Life Level(s)

Best practice guide to support incorporating Level(s) LCA, LCC and IAQ indicators into Public Procurement process

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The LIFE Level(s) project is directed towards mainstreaming sustainable buildings in Europe through greater awareness and use of the specified indicators within the framework of Level(s), a set of common European Union indicators to address life cycle environmental performance of buildings.

The key indicators within Level(s) are Life cycle assessment (LCA), Life cycle costing (LCC) and Indoor air quality (IAQ).

The project has received funding from the LIFE Program of the European Union. The project will last for three years, from 2019 until 2022.

The partners engaged in the execution of the project and implementation of its outcomes are 8 European Green Building Councils, acknowledged for their contribution in spreading the awareness about green building principles and promotion of environment protection and energy efficiency values.

This document is part of part 3 and part 5 of the LIFE Level(s) project.

This guide presents you best practice examples all around Europe that incorporate LCA, LCC and/or IAQ indicators in their public procurement. Its objective is to help public authority to implement it in their own project.

It is composed of 3 parts:

First,
- A Level(s) framework presentation to explain you what is this methodology and how it works.
- An explanation of the 3 indicators: LCA, IAQ, LCC to have the same definition of this three terms.

Second,
- A state of the art in GPP in each country with a focus on this three indicators
- Different best practice examples

Finally,
- A conclusion drawn by this example
- Different resources produced by each GBCs on the subject.
WHAT IS LEVEL(S)?

The commitment of global leaders to the United Nation’s Sustainable Development Goals (SDGs) and the Paris Agreement have demonstrated their resolve to tackle issues such as climate change, resource scarcity, health and wellbeing and sustainable development. The role of the building sector in addressing these complex issues is absolutely critical, and sustainable buildings have huge potential in helping us to achieve a large number of our global, regional and local goals. However, it will be very difficult to meet these goals unless we release this vast potential in the construction and real estate sectors.

This is why the European Commission has developed Level(s), a voluntary reporting framework to improve the sustainability of buildings. Level(s) is the common EU framework of core sustainability indicators. It is designed to enable professionals that play a role in the planning, design, financing and execution of building projects to make a clear contribution to broader environmental improvements at European level.

Level(s)’s aims are:

- To establish a common language of sustainability for buildings by defining core indicators for the sustainability of office and residential buildings and ensuring comparability.
- To disseminate the use of Life Cycle Assessment (LCA) and Life Cycle Cost Assessment (LCC) methods at European scale.

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LEVEL(S) MACRO-OBJECTIVES

It is built on 6 macro-objectives for the sustainability of office and residential buildings with focus on the environmental performance, health and comfort, life cycle cost and value, and potential risks to future performance. It provides a set of indicators and common metrics for measuring the performance of buildings along their life cycle. It can be used to report on and improve the performance of new-build and major renovation projects.

LEVEL(S) APPROACH

The common framework is organised into three levels. The levels provide a choice as to how advanced the reporting on sustainability for the project will be. You can choose to only work at one level or up to a specific level and use the guidelines accordingly.

LEVEL(S) TARGET GROUP

Level(s) can be used by a variety of different groups at different stages of a building’s lifecycle.

For more information: Visit Level(s) website and publications: Level(s), A common language for building assessment Level(s), What’s in it for public authorities, policy-makers and procurers?
DEVELOPMENT OF LEVEL(S)

Initiative of the European Commission*
- Aim to reduce the environmental impact caused by buildings through improved resource efficiency
- Need for common EU reporting framework for assessing the environmental quality of buildings

Publication of the Level(s) framework Level(s)
- Beta version
- Flexible indicator system
- Possible integration into existing evaluation systems

Circular Economy Action Plan**
- Promote design improvements to reduce environmental impacts
- Increasing the durability and recyclability of components

End of beta test version
- 2 years test phase (2017-2019)
- 136 Buildings including 74 residential and 62 office buildings were tested in all Europe

Level(s) methodology v2
- A new methodology, more understandable was publish
- Follow the life cycle of construction

Publications and website
- Communication and training materials published
- https://ec.europa.eu/environment/levels_en

For more information: Level(s) Specimen Specialised Article: For Public Authorities and Decision-Makers

* Communication “Resource efficiency opportunities in the building sector” (2014)
** Circular Economy Action Plan
Level(s) framework support Green Public Procurement in Europe. Introducing 16 indicators, this framework is a comprehensive approach to sustainable building. With the intention to enable European public procurers to deal sustainable development (environmental, economic and social requirements) more easily, Life Level(s) promote a life cycle thinking approach and awareness on health. To do so, it simplifies the Level(s) framework to focus on three indicators: LCA, LCC, and IAQ.
LCA (LIFE CYCLE ASSESSMENT)

Life Cycle Assessment (LCA) is a method to calculate the environmental impacts of a product all over its stages of life.

A Life Cycle Assessment of a building normally involves evaluating its whole life cycle. This means including all the stages in the assessment - raw material supply, manufacture of construction products, the construction process stage, use stage, demolition and recycling of materials.

The Paris Agreements emphasize the importance of assessing the environmental impacts and reducing the activities that most actively contribute to global warming. To calculate these impacts in the building sector, Life Cycle Assessment (LCA) is the most efficient because it is multicriteria and it considers all the environmental impacts throughout the entire life of a product.

General international standards for LCA:
- ISO 14040 (Principles and framework)
- ISO 14044 (Requirement and guideline)
- ISO 14025 (type II declaration)

European standards for LCA constructions:
- EN 15804 (for products)
- EN 15978 (for buildings)

IAQ (INDOOR AIR QUALITY)

Indoor Air Quality (IAQ) is the air quality within and around buildings and structures. It has become a major public health issue. There are many potential sources of pollutants inside buildings: construction materials, decoration products, maintenance and furniture.

When measuring Indoor Air Quality, one must consider performance at different project stages, due to complex cause and effect relationships for indoor air parameters that require measurement.

