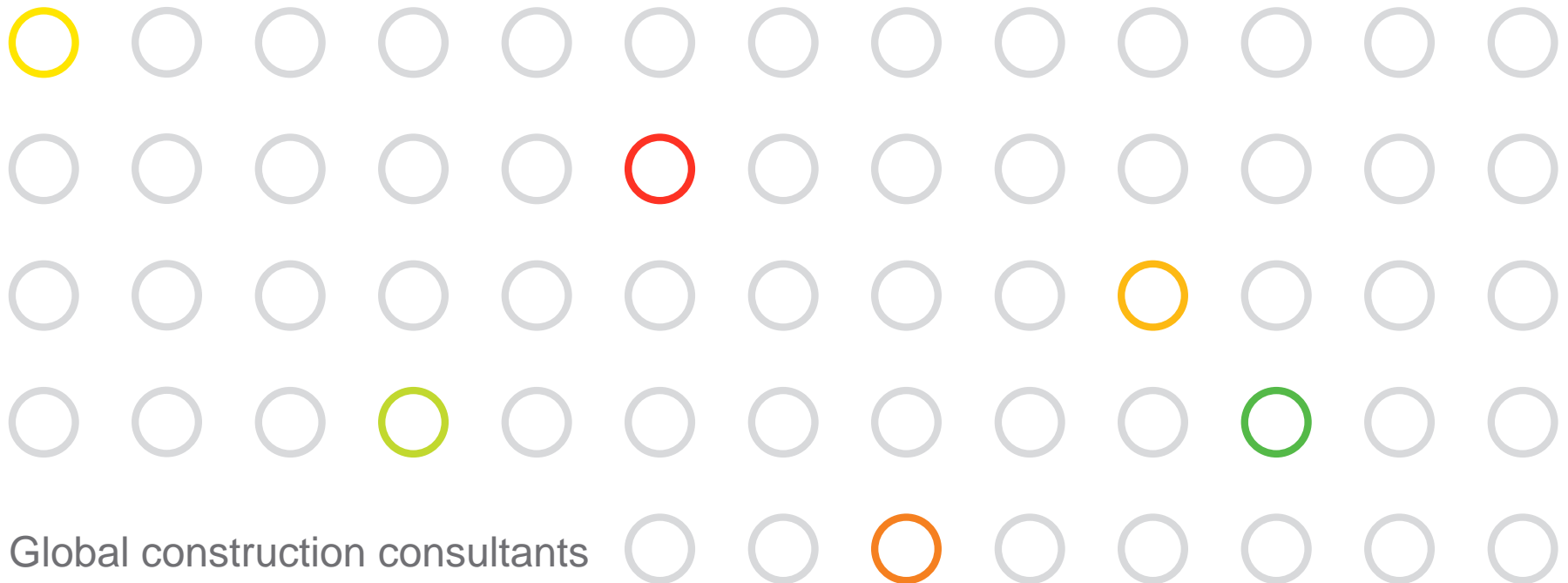


Use of Life Cycle Costing in European Construction Green Public Procurement Expert Meeting - Stockholm - 27 November 2009

