICULTIES ENCOUNTERED

It requires people with high expertise involved in the calculation to apply methodologies defined. However, main challenge consists of the data search for calculation.



### POTENTIAL FOR LEARNING OR TRANSFER

This good practice may be applicable in every region. It may be accomplished with support of external assistance, or by own resources.

It is used to monitor the GHG emissions in the region, and as a tool to monitor the KLINA, which is the regional policy instrument which defines the climate change roadmap in Navarra, and was approved in 2018, together with the Navarra Energy Plan.

With this instrument, mitigation measures to fight against climate change may be also evaluated.

Further information

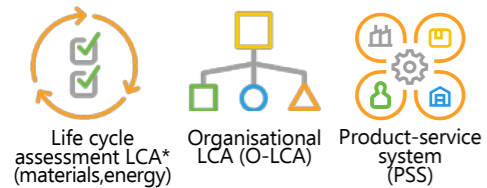






Good Practice n° 21

## Doing good: carbon handprints as assessing positive impacts of companies and the public sector



### THE PRACTICE

Assessing environmental impacts typically focuses on measuring negative effects that products, services, organisations, municipalities etc. cause to the environment. Standardised life cycle assessment (LCA) methods are established for evaluations. More companies are using these tools to pursue a business concept around reduced environmental impact of systems and products. Conveying false impression or provision of misleading information about environmental benefits, a process of “greenwashing”, is of concern. A recognised method of calculating and communicating the environmental benefits of companies and organisations actions was lacking.

Concept of footprint looks to reduce its effects close to zero, whereas the handprint sets no limits to the good that can be achieved. Need for communicating positive environmental impacts has been identified among researchers, as well as frontrun-

**Carbon handprint assesses beneficial environmental impact of offerings. Footprints of an improved and a baseline system are compared, based on LCA methods.**

**LUT UNIVERSITY**  
Etelä-Suomi, Finland (Suomi)

**Date: January 2018 - Ongoing**

ner companies and municipalities with climate friendly initiatives.

The handprint concept is defined in the context of existing LCA-based methodologies. The scope is a carbon handprint. It is based on actual impacts of the products, services or technologies. The practise facilitates internal education or process management within an organisation. Handprints may attract new customers for a product or inhabitants to a municipality, when incorporated into branding and marketing initiatives. Case studies with companies have been assessed. Potential of handprint concept for public sector is analysed.

### RESOURCES NEEDED

Personnel that understands the idea and methods.

### EVIDENCE OF SUCCESS

Case studies from different economy sectors have been presented and analysed. Suitability for addressing environmental handprints at public sector level is being analysed. The reliability of assessment of different environmental assessment studies has increased by provision of common guidelines.

### DIFFICULTIES ENCOUNTERED

Critical review of calculation practice is strongly recommended. It is important to make communication understandable to the target audience.

### POTENTIAL FOR LEARNING OR TRANSFER

Main purpose of the carbon handprint (CH) for cities is to recognize climate actions and encourage cities to carry out solutions to combat against climate change. CH also provides a tool for strategic planning beyond carbon neutrality goals, as well as a communication tool for branding to attract activities, businesses and residents to the area. CH was tested and applied in Espoo city. Study showed that examples of CH contributors divided into categories of ownership, operating environment and projects. Additionally, companies providing CH solutions contribute to handprint efforts. In future, handprint potential can be increased by including handprint targets in the city action plan.



Research is needed to test the applicability of GP in cities and regions. The climate benefit achieved through a handprint can be significantly greater than the size of city's own footprint. In applying handprint thinking allows cities to differentiate and go beyond their climate neutrality targets.



Further information



# LCA4Regions

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