Why is Indoor Air Quality important?
- In 2012, 1800 deaths in Europe due to poor IAQ (European Environmental Agency)
- People spend around 80% of their time indoors
- IAQ is about health and comfort
- The COVID crisis has highlighted the importance of IAQ
Life Cycle Cost (LCC) analysis is a methodology for comparing the total cost of a product, structure or system over its entire life cycle.

LCC gives a measurement of long-term economic performance of a building taking into account all its life stages. It includes various kinds of cost: the upfront capital costs, maintenance, repair and operation costs, renovation and adaptation costs, and finally demolition and disposal costs. It can also include environmental externalities.

LCC can be used to optimize the value and the cost of the entire life cycle of a building. It can help to make savings on resources consumption (energy, water, fuel) maintenance and replacement costs and disposal costs. LCC leads to a win-win situation whereby the building is less expensive and has better environmental performances.
Under EU procurement policy, tenders that exceed a specific set amount need to abide by a set of minimum requirements set by the EU. This policy has been transposed into national legislation by each member state. Member states have additional legislation for smaller tenders.

A quarter of a million public authorities spend around 14% of the joint GDP of the EU on the purchase of services, work and supply annually. The European Commission believes strategic public procurement provides possibilities to boost the economy as well as innovation towards sustainability.

To ensure public procurers are able to take into account environmental aspects, the Commission has created a set of tools and criteria to lead the way. One of these tools is the Level(s) Framework.

In the following pages you will find a summary of how green public procurement principles are implemented in the eight states involved in the project.

For more information on public procurement in the EU visit the European Commission’s website.
PUBLIC PROCUREMENT FUNCTIONING

WHO?
The key central institutions in the Republic of Croatia are the Directorate for the Public Procurement System within the Ministry of Economy, the Ministry of Economy and Sustainable Development, the Public-Private Partnership Agency for PPPs and the State Commission for the Supervision of Public Procurement Procedures for review procedures.

HOW?
All notifications and related procurement documents are accessible online through a centralized electronic public procurement system operated by the National Gazette. The electronic submission of tenders has been mandatory in Croatia since 1 January 2016.

GUIDING PRINCIPLES

2017 : Law on Public Procurement
- Quality assurance standards and environmental management standards

2019 : 4th national action plan on energy efficiency for the period 2017-2019
- Key objective: to engage GPP criteria in regular public procurement procedures on a national and local level

2021 : Decision on green public procurement in central public procurement procedures

INTEGRATION OF ENVIRONMENTAL INDICATORS IN PUBLIC PROCUREMENT

LCA
No legislative incentive through Green Public Procurement standards, but it is practiced by individuals mostly within the academic sector. The existing best practices could be used for education purposes.

LCC
Although seen as a challenge, LCC is used in the country. Good practices exist and could be replicated.

IAQ
Not many actors are familiarized with IAQ in Croatia, and there is a lack of measuring technologies.
LCA
Legislation in process – to be verified for use in 2022
Voluntary use of this indicator is relatively popular and gaining more traction annually.

LCC
Voluntary but very popular indicator in public procurement.

IAQ
Dictated by the Act on Public Procurement.

WHO?
The controlling actor in charge of the public procurements in Finland are ministry of Economic Affairs and Employment, and The Ministry of Finance and their connected bureaus. Governments Energy and Climate strategy sets the direction and principles for public procurement and municipalities and other actors that the public procurement procedures apply to use this strategy as a base to set their own sustainability and environmental goals for their procurement strategies.

HOW?
According to the Finnish Governments Energy and Climate Strategy public procurement in Finland should fulfill economical, qualitative and strategist requirements, the procedure should be as open and transparent as possible and public procurement should enhance choices that improve environmental and social sustainability.

GUIDING PRINCIPLES
The Act on Public Procurement and Concession Contracts (1397/2016, “Act on Public Contracts”)

The government has set the goal for Legislation for procurement to optimize the use of public funds, enhance good quality, innovative and sustainable public procurement. Procurers are required to organize procurement in a way that procurements can be executed as economically as possible while still with the quality required. Strategic, environmental and social aspects have to also be taken into consideration. These principles and goals guide states strategy which so on guides the operation and strategies of the municipalities, bureaus and other public actors considered in the Act on Public Procurement. Procurement Act enables the procurer to set different kinds of requirements or criteria to competitive tendering in public procurement process. The Act states that the procurer needs to choose most overall economical offer. This means that the decision can still be made based on the lowest price, but they can also choose option with the best value-quality ratio which enables procurer to make better choices also based on the projects, sustainability value and the life-cycle costs.
PUBLICATION PROCUREMENT FUNCTIONING

WHO?
The Ministry of Economy and Finance votes on the Code of Public Procurement, the legal code containing the provisions governing public procurement contracts.

HOW?
The MOP law (law on public contracting) is a French law dealing with linking public contracting and private contracting. This law applies to public contracts in the event of construction.

GUIDING PRINCIPLES
Since 2006, it is compulsory based on the Public Procurement Code to integrate environmental criteria in an offer.


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INTEGRATION OF ENVIRONMENTAL INDICATORS IN PUBLIC PROCUREMENT

With the RE2020 regulation, Life Cycle Assessment (LCA) is becoming a requirement to calculate the ‘carbon weight’ of new buildings first residential, then office and primary school and finally all new buildings. A database for LCA datasets on construction products and services (www.inies.fr) need to be used.

LCC is not compulsory but the public procurement code, since 2016, defines “Life cycle costing” as a permissible criterion for the selection of tenders. Also, the RE2020 (to come in 2022), will value both technical and economical performance of buildings. Also, the Climate and Resilience Law (2021) indicates global cost as a goal to reach for green buildings.

For “public establishments” (ERP), obligation to monitor indoor air quality and to label pollutants. Decree of 7 August 2015 set the deadline of 1 January 2023 for all public buildings to have the obligation to monitor IAQ.
/publicprocurementfunctioningintegrationofenvironmentalindicatorsinpublicprocurement

Public Procurement Functioning: Integration of Environmental Indicators in Public Procurement

**WHO?**

Relevant actors in public procurement are all public sector entities that purchase goods and services for public use. These entities can be federal, state, or local institutions. The order volume for the procurement from the public sector is estimated in Germany at annually 500 billion €.