Nora Popescu-Kirby, Associate, Davis Langdon



Global construction consultants

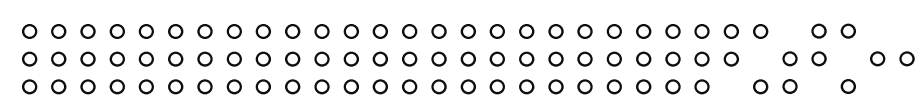
Agenda

EU Life Cycle Costing (LCC) Methodology & Guidance

EU Life Cycle Costing (LCC) Methodology Promotional Campaign

Case Studies Across Europe

Discussion & Questions



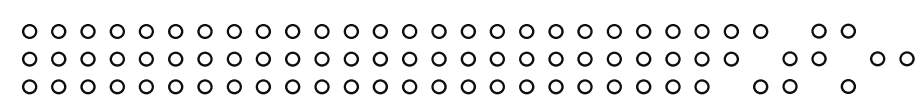
Agenda

EU Life Cycle Costing (LCC) Methodology & Guidance

EU Life Cycle Costing (LCC) Methodology Promotional Campaign

Case Studies Across Europe

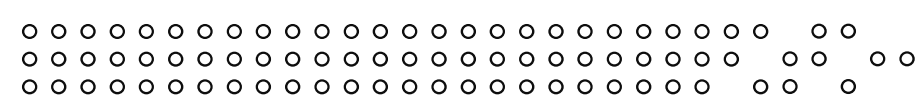
Discussion & Questions



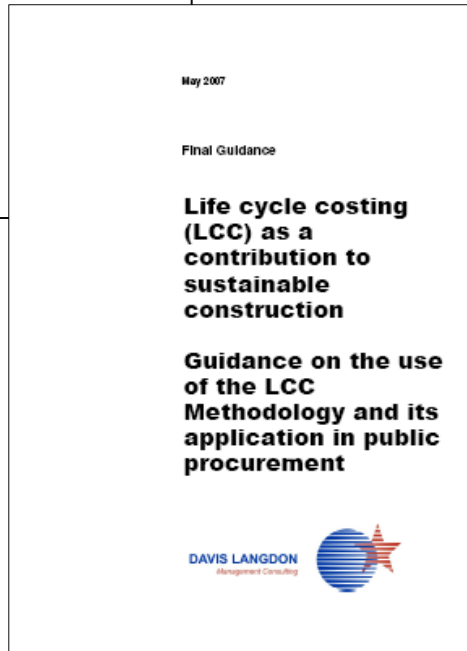
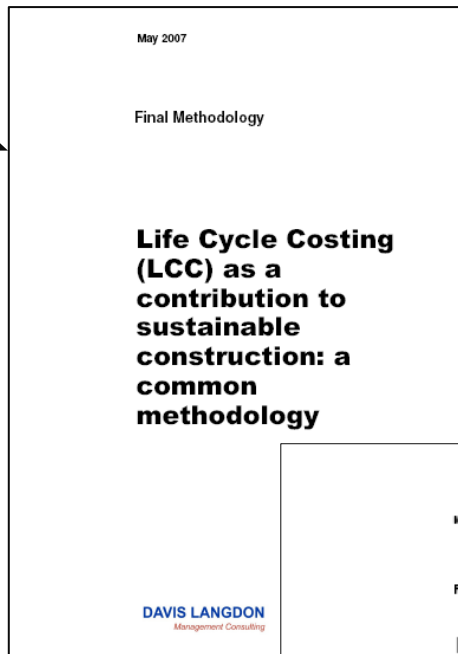


EU LCC Methodology & Guidance

- **2004** - Sustainable Construction Working Group **identifies the need** to develop a common methodology at European level for **evaluating the overall sustainability performance of building and construction**, including their Life Cycle Costing (LCC).
- **2006** – European Commission develops a EU wide LCC methodology (**Life Cycle Costing (LCC) as a contribution to sustainable construction: a common methodology** - 2007)
- **2008** – **Lead Market Initiative** - an innovation policy initiative where European Member States, companies, NGOs, public organizations, other stakeholders, and the European Commission work together to reduce time-to-market of new products and services (key sector is sustainable construction)
- **2008** - European Commission commissions the "**Development of a promotion campaign for Life Cycle Costing (LCC) in construction**"



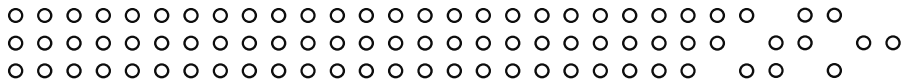
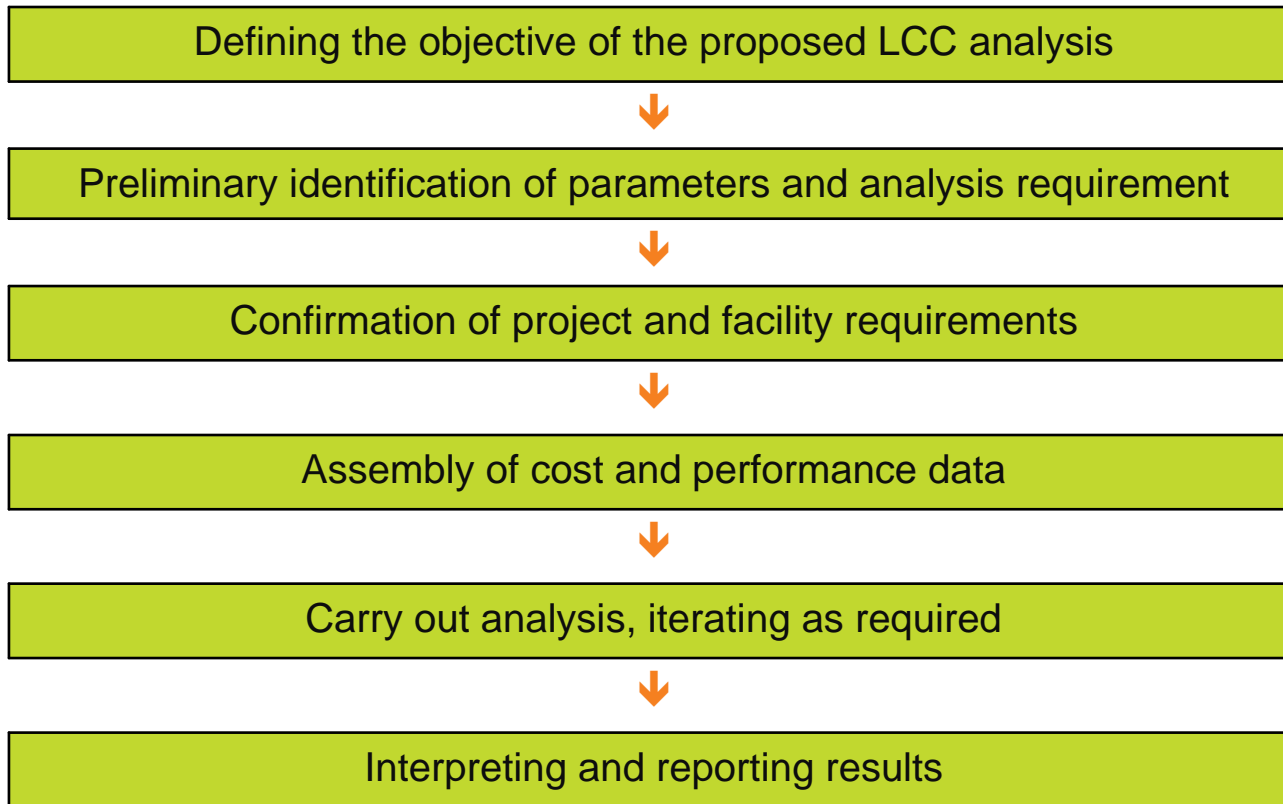
EU LCC Methodology & Guidance



