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Life Cycle Costing in European Construction
EFCA Annual Conference (Rome – 28 May 2010)

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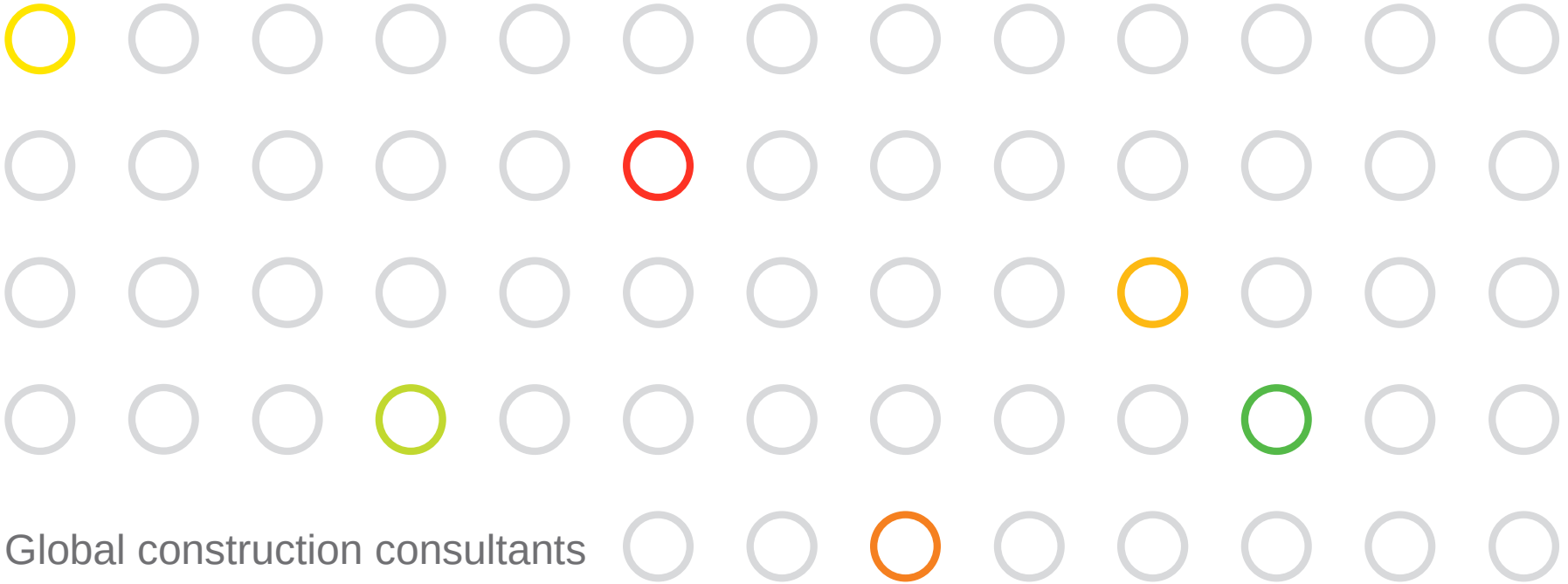
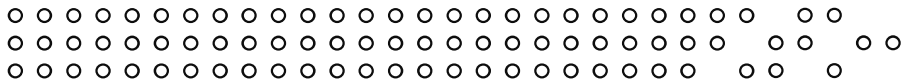


Global construction consultants

Agenda

- EU Life Cycle Costing (LCC) Methodology & Guidance
- EU Life Cycle Costing (LCC) Methodology Promotional Campaign
- Case Studies
- Questions & Answers



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EU LCC Methodology & Guidance