The regulations for the award of public contracts are defined in various ordinances and laws and are subject to the EU Public Procurement Directives from 2014. Local and municipal regulations and procurement guidelines can supplement these regulations.

**GUIDING PRINCIPLES**

Act against Restraint of Competition - GWB

- Strategic procurement purposes, aspects of quality and innovation, and social and environmental aspects (§97)

Public Procurement Ordinance - VgV

- Performance specification (§31)
- Verification through labels and certification (§34)
- Award and award criteria (§58)
- Life cycle cost (§59)

Sub-Threshold Procurement Ordinance - UVgO

- Performance specification (§23)
- Verification through labels and certification (§24)
- Award and award criteria; Life cycle cost (§43)

Construction Tendering and Contract Regulations - VOB/A, VOB/B

- Binding for public works contracts

Waste Management Act - KrWG

- Durability, ease of repair and reusability or recyclability of products (§45)

Climate Protection Act - KSG

- Preference for products with reduced greenhouse gases (§13)

Sources and further information:

**HOW?**

Public Procurement Regulations generally require that environmental and social aspects are taken into account in addition to economic viability (§97 (3) GWB). Furthermore, the public sector is obliged to take aspects of circular economy into account (§45 (2) KrWG).

Threshold values are the most important determining factor for the question of which rules and regulations must be followed by contracting authorities when awarding public contracts and when organizing competitions. If the contract value exceeds the current threshold value (defined by the EU), public contracting authorities have to tender in accordance with the "GWB-Vergaberecht" (procurement law). For contracts below the threshold, budgetary law applies and different ordinances and regulations have to be followed.

**INTEGRATION OF ENVIRONMENTAL INDICATORS IN PUBLIC PROCUREMENT**

There is no general legally binding obligation to use LCA. However, it is permissible and encouraged to integrate LCA into public procurement. For all federal buildings, the application of the Assessment System for Sustainable Building (BNB), is mandatory, including the assessment of LCA, LCC and IAQ. In addition, more and more state and local governments are demanding or promoting the use of these (and further) indicators in public buildings, adopting the BNB or other certification systems (e.g. DGNB) or providing funding programs (e.g. NBBW). A database for LCA datasets on construction products and services (www.ökobaudat.de) is providing additional support.

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LCC

In Germany, the contract is generally awarded to the most economical (not necessarily the cheapest) tender (§58 VgV, §43 UVgO). The integration of LCC in public procurement is not legally binding, but the contracting authority may specify that the award criterion "cost" is calculated on the basis of the life cycle costs (§59 (1) VgV, §43 (4) UVgO). For federal buildings, LCC assessment is mandatory (see above).

IAQ

Indicators for indoor air quality can be integrated into procurement processes. For federal buildings, IAQ assessment is mandatory (see above). An important tool for taking these aspects into account is environmental labeling, the criteria of which can serve as a basis for the performance description as well as the evaluation and selection of tenders.
IRELAND

PUBLIC PROCUREMENT FUNCTIONING

WHO?
The Office of Government Procurement (OGP) is responsible for setting the rules for PP in the State.

GUIDING PRINCIPLES
Develop and implement a sustainable procurement policy:
• Seek to minimise environmental impact
• Encourage suppliers to adopt practices that minimise their environmental impact.

The government also commits to:
• Ensuring that public procurement leads the transition to a Circular Economy
• Mandating the inclusion of green criteria in all procurements using public funds
• Creating a Circular Economy Unit in Government

HOW?
2020: Programme for Government
The programme sets out the priorities for the government. Within the Programme the Government has tasked the OGP with updating all procurement frameworks in line with green procurement practices.

INTEGRATION OF ENVIRONMENTAL INDICATORS IN PUBLIC PROCUREMENT

LCA
The latest guidance on procurement for office buildings has a significant focus on LCA, the Level(s) framework and standard EN15978. The national database and development program for EPDs are administered by the IGBC and the database is growing all the time (www.epdireland.org). LCA is beginning to be requested by Local Authorities.

LCC
The concepts of life-cycle analysis and lifecycle costing are at the heart of Green Procurement and require buyers and suppliers to consider not just the up-front purchase costs of a given solution, but its total economic and environmental cost.*

IAQ
There is no specific national regulation on IAQ. In general, the key drivers to produce data on IAQ is to comply with certifications schemes. When filling in EPDs, usually manufacturers do not provide the information on IAQ.

Further information:
The LCA analysis is not mandatory. A recent review of CAM included the proposal of a voluntary use of LCA in public tenders. The amended decree has not been published yet.

CAM includes an economical criterion of the most favourable price following a method based on LCC (article 96 of the National code for public procurement). The criterion is often partially applied because reference, norms and methods are not clear.

CAM provides a good analysis of IAQ through various criteria (natural ventilation and controlled mechanical ventilation, materials’ emissions, radon). For each criteria, reference boundary values are given as foreseen by dedicated norms.

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PUBLICATION FUNCTIONING IN PUBLIC PROCUREMENT

WHO?
The Ministry of Treasury and Public Administration is in charge of the national public procurement policy through two main bodies: the General Directorate for State Assets (responsible for e-procurement) and the General Sub-Directorate for Governance and Coordination of Public Procurement which harmonize public procurement at national and regional level. Key is its Observatory for Public Procurement.

GUIDING PRINCIPLES
Substantial efforts are underway to improve the centralization and harmonization of the system to reduce the costs of its current dispersed nature.

In order to standardize technical and economic requirements for public procurement procedures, Spain also makes use of a company classification system wherein enterprises can request certification as operating in one or more of 22 existing categories of business according to their field.

For larger value contracts contracting authorities can restrict eligibility to firms with the relevant classification, even under open procedures.