Aims

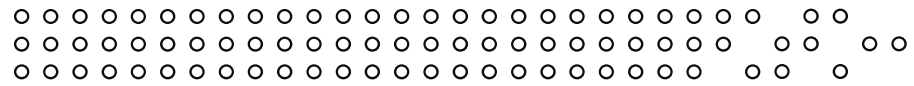
- To address a need for a more consistent & robust approach to the application of LCC across the EU
- To encourage the wider uptake of LCC
- To improve long term cost forecasting and optimisation
- To recognise the contribution of LCC to the sustainability agenda
- Aimed at public sector clients and their advisors, but equally applicable to private sector

The core LCC process



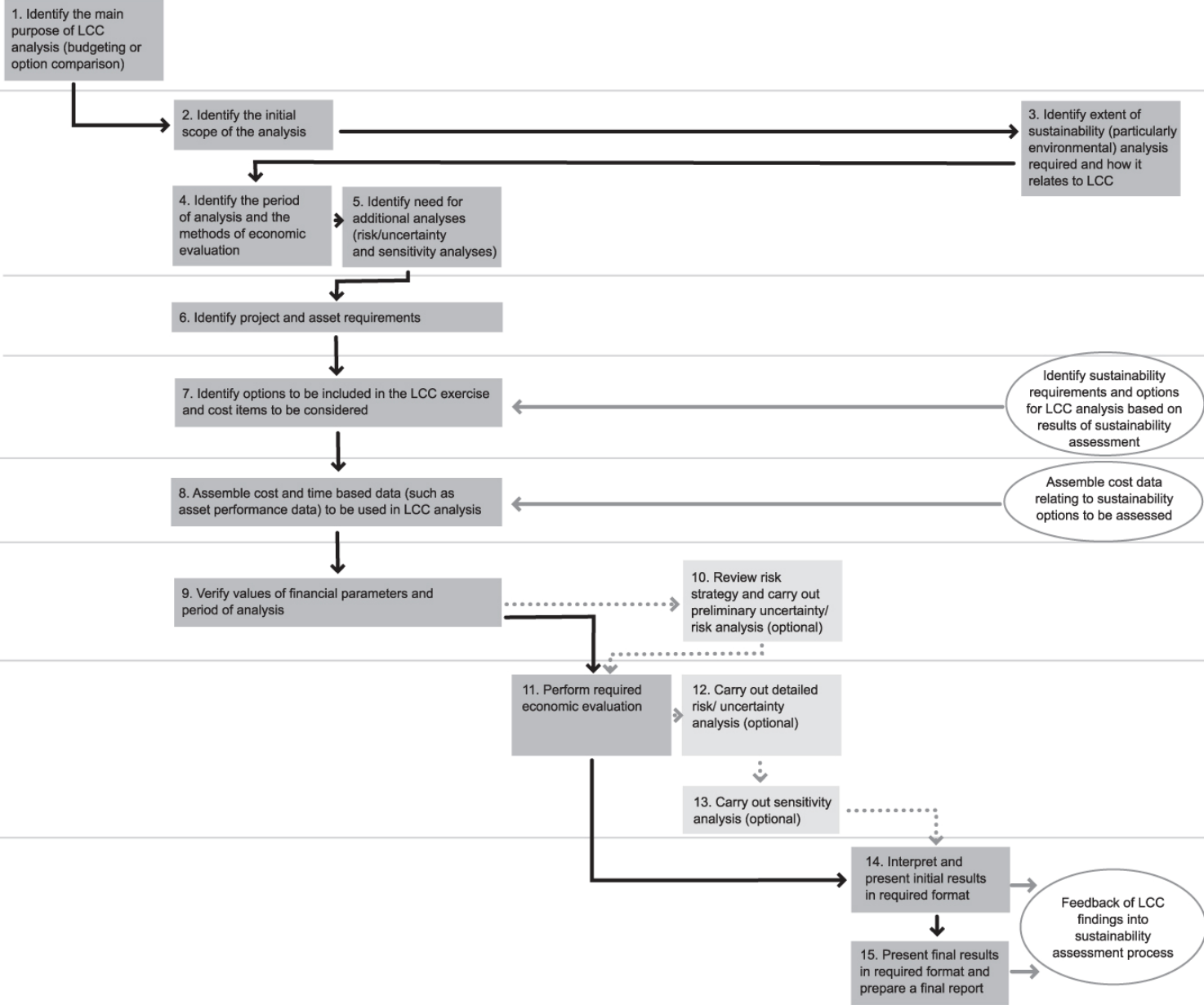
Key features

- Practical step-by-step approach, backed up by guidance and examples
- 15 clearly defined Steps, each covered by a chapter in the Methodology
- 3 optional Steps relating to uncertainty and risk
- Annexes provide a bibliography and sample outputs from typical LCC exercises
- Methodology is compatible with ISO 15686:Part 5
- Recognition that the LCC process is essentially iterative
- Recognition that in practice, some Steps may be combined or omitted
- Links with environmental sustainability clearly identified





**CLIENT ACTIONS/
INTERFACES**



Appoints advisors

Confirms scope & size

Selects/approves options

Verifies parameters and risk strategy

Reviews interim and final report

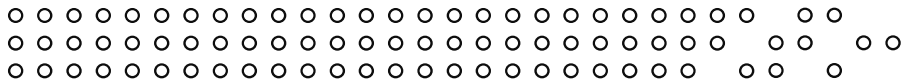
Identify sustainability requirements and options for LCC analysis based on results of sustainability assessment

Assemble cost data relating to sustainability options to be assessed

Feedback of LCC findings into sustainability assessment process

LCC and Sustainability

- LCC and LCA as two criteria in broader evaluation of options
- LCC as a means of financial evaluation of sustainability options
 - How to put a price on environmental impact?
 - What is the total cost over the life of the asset?