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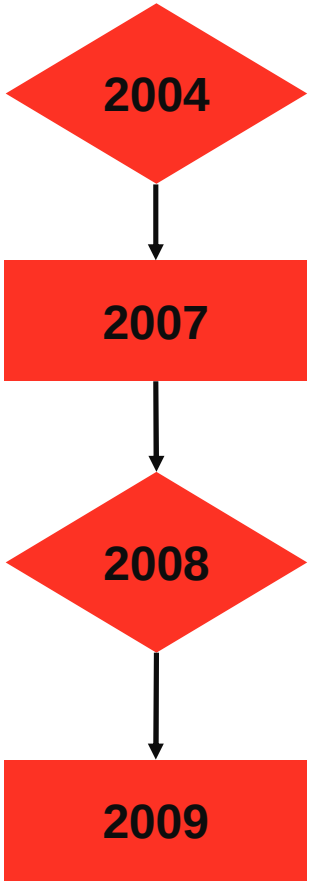
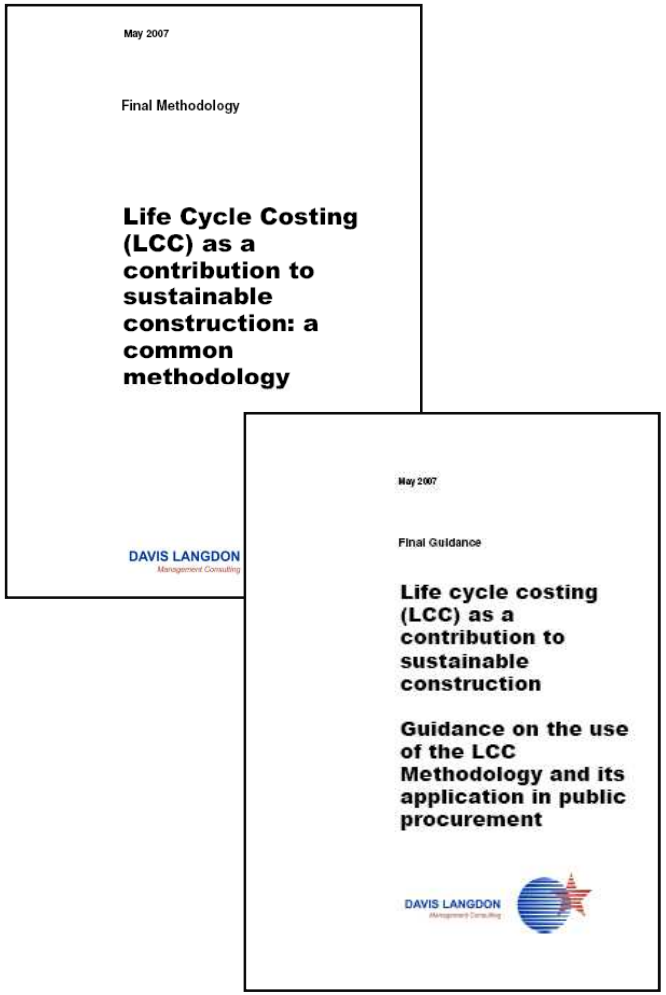
European Commission Work



- Identified need for a common European methodology
- Developed EU wide Life Cycle Costing (LCC) methodology
- Launched Lead Market Initiative (innovation policy initiative to reduce time-to-market of new products and services)
- Promotional campaign for Life Cycle Costing (LCC) in construction

EU LCC Methodology & Guidance



Aims

- Address the need for a more consistent & robust approach to the application of LCC across the EU
- Encourage the wider uptake of LCC
- Improve long term cost forecasting and optimisation
- Recognise the contribution of LCC to the sustainability agenda
- Target public and private sector clients and advisors

Key Features

- Practical step-by-step approach, backed up by guidance and examples
- Enables iteration
- Identifies links with environmental sustainability
- Compatible with ISO 15686:Part 5