HOW?
The Spanish public procurement system is composed of one single legal framework and a wide diversity of contracting, management and oversight institutions, due largely to the country’s decentralised political system.

INTEGRATION OF ENVIRONMENTAL INDICATORS IN PUBLIC PROCUREMENT

LCA
The potential of calculation LCA at buildings, creating benchmarks, recommending its use for sustainable design and possible inclusion at building regulations has got into the policy conversation. Very recently (Dec'21) LifeCycle terms have entered public procurement of building works. Nevertheless, volunteer pioneering practices are on the rise, though still few.

LCC
Neither the indicator nor the methodology is widespread, even at a conceptual level. Other economic indicators as ROI are used. While sustainable financing is increasingly being debated, the focus on a lifecycle approach to it has not yet reached mandatory or voluntary initiatives.

IAQ
The building code (CTE-DB HS, specifically HS3 about IAQ) includes a solid approach to health in interiors, expanding beyond IAQ, including all Level's parameters.
PUBLIC PROCUREMENT FUNCTIONING

WHO?
Dutch government PIANDo - the Dutch Public Procurement Expertise Centre

GUIDING PRINCIPLES
All Dutch authorities are obliged to publish their national and European tenders on Tenderned's announcement platform.
Professional procurement means linking procurement to your policy aims and budget and focusing on efficiency and quality.
A will for sustainable procurement: taking into account environmental and social impacts as well as the prices.

HOW?
Tenderned - Dutch government's online tendering system

INTEGRATION OF ENVIRONMENTAL INDICATORS IN PUBLIC PROCUREMENT

LCA
TBouwbesluit: LCA calculation is mandatory for new build
Nationale Milieudatabase (NMD): database available for LCA calculation though still few.

LCC
Value of LCC can have a major impact on sustainability in maintenance and operating phase, but there is a need for procurement on LCC build and maintenance and for a common calculation method.

IAQ
TBouwbesluit: regulation on formaldehyde concentration
Mostly focused on ventilation and toxicity of building materials and the impact on the user’s health
But testing at delivery and during use phase is not always mandatory.
EXAMPLES OF BEST PRACTICES

EXAMPLES OF IMPLEMENTATION OF LIFE LEVEL(S) INDICATORS

The European Commission has created resources to teach how to use the Level(s) framework. However, their use may still seem complicated to the untrained eye. A better understanding may come with the presentation of practical study cases.

In the following pages you will find examples of public construction projects that include at least one of the three Life Level(s) indicators. Those examples come with the description of the steps leading to the integration of the indicator, the methodology and tools that were used and feedbacks from the public procurers.
LIFE CYCLE ANALYSIS – BEST PRACTICES

LCA: ASETELMAKATU, HELSINKI

GENERAL INFO
Country: Finland
Developer: ATT (City of Helsinki)
Technical manager: Kimmio Antola
Case: Residential building worth 23 million euros
Date: 1.2.2021
Standard used: EN15987 and National method
Data sources: Database provided by One Click LCA

Steps

1. Project manager, HVAC manager and developer architect scope out LCA criteria.
2. Internal experts, national governmental professionals and an external consultant assist.
3. Contractors were provided with software and assistance to evaluate LCA calculations.
4. LCA calculations verified by external consultant.
5. LCA calculations will be redone when construction is complete to ensure accordance.

Methodology and tools
LCA was performed using both the draft version of national legislative methodology and EN15987. At the time of the procurement, the national database was incomplete so general databases had to be used.

Goals
Decreasing lifespan carbon through competition
The City of Helsinki has ambitious carbon neutrality targets. They have placed extensive environmental criteria as a part of procurement criteria to ensure the most sustainable building possible.

Conclusions
The process was demand successful though the outcome would have benefited from a higher level of competition.

In hindsight it would have been beneficial to discuss in length with the market in advance to ensure capability to produce according to requested criteria. As the project was based on wooden construction to begin with, the amount of contractors available in the market was limited. This was exaggerated by additional criteria. However, the two received proposals were of high quality and the procurement was completed according to procedure. Wooden construction seemed more expensive than concrete, but the requirement of LCA did not affect the pricing.

In order for the selected criteria to have a real impact, the contractors must really feel it is meaningful to invest: the criteria must be given significant enough weight. Based on the experience in similar tenders, the weight should be at least 20%.

The climate and environmental criteria used in the procurement are applicable as such in other locations and projects as well. If a minimum level can be set for the carbon footprint in the future, it will be easier to implement criteria more appropriately.

In addition, when requesting carbon footprint information as part of a tender, it should be monitored during the construction process. The purpose of this competition was to check the carbon footprint twice: once at the design stage and a second time at the end of the construction phase. The result of the calculations is tied to the Bonus or Sanction scheme.

Jonna Seppänen, Environmental Expert, City of Helsinki
LCA: TECHNOLOGICAL UNIVERSITY DUBLIN, FOCAS RESEARCH INSTITUTE

Country: Ireland
Client: Grangegorman Development Agency (GDA) / TU Dublin
Architectural Lead: Carr Cotter Naessens Architects
Project: FOCAS Research Institute
Competition Date: 2020-2021
Standard used: EN-15978

**Goals**: develop an enduring, adaptable and environmentally responsible building

**Choice of indicator**: Whole life carbon defined by BS-EN-15978

**1st stage**: selection of 5 teams which will provide a more detailed design

**2nd stage**: selection of the best project by a jury

Methodology and tools

In order to meet strategic objectives of a net carbon zero horizon for both the Grangegorman site and nationally, performance targets are set for this project. Targets are set for both embodied and operational carbon as elements of whole life carbon. These are complementary to regulatory compliance and are fundamental to the project.

The project use the BS-EN-15978 standard to provide the framework of its LCA. The iterative approach to LCA means decisions can be guided by the latest knowledge on the carbon impact of the design as it evolves.

**CONCLUSION**

FOCAS Research Institute project is a leading project regarding the use of LCA in public competition in Ireland. It has introduce carbon indicators in its tender, with the goal of making an enduring, adaptable and environmentally responsible building.