 - What cost savings are generated by sustainable options?
 - How many years to pay back the initial investment?
 - What is the impact of different energy prices or inflation rates?

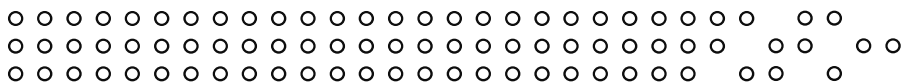


Use

- Addresses all typical uses of LCC in construction:
 - *Single constructed asset (building or civil engineering structure)*
 - *Individual components or assemblies within a constructed asset*
 - *Portfolio comprising a number of constructed assets*

- Can be applied at all stages of asset life:
 - *During design stages of a project to construct a new asset*
 - *At tender stage to determine best value for money (EMAT)*
 - *On completion/during operational stages of an existing asset*
 - *As part of a project to refurbish/adapt an asset*
 - *At the end of the asset life*

- Analysis period can be the complete life cycle of an asset or a shorter period



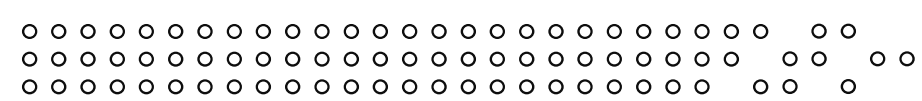
Agenda

EU Life Cycle Costing (LCC) Methodology & Guidance

EU Life Cycle Costing (LCC) Methodology Promotional Campaign

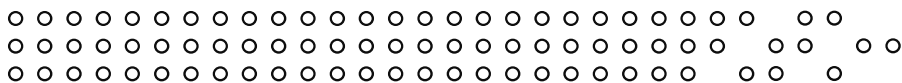
Case studies Across Europe

Discussion & Questions



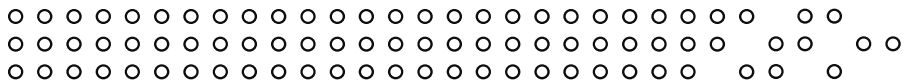
Promotional campaign

- Part of the implementation of the **Lead Market Initiative** (2008)
- General aim - Improve knowledge of how to apply sustainability criteria and Life Cycle Costing (LCC) in public procurement in order to increase the demand for innovation-oriented solutions
- Specific aim - to promote the use of a common methodological framework and guidance material for LCC across Europe and stimulate an exchange of experience and information related to LCC between Member States