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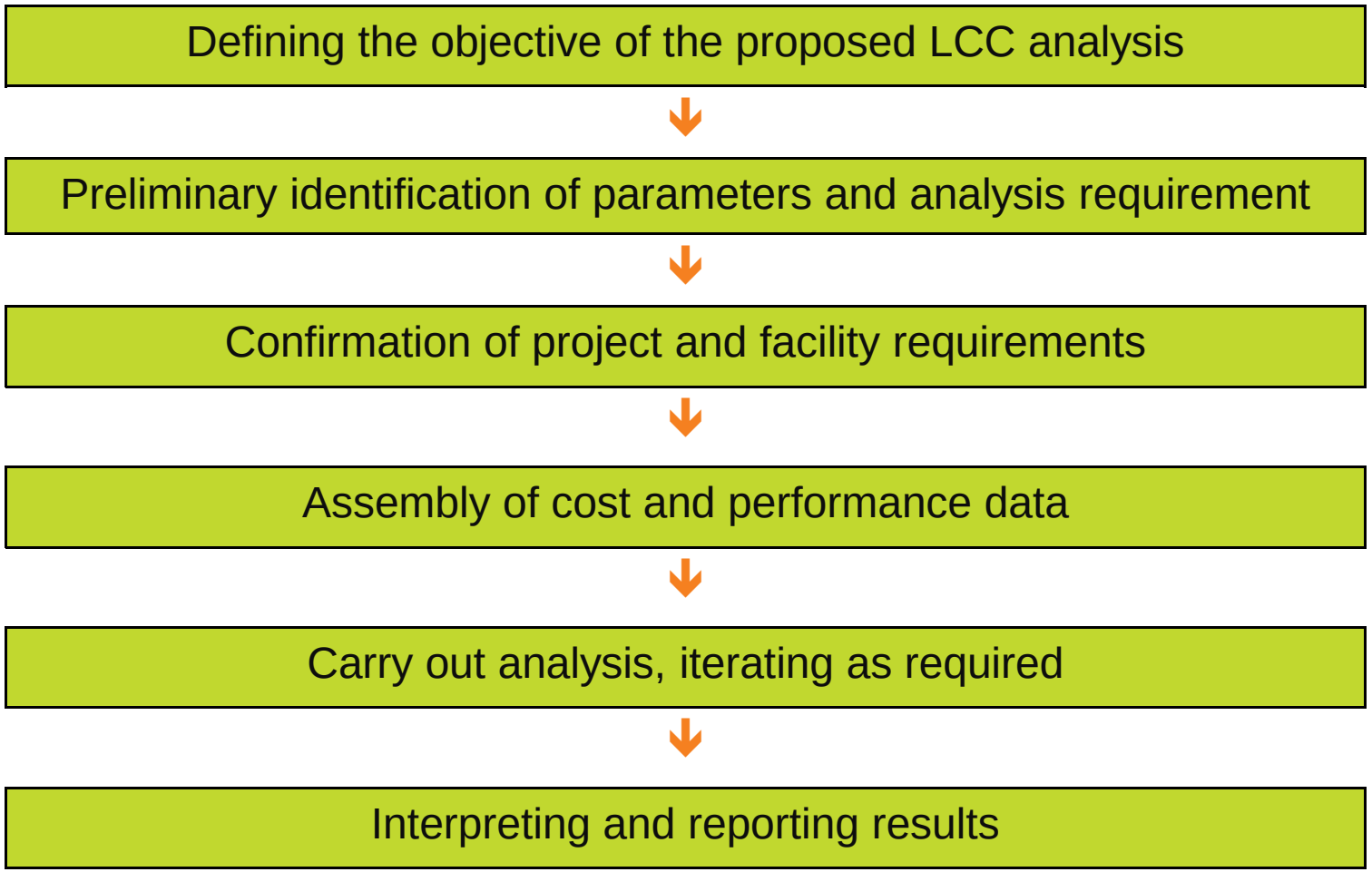
EU LCC Methodology & Guidance