Catherine Opdebeeck, Project Coordinator - Grangegorman Development Agency

The Design Team are currently reviewing a number of options around the structural frame which will be reviewed according to a matrix of risks and opportunities including embodied carbon. The Life Cycle Assessment is being considered as an iterative process used to influence early decision making.
Country: France
Contractor: Lille Métropole Habitat (LMH), public housing office of the Lille métropole.
Technical manager: LMH and the CD2E
Pilot projects: Brève Breughel and Wavrin (reference)
Date: 2019 – 2021
Standard used: E+C- experiment rules (based on EN 15978), and HQE Performance LCA in renovation method for the Wavrin project
Data sources: EPDs of Inies database

Steps
1. LMH’s willingness to implement LCA clauses in its tenders
2. Define which 9 indicators will be looked at
3. Establish ratios and scores in relation to the reference project, adapt to the reference
4. Testing of the method
5. Upgrade the method by shifting from a reference project to absolute indicators

Methodology and tools
They based their method on the French E+C- experiment (based on EN standard 15978), and the HQE Performance test for renovation. The results for each indicator were compared with the Wavrin reference project.

The LCA is conducted in an energy-carbon framework, and considers 9 different indicators (GWP, Acidification Potential...). For each indicator, an impact value is attributed and is converted into a score. At the end of the process, each scenario has scores for the 9 indicators and receives a global score. These scores help creating eco-conception strategy and choosing between the scenarios.

Goal
To include multicriteria LCA clauses in tender assessment criteria

Why is it working
Brève Breughel and Wavrin projects were a success for several reasons. First, there was a will from LMH to conduct LCA. Moreover, in France, new regulation will soon apply, (RE2020), and actors from the building sector have to adapt. Finally, LCA can not be conducted without data, which are available in France through the INIES database.

Conclusion
The Brève Breughel and Wavrin projects were pilots, that helped highlighting both the benefits of LCA and the difficulties encountered by actors during the process.

The choice of the framework, for example, impacts the results of the study, since the indicators will not have the same weight. It is therefore important to choose the most adapted framework from the beginning of the study. Here, it was especially important to properly frame the standard reference and to identify the importance of the different indicators.

The key is to get started and to begin by surrounding yourself with the skills that will allow you to avoid most barriers. When we look at the road ahead, it seems winding and unmarked. However, it is very rewarding because it allows us to better understand the impact of our design choices; to inform our boards, our leaders and our elected officials on the environmental impacts of our decisions. The financial arbitration remains a determining factor but it can be moderated by these criteria if they are integrated in the judgement of the offers. At LMH, my role as project manager was decisive in the integration of LCA in renovation project. We were thus able to understand how the lifecycle analysis could be an help to the decision. For the second project, we integrated LCA as criterion for judging tenders. The most important parameter in this type of project is the owner’s will. Because LCA is based on calculation and with standards, we can have a concrete idea of the environmental value of a project throughout its life cycle. My next project integrating LCA will be the rehabilitation of the headquarters of the CARSAT Haut-de-France.

Romain Vermaut,
Carsat Hauts de France
(previously at LMH, worked on the conduct of the project)

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INDOOR AIR QUALITY – BEST PRACTICES
Country: Netherlands
Client: Municipality of Oostellingwerf
Architect: Paul de Ruiter
Construction: Natuurlijk Bouwen B.V.

Knowledge centre for biobased products for construction
In The Netherlands, the municipality of Oostellingwerf had the ambition to score ‘Outstanding’ on the BREEAM-NL certification. Goal is to become one of the most sustainable and innovative buildings in Europe.

Steps
The municipality wanted to take a frontrunners position in biobased use of materials. The contractor was selected after winning a tender. The architect and contractor defined, together with government, education and business the design and construction.

From design to delivery, a BREEAM-NL Expert was involved in the project. BREEAM-NL and critical BREEAM credits led to a reference methodology that helped to shape the project and a high health score.

Why is it working
The method of BREEAM-NL helped the project with a central reference management system to incorporate all sustainability aspects;
• Low energy- and exploitation costs
• Optimal building management, through extensive metering and control
• Better process monitoring and control during construction
• Reinforcing the image of the user of the building
• Housing matching the set sustainability ambition
• Financial benefit using the MIA subsidy

CONCLUSION
The usage of BREEAM-NL helped the contractor and architect and other stakeholders with a central system. This has led to a great indoor climate, with ability to change temperature and air flow rates in each room.
Moreover, the usage of biobased materials (80%) also leads to a better indoor climate and a very high overall health score of the building. A healthy indoor climate leads to an healthy and productive environment, an improved image and the possibility to increase rent.

In The Netherlands, the municipality of Oostellingwerf had the ambition to score ‘Outstanding’ on the BREEAM-NL certification. Goal is to become one of the most sustainable and innovative buildings in Europe.

Methodology and tools
The BREEAM-NL methodology has led to a very high health score of 92.86%. The guidance of the BREEAM credits gave structure to the process of the project, since it was used as a central sustainability management methodology.
All rooms are equipped with mechanical air supply and disposal. All rooms are also equipped with a control panel where the mechanical ventilation flow rate, temperature and lights can be regulated with. If the CO2 content in a space reaches a certain limit, rooms will get more ventilation. All living areas have a CO2 regulator in place. All living spaces have windows that users can open. Reception can control the first and second floor separately.

IAQ: NETHERLANDS - BIOSINTRUM

For more information

GENERAL INFO
Ing. Tom Linneman
Linneman – Bouw en Advies
LIFE CYCLE COSTS – BEST PRACTICES

LCC
WHY IS IT WORKING

The analysis showed how significant the cost of maintenance and use of the Hall in the economic life of the building and why it is important in the design stages to analyse not only the cost of construction but also other significant costs in the stage of use of buildings. The LCC analysis proved that it is justified to reduce operating costs (maintenance and use) and increase energy efficiency with increasing the quality of selected materials and equipment.