Project tasks - overview

- **Task A:** Review of cost breakdowns and reporting schemes used for LCC in different construction projects/segments and from country to country across the EU.
- **Task B:** Identification of the information sources used on costs and performances of key construction systems and components.
- **Task C:** Consistent application of the LCC common methodology across a range of projects, plus assessment of the lessons learnt from this application.
- **Task D:** Preparation of a framework for training activities, in particular for a better monitoring/control of operational and maintenance expenses.
- **Task E:** Secure the active participation of a group of public sector clients and construction practitioners in order to collect and share information and results from tasks A, B and C.



Countries coverage

○ Eleven countries:

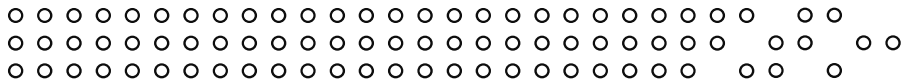
- Finland
- France
- the Netherlands
- Norway
- Sweden
- the United Kingdom

- Belgium
- Czech Republic
- Greece
- Ireland
- Slovenia

○ Fifteen case studies:

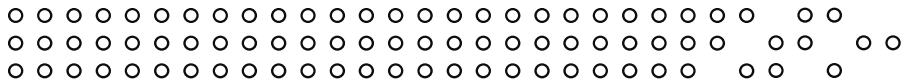
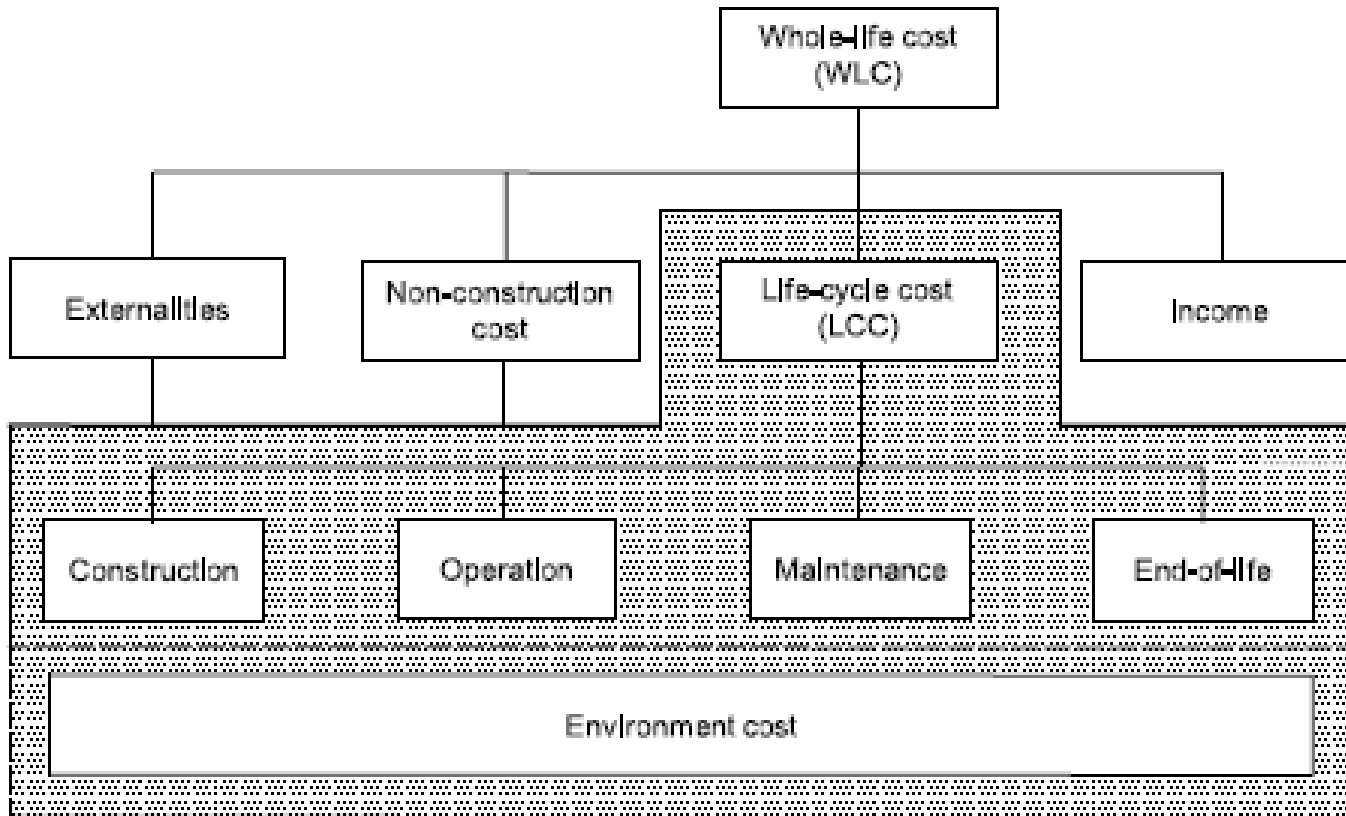
- Finland - 1
- France - 1
- the Netherlands - 2
- Norway - 2
- Sweden - 1
- the United Kingdom - 3