Core LCC Process



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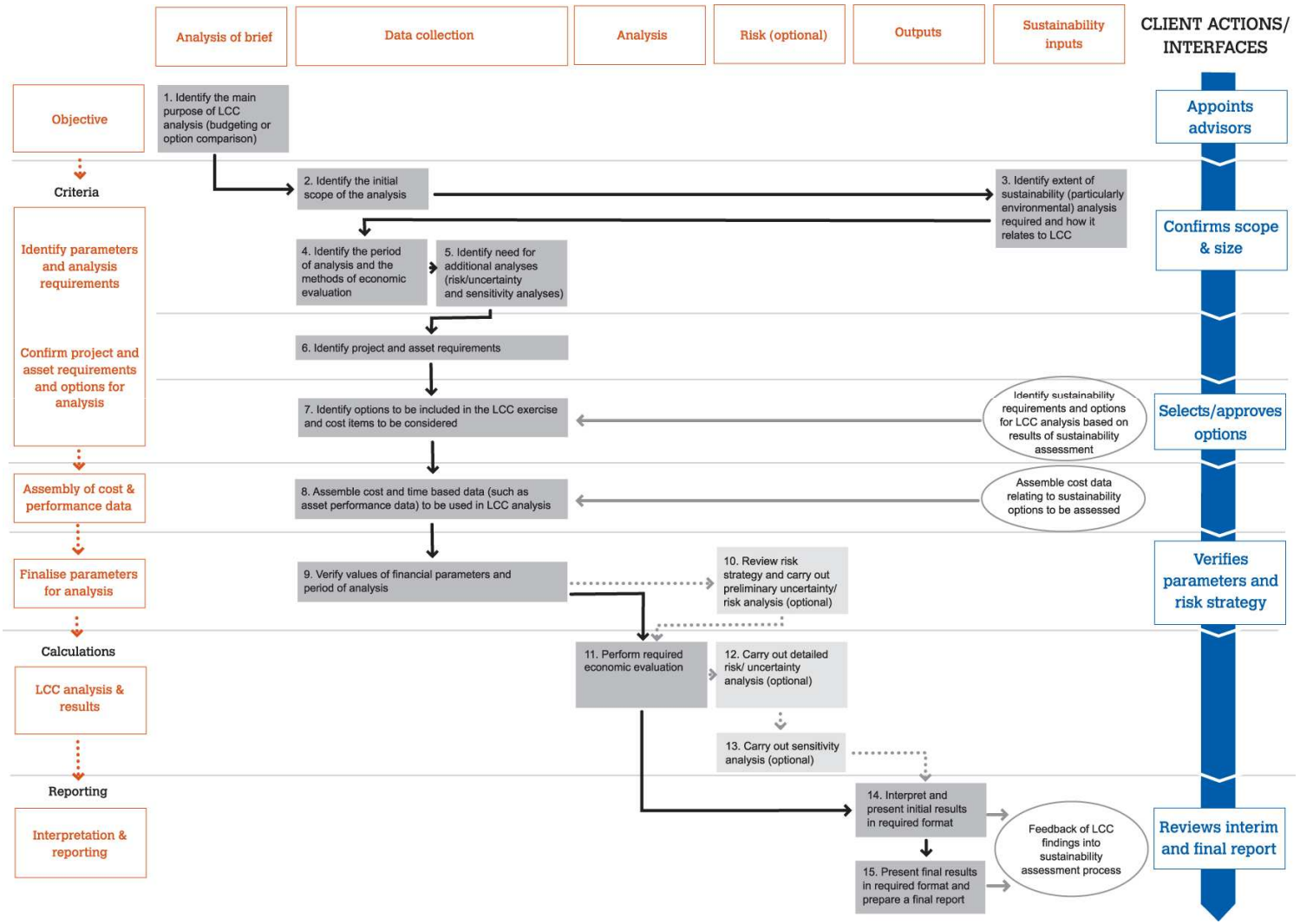
EU LCC Methodology & Guidance

Methodology Flow Diagram



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LCC and Sustainability

LCC as a means of financial evaluation of sustainability option:

- How to put a price on environmental impact?
- How many years to pay back the initial investment?
- What is the total cost over the life of the asset?
- What cost savings are generated by sustainable options?
- What is the impact of different energy prices or inflation rates?