LCC: LCC ANALYSIS OF VARAŽDIN PFI SPORTS HALL

Country: Croatia
Contractor: PPP Centre
Technical manager: prof.dr.sc. Saša Marenjak
Pilot project: life cycle cost analysis in construction of sports hall
Date: 2008.
Standard used: ISO 1568-5
Data sources: data provided by contractor

Steps

Assessment and justification of competitive options
Awareness on total costs
Precise way to foresee financial flows
Strategy development for future efficiency
Risk management
Best value for money solutions

Methodology and tools

- Norms and process based on ISO 15686-5 standard
- By analysing the total life cycle cost (LCC) and applying the Method of Approximate Quantities and the authors database developed on his previous research and based on the analysis of historical data of similar buildings, the total cost of living of the project was estimated

CONCLUSION

- LCC analysis showed that the largest amount of costs covers the aspect of maintenance and operation costs
- Commercialisation income – tends to be underutilised – significant element in potential reduction of whole life costs

Key LCC analysis aspects to address:
- Service standards need to be contractually defined
- Public sector needs to provide continuous monitoring of performances and costs
- Monitoring of LCC enables a perspective on key cost characteristics which provide comparable data

The process of calculating the total life cycle cost (LCC) of a building provides insight into the costs of planning, designing, building, using and removing the building. By using this method at an early design stage, it is possible to reduce operating costs, plan future project ownership costs, and prevent or reduce the impact of business interruptions due to maintenance needs and functional usability.
LCC: Guidelines for economically viable construction, FRANKFURT AM MAIN

Country: Germany
Publisher: City of Frankfurt am Main (Magistrat)
Editor: Mathias Linder
Date: 29.12.2020

Steps

Needs Assessment Setting out planning objectives in a coordinated and approved target agreement
Planning Early assembly of planning team, integration of anticipated operating costs into performance specification
Acceptance Preparation and handover of building operation folder and as-built documents
Operation Regular monitoring: User satisfaction, indoor air quality, actual operating costs
Reducing the total annual costs over the entire life cycle

Objective:
Reducing the total annual costs over the entire life cycle for public buildings

The city of Frankfurt am Main in Germany shifts the focus from cheap construction to economically viable construction, taking into account the entire life cycle.

Methodology and tools

Compliance checks to be conducted on the basis of step-by-step checklists (Excel-Tools) to follow at the time of reaching the four milestones: 1. conclusion of preliminary planning, 2. at the construction and financing submission, 3. at acceptance, 4. after two years of operation. For all measures >500.000 EUR, an up-to-date total life cycle cost calculation (LCC) must also be submitted at all milestones. Along with the guidelines, the city of Frankfurt am Main provides excel-based step-by-step-checklists as well as practical templates in order to conduct the compliance checks at the relevant milestones.

Conclusion

The guidelines for economically viable construction of the city of Frankfurt am Main aim at minimizing the total annual costs (sum of capital costs, operating costs and follow-up costs) over the entire life cycle (planning, construction, operation, refurbishment, demolition and disposal) for specified qualities. The guidelines define the quality of new construction and renovation projects of the City of Frankfurt am Main and describe the processes that are to be followed in order to achieve these qualities.

WHY IS IT WORKING?

The guidelines for economically viable construction from Frankfurt serve as a model for how sustainability requirements, in particular the life cycle costing (LCC), an integral part of the Level(s) framework, can be anchored at regional and municipal level. They apply to all public new construction and renovation projects of the city of Frankfurt am Main, Germany (except temporary buildings with an operating life < 2 years). The guidelines are aimed in particular at architects and engineers who are commissioned with municipal construction projects, but also to all those involved in municipal construction tasks. The guidelines and tools are being updated annually.


Mathias Linder, Head of Department Energy Management, Magistrate, Office for Construction and Real Estate
MIX – BEST PRACTICES
LCC & LCA: METSOLA PRIMARY SCHOOL, HELSINKI

Country: Finland
Client: Facilities-service (City of Helsinki)
Developer: Hoivatilat
Toteutusmuoto: Vuokrahanke
Case: Educational building worth 10 million euros
Date: 1.2.2021
Standard used: EN15987 and National method
Data sources: Database provided by One Click LCA and Kustannustieto TAKU 2020

Goal:
Decreasing lifespan carbon through competition
The City of Helsinki has ambitious carbon neutrality targets. They have placed extensive environmental criteria as a part of procurement criteria to ensure the most sustainable building possible.

Steps
Project managers and internal LCA expert scope out the LCA and LCC criteria and other minimum requirements.
An external LCA consultant describes the calculation methodologies and required input data.
Contractors were provided with input data forms and methodology descriptions.
LCA and LCC calculations were carried out by the external LCA consultant based on the information provided by the contractors.
LCA calculations will be redone when construction is complete to ensure accordance.

CONCLUSION
• There were no significant differences between bidders (45p vs 48.9p when maximum 50p. Quality scores for the whole entity combined at 95p and price at 120p.
• More efficiently, a lower carbon footprint is controlled by setting a minimum level.
• Quality points for the proportion above that. The comparison was made for two offers: more would have been laborious and expensive.

WHY IS IT WORKING
The relative weight of the issue: Calculations by a third party do not allow for comical gimmicks. On the other hand, the tenderer does not have the possibility to optimise his tender unless he makes his own calculation.

Methodology and tools
• LCA calculation was divided into two parts both of which were evaluated individually: Materials (A1-A3, B4-B5) and Energy (B6).
• LCC was evaluated without investment costs as that information was part of the tender and provided by the constructor.
• The tender with the lowest LCA (divided into materials and energy) and LCC was granted with maximum points and the other tenders relative to that.
• LCA was performed using the draft version of national legislative methodology using OneClickLCA software and its database.