- Belgium - 1
- Czech Republic - 1
- Greece - 1
- Ireland - 1
- Slovenia - 1



Task A – Cost Breakdown Structures - Overview

ISO 15686: Part 5 – Whole Life Costs and Life Cycle Costs



Task A – Harmonisation of CBS and LCC

- **CEEC Code of Measurement for Cost Planning**

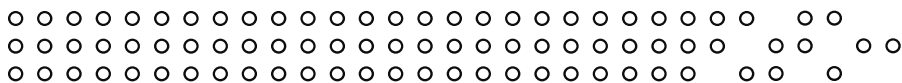
- Belgium, Switzerland, Germany, the Netherlands, Ireland and the UK
- Provides a framework that covers global cost of buildings (including costs-in use, land costs and finance) and construction (capital) costs
- A degree of correspondence at a very high ‘element group’ level with ISO 15686: Part 5.

- **Joint Nordic Proposal for Classification of LCC**

- Denmark, Finland, Iceland, Norway and Sweden
- Establishes a common model and specifications for LCC calculations and analysis with emphasis on assessing environmental impact and the promotion of the adoption of LCC principles
- Close correspondence with ISO 15686: Part 5 at high level classification

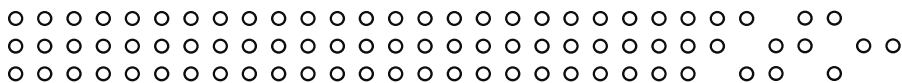
- **Project LCC-DATA (EC funded project)**

- Austria, Czech Republic, Greece, Germany, Norway and Slovenia
- Proposes a framework of all cost items to allow users to compare projects
- Close correspondence with ISO 15686: Part 5 at high level classification



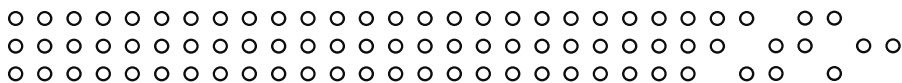
Task A – Countries Overview

- In general countries each have their **own cost breakdown structures** and only few have developed detailed cost breakdown structures for the operating and maintenance aspects of LCC.
- **ISO 15686 Part 5 and its associated CBS are gaining traction as a high level cost breakdown structure** - formally adopted in some countries (Sweden and the UK), with others indicating likely adoption (Netherlands, Slovenia, Ireland). The CBS in ISO15686 Part 5 is open to varying interpretation and provides a workable, generally comprehensive and potentially consistent basis for the assessment and comparison of Life Cycle Costs between different projects.
- No major problems reported in relation to the **interpretation and practical use of national CBS definitions**. CBS common definitions and local definitions from all the countries analysed are difficult to reconcile given the lack of national CBS standards.



Task A: Countries overview

- Work is ongoing on a proposed new **European Standard for Facility Management (CEN TC 348)** and is, in particular, (through WG 4: Taxonomy) developing structures and definitions for Facility Management work and cost categories. This work is not yet complete but could inform future work on the development of a common CBS for LCC.
- At project level, the cost breakdown structures used are predominantly driven by capital cost planning to which **maintenance, operating and energy costs are added depending on project circumstances.**



Task B – Sources of Information - Countries overview

○ CAPITAL COSTS

- **Construction costs** – country specific publications
- **Professional fees** – confidential data
- **Utilities costs and charges** – country specific utilities providers
- **Tax** – country specific local and central government

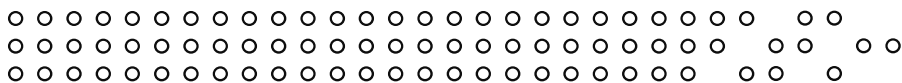
○ OPERATIONAL AND MAINTENANCE COSTS

- **Soft services** – primarily organisations' internal data
- **Repairs/Replacement of Minor and major Systems and Components**
– primarily manufacturers, suppliers and contractors