Promotional Campaign

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EU LCC Promotional Campaign

General Aim

- Improve knowledge of how to apply sustainability criteria and LCC in public procurement
- Increase the demand for innovation-oriented solutions

Specific Aim

- Promote the use of the EU LCC Methodology & Guidance across Europe
- Stimulate an exchange of experience and information related to LCC between Member States

EU LCC Promotional Campaign

A Review of cost breakdowns and reporting schemes used for LCC in different construction projects/segments and from country to country across the EU.

B Identification of the information sources used on costs and performances of key construction systems and components.

C Consistent application of the LCC common methodology across a range of projects, plus assessment of the lessons learnt from this application.

D Preparation of a framework for training activities, in particular for a better monitoring/control of operational and maintenance expenses.

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 & 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

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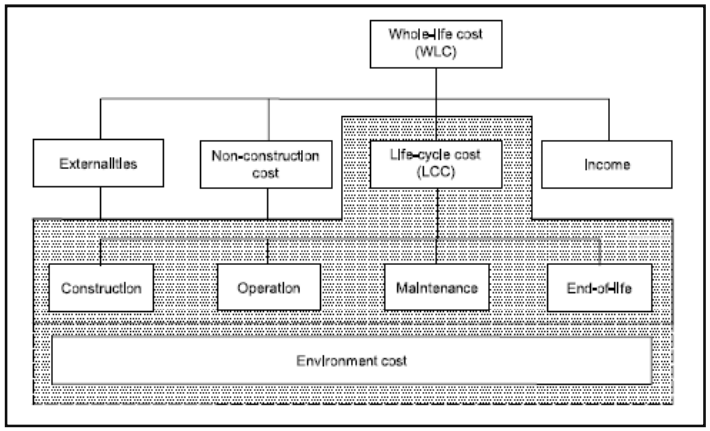
A – Cost Breakdown Structures

ISO 15686: Part 5

Whole Life Costs and Life Cycle Costs



Overview

- Country specific cost breakdown structures in place
- Few detailed cost breakdown structures for the operating and maintenance aspects of LCC
- CBS common definitions and local definitions from all the countries analysed are difficult to reconcile given the lack of national CBS standards.
- ISO 15686 Part 5 - gaining traction as high level cost breakdown structure (formally adopted in Sweden and the UK, with Netherlands, Slovenia, Ireland indicating likely adoption)
- CBS in ISO15686 Part 5 - open to varying interpretation but a workable, generally comprehensive and potentially consistent basis for the assessment and comparison of LCC between different projects.
- EU Harmonisation work: CEEC Code of Measurement for Cost Planning; Joint Nordic Proposal for Classification of LCC; Project LCC-DATA (EC funded project)

CEEC STATSBYGG SINTEF

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B – Sources of Information

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

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B – Sources of Information

Findings

- Multitude of cost and performance sources
- Little information on the systematic use / maintenance / updating of information
- Little correlation or commonality between sources
- Difficult to obtain robust and consistent data that can be applied in different locations
- New EU legislation is not focused on testing the durability of products
- Accuracy of performance information can be perceived as less important in comparison to other variables (i.e. interest rates)