Sara Tapiala
Team mm manager City of Helsinki

The project showed that it is possible to include a quality score in the competition based on the carbon footprint. The approach used here is to reward the smallest LCA out of that group, but let’s not take into account whether it’s actually a little or a lot.
IAQ & LCA: NEW GYM FOR THE SCHOOL OLIVIERI IN PESARO, ITALY

Country: Italy
Owner: Municipality of Pesaro
Contractor: The tender is closed (November 2021)
Technical manager: Office for Public Works
Date: tender published on the 4th of August 2021
Standard used: Sport facility
Data sources: local authority web site

Methodology and tools
The municipality has chosen various indicators for LCA and IAQ. Each indicator was then given a score and a weight to calculate the total score of the project. The relevant weights can be summarized as follow:

For comfort and IAQ

- Energy parameters requirement
  - nearZEB: CPE-Pres ≤ 0
  - CPE ≤ 25 kWh/m²y
  - CHVAC ≤ 20 kWh/m²y
  - Clighting ≤ 5 kWh/m²y
- Indoor environmental quality parameters
  - CO₂ max: 1000 ppm (daily average)
  - CO₂ > 1000 ppm for 100 hours/year
  - VOC < 0.05 ppm
  - PM10 < 50 μg/m³ (24 hours average)
  - T min (winter) 19-21°C
  - Tmax (summer) 25-27 °C
  - T air above 28 °C ≤ 40 hours/year
  - Blower window test required

For LCA

- Building sustainability certification:
  - LEED v4: gold or platinum
  - With mandatory criteria:
    - LCA
    - Envelope commissioning
    - Building systems commissioning

- Building materials and product environmental certification:
  - Building carbon footprint calculation (UNI ISO/TS 14067)
  - Labelled products:
    - EPD for reinforced concrete and steel bars, screeds and insulating products
    - ECOLABEL for paints and adhesives
    - FSC or PEFC for timber products

Scorecard

<table>
<thead>
<tr>
<th>Topic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental performance of the structure improvement: timber structure</td>
<td>25</td>
</tr>
<tr>
<td>Building envelope environmental performances improvements: water shedding devices</td>
<td>11</td>
</tr>
<tr>
<td>Energy performance improvements: heating/cooling production systems; mechanical ventilation, heat recovery</td>
<td>15</td>
</tr>
<tr>
<td>Improvement of water distribution system</td>
<td>2</td>
</tr>
<tr>
<td>Rain-water collection system and green areas irrigation</td>
<td>2</td>
</tr>
<tr>
<td>Energy performance monitoring system</td>
<td>8</td>
</tr>
<tr>
<td>Acoustic performance improvement: building envelope</td>
<td>6</td>
</tr>
<tr>
<td>Acoustic performance improvement: building service</td>
<td>3</td>
</tr>
<tr>
<td>Site improvement: material and waste collection areas</td>
<td>3</td>
</tr>
<tr>
<td>Sustainability certification of the building</td>
<td>10</td>
</tr>
<tr>
<td>Building materials and products sustainability certification</td>
<td>4</td>
</tr>
</tbody>
</table>

Steps

Public tender will be 5 for economic aspects and 95 for technical.

Choice to use the LEED V4 certifica-
tion for the building: methodology, third verification

The municipality awards the best value for money offer

The public tender
The tender awards the technical offer more than the economic one, as shown:
CONCLUSION
In Italy there is not yet reference to the use of LCA and LCC on GPP rules (CAM edilizia), whereas there are specifications regarding IAQ. Italy doesn’t have a national methodology and database to support LCA calculation either. Nevertheless, the CAM edilizia have criteria referred to material circularity and low environmental impact, such as recycled content and the end-of-life plan for the full building.

Two main key learning for countries on a similar situation are:
• To include in tenders the request for building certification with rating systems such as LEED, HQE, DGNB and other that encompass the use of LCA. In tenders there should be a specific reference to the rating systems’ credits that include LCA and LCC.
• To pay attention to the distribution of the awarding points of the full tender to give enough weight to sustainability and life cycle principles and related requirements. In the Italian example almost 50% of the full score tender is given to life cycle-related strategies.

WHY IS IT WORKING
The reference to rating systems that already encompass the use of LCA overcomes the barrier of the lack of a national law, methodology and database on life cycle impact assessment of buildings.

The weight given to life cycle principles and solutions in the tender score, about 50%, indirectly makes the requirement mandatory for a project to be awarded.

Margherita Finamore
Public Works Department
Pesaro Municipality

Nowadays in Italy, including energy-environmental certification in public tenders is necessary to achieve low environmental impact of buildings. To this requirement a highly rewarding value shall be attributed to encourage companies to offer such certification. It is essential to ensure that the economic offer only does not affect the result of the tender in order to reward the companies that offer the best offer.

The model is replicable because in the case of the school we have:
• Construction cost 1,300 € / sqm
• Less than 10 kg CO2 m2 / y against 550 kg CO2 of a traditional corresponding building
• nZEB energy standard
• 98% recycled C&D waste

This GPP model built around a circular approach has already resulted in a budget that allows for great replicability showcasing to be a crucial contribution to a net zero carbon transition.

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This GPP model built around a circular approach has already resulted in a budget that allows for great replicability showcasing to be a crucial contribution to a net zero carbon transition.
LCA & LCC: SUSTAINABLE MODEL DISTRICT NECKARBogen, HEILBRonn

Objective: Development of a vibrant, diverse and innovative sustainable district

Within the model district Neckarbogen in Heilbronn, Germany, several instruments were used at municipal level in order to foster the integration of sustainability criteria into the planning and procurement process - the main instruments being certification, quality assurance, and through-out mixing.

Methodology and tools

Aiming at a DGNB pre-certification of the district, where among other criteria, LCC and LCA play an important role, the key lever of success of the implemented quality assurance process has been the ownership of the plots for sustainable district and provides essential goals for its development into a vibrant, diverse and innovative sustainable district. A strong focus was put on the topics of diversity and ‘through-out mixing’ (referring to a combination of purposes of a building, e.g. office, leisure, commercial, restaurants, etc.) This allows change in the use of buildings and the ‘multi-coding’ of free spaces, creating a level of resilience which supports long-term sustainability and acceptance.