○ END OF LIFE COSTS

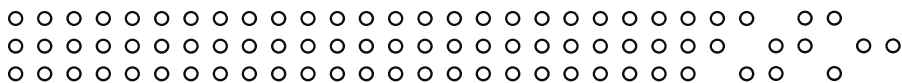
- Contractors or organisations' internal data

○ Tender indices – only in some countries



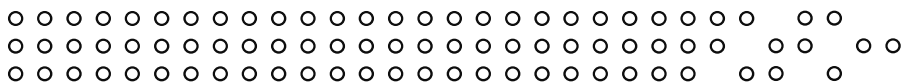
Task B: Countries overview

- A **multitude of cost and performance sources** are used across Europe.
- Little information obtained on the structured approaches adopted for the **systematic use / maintenance / updating of information**.
- In terms of applicability of data between different countries, there appears to be **little correlation or commonality** between the sources used.
- **Client briefs** are essential for the performance specification of materials, however, they are usually concerned with cost, time and overall performance and this usually hinders innovative solutions.
- A key issue in relation to performance data is the **difficulty of providing robust and consistent data** that can be applied in different locations as a number of factors influence the durability and maintenance requirements of building components, materials and assemblies in practice.



Task B: Countries overview

- New EU legislation is not focused on **testing the durability of products** and materials and national governments have concerns about issuing agreements on this aspect.
- A considerable body of knowledge focusing on the **reliability and 'mean time to failure' of building services plant**.
- When carrying out LCC assessments, the **accuracy of performance information** can be perceived as less important in comparison to other variables, such as interest rates. Lack of accurate data or over-optimistic assessments lead to significant discrepancies between estimated and real LCC costs, primarily for maintenance, operation and energy.



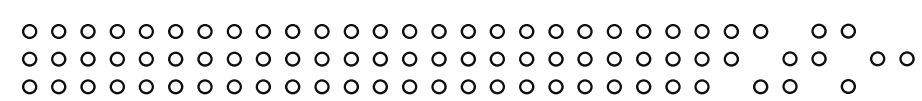
Agenda

EU Life Cycle Costing (LCC) Methodology & Guidance

EU Life Cycle Costing (LCC) Methodology Promotional Campaign

Case Studies Across Europe

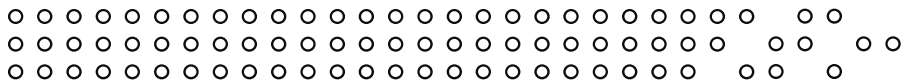
Discussion & questions



Task C – Case study projects

Project sector:	Administration / Office	2 projects
	Civil / Infrastructure	3 projects
	Culture	1 project
	Education	2 projects
	Fire stations	2 projects
	Health	2 projects
	Residential	2 projects
	Retail	1 project
Project type:	New build	9 projects
	Refurbishment	3 projects
	Combination of refurbishment and new build	3 projects

Project value:	Small (1-10 million Euros)	4 projects
	Medium (10-50 million Euros)	3 projects
	Large (50+ million Euros)	8 projects
Procurement route:	Direct Procurement (Traditional)	3 projects
	Design & Build	4 projects
	PPP	3 projects
	PFI	1 project
	Design, Build & Maintain/Operate	3 projects
	Design, Build & Sell	1 project



A50 Ewijk – Valburg Road, the Netherlands



- Road widening, intersections customization, new bridge
- Design & Build contract (50+ million euros)
- Objective: award the project to the Economically Most Advantageous Tender (EMAT) taking into account Life Cycle Cost.
- LCC specialist: Rijkswaterstaat

Input figures Contractor (example)

Object: KW 02a Object category: Viaduct Founding year: 1973 Concerns: Knooppunt Ewijk, Druen-Nijmegen
 Name employee: Jaap Bakker Highway: 50 Kilometer: 148,000

Basics **Noise reduction**

Object sort: Viaduct in ASW (beton) Verkeerskl. ≥ 4 YoE: 2010 Overhead factor: 1,28 Discount rate: 2,500

Exploitation Cost

	Amount	Unit	NCW per unit	NPV Traffic Measures	
Cost of Inspection	1	stuk	€ 19.480,00		€ 24.934
Cost of Routine Maint.	1	stuk	€ 52.800,00		€ 67.584
Replacement Cost	2000	m2	€ 463,00		€ 1.185.268
Rijvloer	1000	m2	€ 2,00	€ 0,00	€ 2.566
Asfaltconstructie; verkeersklasse ≥ 4	800	m2	€ 103,39	€ 0,00	€ 105.876
1) Voegovergang	200		€ 1.230,97	€ 0,00	€ 315.128
2) Voegovergang	0	m	€ 3.412,56	€ 0,00	€ 0
Draagconstructie rijvloer	300	m2	€ 2,00	€ 0,00	€ 770
Exploitation Cost					€ 1.702.125