Case Studies

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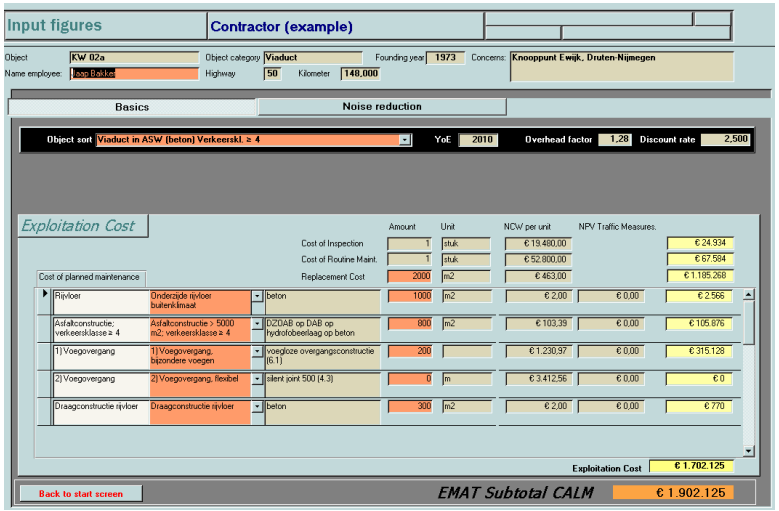
A50 Ewijk – Valburg Road, the Netherlands

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



- Discount rate: 2.5% due to infinite time horizon
- 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

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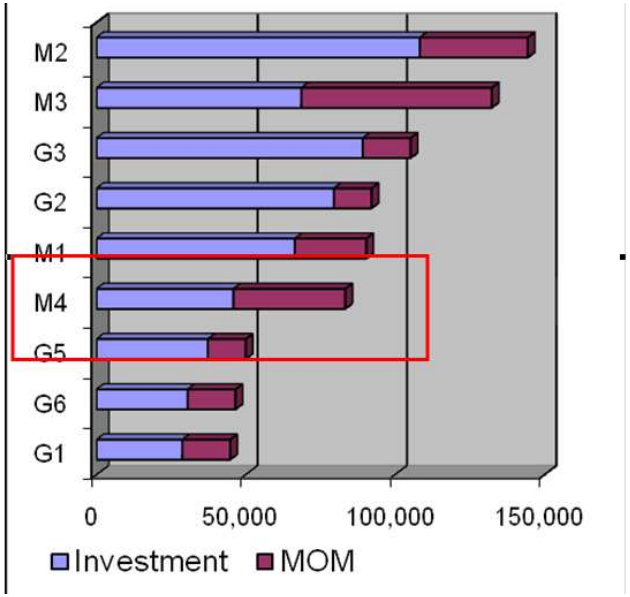
New Opera House, Norway



- Project: New Opera House building & facilities
- Objective: Estimate the Maintenance Operation and Management (MOM) costs
- Contract: Design, Build & Maintain/Operate (50+ million euros)
- 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 coponent options (e.g marble vs. granite)
- Maintenance Operation and Management costs higher than anticipated primarily due to a hugely successful building (impact on energy, cleaning and management costs)

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Uppsala Entrance, Sweden

- Project: Residential development (7 buildings, 90 flats)
- Objectives:
  - Identify the right actions to reduce the use of energy and costs to obtain a comfortable indoor climate
  - Choose the most efficient heating and cooling system
  - Choose the windows that provided most sun protection
- Contract: Design, Build & Sell (10-50 million euros)
- LCC specialist: Skanska & Ramboll