The successful development of the Neckarbogen district has shown how important an interdisciplinary and integrated approach is, especially for projects on the scale of a completely new urban district. The framework plan sets a clear vision for the qualities of the new district and provides essential goals for its development into a vibrant, diverse and innovative sustainable district. A strong focus was put on the topics of diversity and ‘through-out mixing’ (referring to a combination of purposes of a building, e.g. office, leisure, commercial, restaurants, etc.). This allows change in the use of buildings and the ‘multi-coding’ of free spaces, creating a level of resilience which supports long-term sustainability and acceptance.

The quality- and concept-oriented approach has certainly proven its worth in the development of the Neckarbogen to date and created incentives to integrate sustainability and diversity in the district development. It has been shown that the ambitions of the city of Heilbronn have been well received by citizens and investors.

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The key lever of success of the implemented quality assurance process in order to ensure the implementation of sustainability aspects within the project, has been the ownership of the plots within the district. This gave the city of Heilbronn the possibility to implement an innovative tendering procedure (concept tendering), allowing the allocation of the properties based on the best design concept, not on the highest price. The quality- and concept-oriented approach has certainly proven its worth in the development of the Neckarbogen to date and created incentives to integrate sustainability and diversity in the district development. It has been shown that the ambitions of the city of Heilbronn have been well received by citizens and investors.

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The development of a new city quarter with a size that almost reaches the historic core city is a special challenge for a city. Heilbronn was one of the first cities to have a plan for a new urban district certified by the German Sustainable Building Council (DGNB). In doing so, it saw the certification process as an important tool for quality assurance and as an important stimulus for further planning.

CONCLUSION

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Learning 1: Municipalities go beyond national regulations
As national and European regulations do not go far enough in the environmental approach for buildings, some municipalities are trying to engage themselves toward this transition. By using what they have (Level(s) methodology, certification schemes, ...), they open the way to other municipalities and allow the States to question themselves on what could be a more ambitious regulation. Thanks to their knowledges, GBCs can also be a help for this municipalities to go further.

Learning 2: A need to share knowledge
When we asked before this best practice guide public procurer on the barriers for the use of LCA, LCC, IAQ indicators, one of the first barriers identified was the lack of information, in particular to show how to move from theory to practice. We need to create communities in each country, to show feedbacks on possible solutions, to get in touch.
In each GBC, groups exist where it is possible to connect with others on specific topics and thus move forward together towards a more sustainable world.

Learning 3: “you can’t manage what you can’t measure”
The feedback we have is that the evaluation of indicators is a key step. Whether we want to reduce the carbon footprint, improve comfort or reduce the overall cost of a project, it is necessary to be able to measure and have figures to guide decisions. It is the use of indicators that will allow the emergence of sustainable buildings.

Learning 4: Moving from carbon saving to a multi-criteria analysis
LCA is a method that allows the environmental impacts of a building to be taken into account over its entire life cycle. Today, LCA is mainly used to calculate the carbon footprint of buildings. This first step is interesting, but LCA is a multi-criteria method, and in order to develop sustainable buildings, it must be used in a more complete way. It would be interesting, for example, to have requirements on other indicators, such as waste production, energy or water consumption, especially since the calculation of these indicators is done automatically at the same time as global warming potential indicator.

Learning 5: Ventilation for a better air quality
IAQ is an important health issue. It varies according to pollutants that can be found in the building and their renewal. Ventilation is the parameter on which is most effective to act. The main difficulty with this indicator is that air quality cannot be predicted without measurement. The regulation must therefore be done after construction.

Learning 6: Global costing for better value for money
LCC makes it possible to calculate the cost associated with product and maintenance throughout the lifecycle. This method allow to make choices on the quality of the products while remaining on affordable prices.

Conclusion and Perspective

Perspective 1
Learning what to do
When we asked stakeholders about their knowledge of Level(s) indicators, and in particular LCA, LCC or IAQ, most of them had not used them because they did not know how.
That's why, GBCs organize training session adapted to each one: manufacturers, public authority and companies.
Go to action B4 of the project!

Perspective 2
Having appropriate method and data
One of the gap for each of these indicators is the existence or access to appropriate data and tools.
The level(s) method provides a common language and proposes a methodology and tools to calculate each of these indicators.
The Life Level(s) project has created data for some countries to make more complete calculations.
Go to action B2 of the project!

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Go to action B2 of the project!
TO GO FURTHER

General resources for public procurer
JRC – GPP good practice (EN)
JRC – Process for setting criteria (EN)
JRC – Buildings (EN)
JRC – Level(s), What’s in it for public authorities, policy-makers and procurers? (EN)
JRC – Green Public Procurement Criteria for Office Building Design, Construction and Management (EN)

Focus on LCC
ObCP – The necessary Big Bang in public contracting: towards a disruptive regulatory vision in public and private management that emphasizes quality (ES)
DGNB – Guideline for sustainability-oriented planning and procurement (DE)

TO GO FURTHER – GBC RESOURCES

Focus on LCA
Alliance HQE-GBC – New and renovated building regard to circular economy (FR)
Alliance HQE-GBC – The hidden treasure of renovation (EN & FR)
Alliance HQE-GBC – LCA guide in renovation (EN &FR)
DGNB – Life Cycle Assessments – A Guide on using the LCA (EN & DE)
DGNB – “Benchmarks for greenhouse gas emissions from building construction” (EN & DE)
FIGBC – Guide for life cycle asessment according to upcoming legislation (FI)
Bionova - Recommendations for Carbon Footprint Limits for Building Types (EN)

Focus on IAQ
Alliance HQE-GBC – The place of continuous measurement sensors during the reception or operation of a building (FR)
Alliance HQE-GBC –IAQ measurement guide in exploitation (FR)
Alliance HQE-GBC – IAQ measurement guide for reception (FR)
DGNB - “Liveable & fit for the future – People as the center of sustainable construction” (EN &DE)