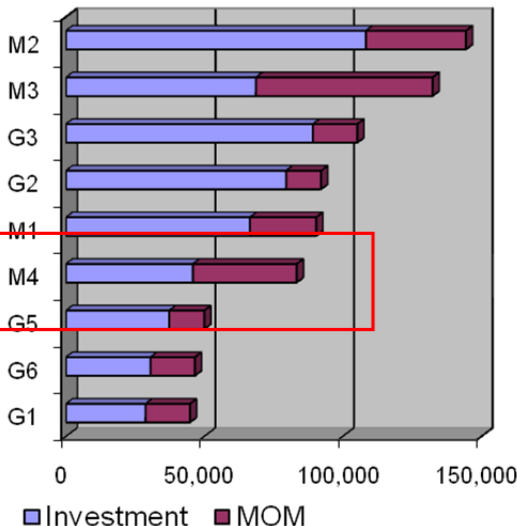
EMAT Subtotal CALM € 1.902.125

- Infinite time horizon leads to low discount rates (2.5%)
- CALM model for LCC calculations
- LEM model to optimise maintenance procedures
- New bridge - contractors free to select materials and construction type
- Existing bridge – contractors free to select between widening and repair or replacement

New Opera House, Norway



LCC over a period of 60 years and 6% real rent

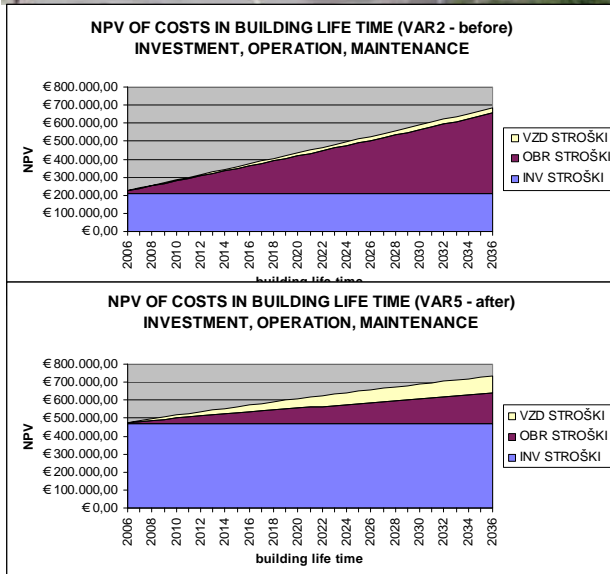


- New Opera House building & facilities
- Design, Build & Maintain/Operate (50+ million euros)
- Objective: Estimate the Maintenance Operation and Management (MOM) costs
- LCC specialist: Directorate for Public Construction and Property Management & Proteknologi
- Initial LCC analysis 60 years vs. 150 years
- LCC used to discuss options and estimate cost consequences of various component options (e.g. marble vs. granite)
- Maintenance Operation and Management costs 100% higher than anticipated primarily due to a hugely successful building (impact on energy, cleaning and management costs)

Steletova 8 Social Housing Refurbishment, Slovenia



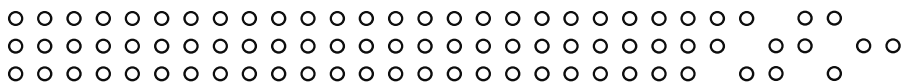
- Low carbon and low energy refurbishment of apartment block
- Traditional procurement (1-10 million euros)
- Objectives: Post completion evaluation of energy efficiency to inform strategic decisions.
- LCC specialist: Gradbeni Institut ZRMK (GI ZRMK)
- 30 years (building elements) vs 60 years (regulations lifespan requirements)
- Scenario adopted - not the most economically viable
- Users behaviour important



Development / investment costs – blue / Operational costs - violet / Maintenance cost yellow

Future direction from the EU

- Public procurement and the EU Works Directive:
 - Lowest Price v Economically Most Advantageous Tender (EMAT)
 - EMAT enables LCC considerations to be taken into account
 - Currently no EU requirement for LCC to be considered
- Construction products directive also currently has no LCC requirements and no requirement to specify service life
- Will the EU become more prescriptive over the use of LCC???



Agenda

EU Life Cycle Costing (LCC) Methodology & Guidance

EU Life Cycle Costing (LCC) Methodology Promotional Campaign

Case Studies Across Europe

Discussion & Questions