	District Heating	Pellets (2 sup.)	Air thermal solar collect (1 lev.)	Flat therm. solar collect (1 lev.)	Combined solar collector/ suncells (1 lev.)	HAWT (1 lev.)	VAWT (1 lev.)	Silicon Suncells (2 lev.)
Investment cost	150 000	1 050 000 (200 kW)	428 000 (41 kW)	462 000 (110 kvm)	630 000 (100 kvm)	665 000 (25 kW)	600 000 (25 kW)	540 000 (200 kvm)
Annual maintenance cost	5000	11 000	9100	9100	7000	10000	9000	9000
New investment cost	0	525 000 kr (20 år)	278 000 kr (12 år) 139 000 kr (24 år)	312 000 kr (15 år)	96 000 (25 år)	258 000 kr (20 år)	90 000 kr (25 år)	0
Technical lifespan/ calculationperiod (year)	30	20/30	12/30	15/30	25/30	20/30	25/30	30
Produced heat (kWh/year)	0	361 000	61 000	49 000	24 300	0	0	0
Purch. värme (kWh/year)	361 000	0	300 000	312 000	336 700	361 000	361 000	361 000
Produced electricity for internal use (kWh/year)	0	0	0	0	6000	20 000	20 000	22 000
Produced elecricity sold ext. (kWh/year)	0	0	0	0	0	10 000	5 000	0
Köpt el (kWh/år)	32 000	32 000	32 000	32 000	26 000	12 000	12 000	10 000
Total present cost (kr)	5 121 000	6 075 000	5 045 000	5 139 000	5 254 000	5 239 000	5 121 000	5 028 000
Energycost per produced/bought kWh (kr/kWh)	0,63 (0,63)	2,34 (0,63)	**0,57 (0,63)**	0,65 (0,63)	0,83 (0,63)	0,75 (0,63)	0,63 (0,63)	**0,53 (0,63)**

- Solar energy, wind power and biofuel plants estimated over 30 years
- Established the sale price that balances sustainability with economic value
- Subsidies for solar renewable energy made it cheaper than buying conventional energy and district heating.

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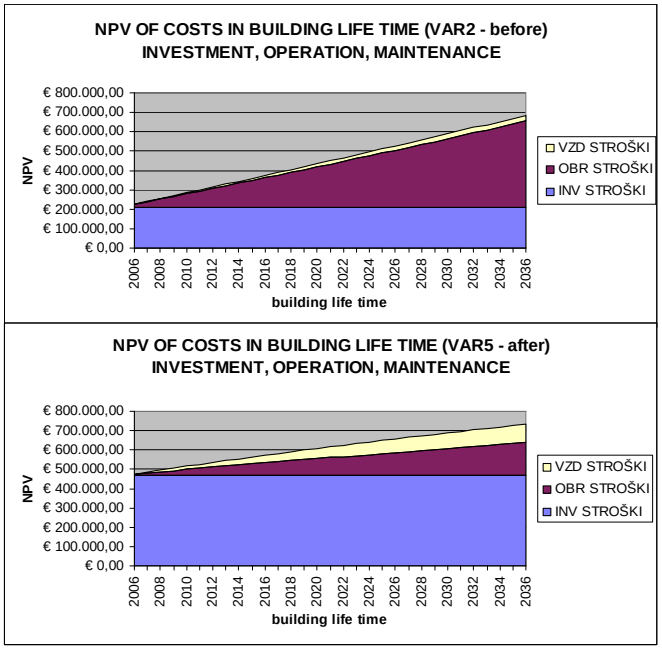
Steletova 8 Social Housing Refurbishment, Slovenia



- Project: Low carbon and low energy refurbishment of apartment block
- Objectives: Post completion evaluation of energy efficiency to inform strategic decisions.
- Contract: Traditional procurement (1-10 million euros)
- LCC specialist: Gradbeni Institut ZRMK (GI ZRMK)

- LCC applied as post completion evaluation to forecast future costs
- 30 years (building elements) vs 60 years (regulations lifespan requirements)
- Discount rate: 2.5 - 5%
- Users behaviour important in achieving the energy performance forecasted

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

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Conclusions

EU LCC Methodology

- Easily applied and fits well within EU LCC practices
- Brings greater commonality between CBSs
- Fits well with the ISO 15686:5

Challenges

- LCC awareness & understanding
- Greater national and international consistency of LCC practices

Next Steps

- Training programme
- Inclusion in the Sustainable Construction & Innovation (SCI) Network
- EU legislation on energy efficiency and public procurement

Questions & Answers

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Further information:
http://ec.europa.eu/enterprise/sectors/construction/competitiveness/life-cycle-costing/index_en.htm.